Aging and Developmental Issues

Are physical activity levels able to predict sleep quality in community-dwelling older adults? A longitudinal study

P. Morelhão[1,2], R. Pinto[3], G. Grande[4], C. Gobbi[5], M. Franco[6], S. Tufik[1,2], M. Andersen[1,2]
[1]Universidade Federal de São Paulo, Psicobiologia, São Paulo, Brazil, [2]Sleep Institute, São Paulo, Brazil, [3]Universidade Federal de Minas Gerais, Physiotherapy, Belo Horizonte, Brazil, [4]Universidade do Oeste Paulista, Medicine, Presidente Prudente, Brazil, [5]Universidade Cesumar, Physiotherapy, Maringá, Brazil, [6]Centro Universitário UNA, Physiotherapy, Belo Horizonte, Brazil

Introduction: For healthy aging, the regular practice of physical activity has been indicated as it promotes further general benefits. However, it is unknown in a single cohort if physical activity domains can predict improvement in sleep quality and clinical outcomes in the elderly with low back pain. To verify the predictive ability of physical activity domains on sleep quality in older adults with low back pain.

Materials and Methods: This was a longitudinal study with a 6-month follow-up. Older adults with low back pain were recruited and assessed through a home interview at baseline and after 6 months. Multivariate linear regression analyses were performed to verify whether the levels of physical activity in leisure time, sports and household tasks, measured by the Baecke Physical Activity Questionnaire Modified for the Elderly, predict an improvement in sleep quality at 6 months follow-up. The analysis was adjusted by the following covariates: age, gender, BMI, mental state, depression, comorbidities, and somnolence.

Results: A total sample of 231 older adults with low back pain were included, between March 2017 and December 2018, consisting of 177 (76.6%) women, mean age of 71 years. Final regression models showed no evidence of the association between the domains of baseline physical activity with sleep quality at 6 months follow-up, domestic, sports, and leisure.

Conclusions: Our findings suggest that the different domains of physical activity do not influence the sleep quality in older adults with low back pain at 6 months follow-up.

Association between sleep-disordered breathing and falls in the robust elderly

F. Perrucho[1], C. Furtado[2], C. Aguiar[2], C. Fernando de Sá Santana[2], M. Meira e Cruz[3,4,5], C. Dias[2], E.B. Pinto[2], C. Salles[1,6,7]

[1]Bahiana School of Medicine and Public Health (EBMSP), International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]Bahiana School of Medicine and Public Health (EBMSP), Salvador, Brazil, [3]University of Lisbon, Sleep Unit, Cardiovascular Center, Faculty of Medicine in Lisbon, Lisbon, Portugal, [4]European Sleep Center, Lisbon, Portugal, [5]College Sao Leopoldo Mandic, Campinas, Brazil, [6]Federal University of Bahia, University Hospital Professor Edgar Santos, Salvador, Brazil, [7]Jorge Amado University Center, Salvador, Brazil

Introduction: Some studies have shown that older adults diagnosed with obstructive sleep apnea (OSA) are twice as likely to fall. However, the literature still lacks the association between sleep-disordered breathing (SDB) and the risk of falling in robust older adults. Objective: To evaluate the association between sleep-disordered breathing and the prevalence of falls among the robust older adult.

Methods: This study is part of a more extensive study entitled "Sleep disorders and metabolomic profile related to the occurrence of falls in older adults community-dwelling: a prospective longitudinal study", involving individuals $\geq$65 years old, regardless of their sex. Exclusion criteria were: neurological or otoneurological diseases (possibility to affect balance) and the inability to understand the test instructions - making it challenging to perform the requested activities. A screening using the Index of Clinical-Functional Vulnerability 20 (CFVI-20) was performed, and only the robust older adults who independently and autonomously could manage their lives were included. A socio-demographic questionnaire was applied; the Montreal Cognitive Assessment (MoCA) was used to screen for mild cognitive impairment; the Epworth Sleepiness Scale(ESS) was used to assess excessive daytime sleepiness (EDS), and the Berlin questionnaire was applied to identify the risk of SDB; in addition, a history of falls over the previous 12 months was questioned.

Results: Initially, 90 older adult individuals were evaluated, 68.9% female, 46.7% self-declared as brown, with a mean age of 71.1($\pm$5.1) years. Less than 15% of the older adults required some gait aid. Most older adults were retired (88.9%), although 27.8% still maintained some professional activity. The robustness was present in 67 older adults, with the female gender presenting a higher prevalence (67.2%), an age range like the general average of the sample with 71.2($\pm$5.0), and the use of a gait aid device was referred to in almost 11%. As for sleep characteristics, among the robust older adults, there was an average of 8.18($\pm$4.95) points on the ESS, with 38.8% EDS, high risk for OSA in 25.4%, and a frequency of 29.9% reporting falling in the previous 12 months. Falling was found to be prevalent in 34.6% of the robust older adult who had EDS (p=0.497); among those who reported falling over the previous 12 months, 45% had a high risk for OSA (p=0.016); and comparing robust older adult at high risk for OSA with those without high risk, the frequency of falls was higher in the former group (52.9% vs 22.0%; p=0.016).

Conclusion: The robust older adults who had fallen at least once in the previous 12 months were at high risk for OSA, and those at high risk for OSA had a higher frequency of falls when compared to those without high risk. These data reinforce the need to establish fall prevention strategies in the older adult population with sleep-disordered breathing.

Association of 24-h rest-activity rhythms and future risk of Parkinson's disease in middle-aged to older adults: results from the UK Biobank

S. Haghayegh[1,2,3], X. Zheng[1], N. Gaykova[1], L. Gao[1,2,3,4], P. Lei[1,2,3], K. Hu[1,2,3]
[1]Brigham and Women's Hospital, Boston, United States, [2]Harvard Medical School, Boston, United States, [3]Broad Institute, Cambridge, United States, [4]Massachusetts General Hospital, Boston, United States

Introduction: Rest-activity rhythms (RAR) play a crucial role in maintaining the synchronization of various physiological processes, such as motor activity, which exhibit approximately 24-hour rhythms. Disturbances in these rhythms can compromise overall well-being. Studies have shown that Parkinson's disease (PD) patients often experience alterations in their rest-activity patterns. In this study, we investigated the potential association between 24-hour RAR and the risk of PD in middle-aged to older adults.

Materials and methods: Actigraphy recordings (up to 7 days) were collected from more than 100,000 participants in the UK Biobank between 2013-2015, the baseline for this study. Participants were followed after actigraphy assessment for up to 7.5 years (median: 5 years). Actigraphy data were used to obtain the following RAR measures: (1) activity counts of the most active 10 hours across the 24-h cycle (M10); (2) activity counts of the least active 5 hours across the 24-h cycle (L5); (3) relative amplitude, indicating the robustness of 24-h rhythmicity; (4) interdaily stability (IS), an estimate of the consistency of activity rhythms across days; (5) intradaily variability (IV), an estimate of the fragmentation of activity rhythms within a day; (6) midline estimated statistic of rhythm (MESOR), representing mean activity count of the 24-hour rhythm pattern; and (7) amplitude, half of the difference between the model fit peak and trough. Cox proportional hazard models were performed to determine the associations of each RAR measure with the events of PD during the follow-up. All the models were adjusted for age, sex, ethnicity, education, obesity, sleep apnea, alcohol intake, smoking status, morbidity burden, circulatory system disorder, and Townsend deprivation index.

Results: After eliminating the data of participants with PD at the baseline or those with low-quality actigraphy data, our analyses comprised a total of 94,071 participants (baseline age: between 43.5-79 years old with an average of 62.5; 56.4% female). Over the course of the follow-up period, 290 participants developed PD. The risk for PD was higher in participants with lower RA (Hazard Ratio [HR] per 1-SD decrease: 1.21, 95% CI: 1.11-1.30; lowest quartile [Q1] vs. highest quartile [Q4]: HR: 1.49; 95% CI: 1.07-2.06), lower M10 (HR per 1-SD decrease: 2.84, 95% CI: 2.32-3.47; Q1 vs. Q4: HR: 5.13; 95% CI: 3.35-7.86), lower MESOR (HR per 1-SD decrease: 2.96, 95% CI: 2.44-3.61; Q1 vs. Q4: HR: 5.14; 95% CI: 3.27-8.10), lower amplitude (HR per 1-SD decrease: 2.86, 95% CI: 2.31-3.55; Q1 vs. Q4: HR: 4.76; 95% CI: 3.14-7.21), lower IS (HR per 1-SD decrease: 1.18, 95% CI: 1.05-1.34; Q1 vs. Q4: HR: 1.44; 95% CI: 1.02-2.03), and higher IV (HR per 1-SD increase: 1.17, 95% CI: 1.04-1.30; Q4 vs. Q1: HR: 1.64; 95% CI: 1.16-2.34). However, there was no significant association between the L5 (HR per 1-SD increase: 0.98, 95% CI: 0.84-1.14) and risk of PD.

Conclusions: Reduced rest-activity rhythmicity may be a risk factor for PD. The mechanisms underlying the association of RAR measures and risk of PD are to be determined.

Associations between objective sleep parameters and brain amyloid-β burden in non-demented populations: a meta-analysis

S. Chong[1,2], H. Zhao[2], L. Shi[1,2], L. Lu[1,2,3,4]
[1]Peking University Sixth Hospital, Beijing, China, [2]Peking University Institute of Mental Health, Beijing, China, [3]National Institute on Drug Dependence, Peking University, Beijing, China, [4]Peking-Tsinghua Center for Life Sciences and PKU-IDG/McGovern Institute for Brain Research, Peking, China

Introduction: Amyloid beta (Aβ) peptides accumulation causes tau hyperphosphorylation and aggregation into neurofibrillary tangles, associated with overwhelming neurodegenerative diseases (NDDs). Therefore, it is imperative to identify the pertinent associated variables in the predementia stage. Sleep deprivation and sleep disorders were associated with Aβ accumulation. Meanwhile, populations with poor subjective sleep quality and sleep disorders reported amyloid overload. However, the relationship between objective sleep parameters and amyloid burden still remains lack of consistency. Therefore, we conducted a meta-analysis to investigate this issue in the non-demented population, to facilitate the early management of NDDs.

Materials and methods: The review protocol can be accessed on the PROSPERO with Registration No. CRD42023387435. We carried out a thorough search in three databases: PubMed, Embase, and PsycINFO. The search strategies were based on the keywords "Amyloid And ((Sleep*) OR (Insomnia*))". Studies that only reported serum Aβ were excluded. We investigated the relationship between brain Aβ and general sleep parameters and sleep stags. We performed a meta-analysis of data by random-effects models. Pooled effect sizes and 95% CIs are reported as Pearson's correlation coefficients. Sensitivity analyses were performed by excluding each study. In addition, meta-regression was used to identify potential moderators, including gender, age, measurement of Aβ and whether outcomes were adjusted, of the effect.

Results: A total of 21 eligible studies for inclusion in the meta-analysis. All included studies reported objective sleep parameters, including total sleep time (TST) (n = 14), sleep efficiency (SE) (n = 12), apnea hypopnea index (AHI) (n = 5), sleep latency (SL) (n = 5), wake time after sleep onset (WASO) (n = 13), and sleep stages (n = 4). As for general sleep parameters, SE was found to be negatively correlated with Aβ burden (r=-0.172, 95% CI: -0.307 to -0.030), while WASO (r=0.101, 95% CI: 0.030 to 0.172) and AHI (r=0.338, 95% CI: 0.055 to 0.571) were positively correlated with Aβ burden. No significant correlation was found between TST (r=-0.045, 95% CI: -0.115 to 0.025), SL (r=0.227, 95% CI: -0.167 to 0.558), and Aβ burden. As for sleep stage, only slow wave sleep (SWS) stage was found to be negatively correlated with Aβ burden (r=-0.250, 95% CI: -0.424 to -0.059), while rapid eye movement (REM) (r= -0.075, 95% CI: -0.212 to 0.064), non-REM1 (r=0.200, 95% CI: -0.126 to 0.487), non-REM2 (r=-0.040, 95% CI: -0.312 to 0.239), and stages did not show any significant correlation with Aβ burden. According to the sensitivity analysis, the significant association between brain Aβ burden and SE, WASO, and SWS demonstrated robustness, however, exclusion of four studies led to the loss of statistical significance for the association between AHI and Aβ burden. Univariate meta-regression revealed that potential moderators were adjusted was not significantly associated with the correlation between SE, WASO, SWS, AHI and Aβ burden.

Conclusions: Nocturnal fragmentation of sleep provides a warning indication of amyloid accumulation among non-dementia individuals. Specific sleep changes could predict the risk of NDDs and might contribute to effective early screening for diseases.

Daytime sleepiness as a mortality predictor in nursing home residents: the FIRST study

R. Piovezan[1], A. Jadczak[2], G. Tucker[2], R. Visvanathan[1]
[1]The University of Adelaide, Adelaide Geriatrics Training and Research with Aged Care (GTRAC) Centre, Adelaide Medical School, the Faculty of Health and Medical Sciences, Adelaide, Australia,
[2]The University of Adelaide, Adelaide, Australia

Introduction: Excessive daytime sleepiness is an increasingly frequent condition among older adults with comorbidities and living in nursing homes (NH). This study investigated associations between participants' characteristics and excessive daytime sleepiness (EDS); the ability of the Epworth Sleepiness Scale (ESS) scores, EDS and EDS severity levels to predict mortality at 12 months of follow-up; and the optimal cut-off for ESS to predict mortality among NH residents.
Materials and methods: Prospective and cross-sectional analysis in a prospective study including older adults permanently residing in 12 NHs from South Australia. Baseline characteristics including the ESS were collected and mortality at 12 months was assessed. Logistic regression analysed associations between participants' characteristics and EDS (ESS>10). Kaplan-Meier cumulative survival estimates followed by log-rank and adjusted Cox proportional hazards models explored associations of ESS scores, EDS and EDS severity levels with time-to-incident death. Receiver operator (ROC) analysis assessed the best cut-off for ESS to predict mortality risk.
Results: 550 participants (mean [SD] age, 87.7 [7.2] years; 968 [50.9%] female) were included in the final analysis. Malnutrition (adjusted odds ratio [aOR] 2.02, 95% confidence interval [CI] 1.13-3.61), myocardial infarction (aOR 1.91, 95% CI 1.20-3.03), heart failure (aOR 2.85, 95% CI 1.68-4.83), Parkinson's disease (aOR 2.16, 95% CI 1.04-4.47) and severe dementia (aOR 8.57, 95% CI 5.25-14.0) were associated with EDS. Kaplan-Meier analyses showed reduced survival among participants with EDS (log-rank test: $\chi 2$ = 25.25, p < 0.001). EDS predicted increased mortality risk (HR=1.63, 95% CI 1.07-2.51, p=0.023). ESS score of 10.5 (>10) was the best cut point predicting mortality risk (area under the curve (AUC)= 0.62).
Conclusions: Mortality among older adults living in NHs can be predicted by increasing daytime sleepiness, which is associated with commonly observed conditions in institutionalised individuals, such as malnutrition and neurodegenerative and cardiac comorbidities. Monitoring sleep-wake disturbances by simple methods can be an effective strategy to identify NH residents who are more susceptible to EDS-related poor quality of life and reduced survival. Measuring EDS levels as a general health indicator can sustain improved care practices by triggering the assessment and management of potentially treatable EDS risk factors and reducing the impact of reversible EDS consequences. In the context of non-reversible associated conditions, such as advanced dementia, increasing EDS can precipitate discussions and considerations about end-of-life care. Future studies targeting interventions to reduce EDS can result in new evidence-based strategies to improve quality of life and reduce the morbimortality observed in NHs.

Develop and convergent validity of sleep disorders questionnaire for elderly people with complains cognitive dysfunction. Preliminary results

V. Santiago-Ayala[1], J.S. Reyes[2], S. Juárez[3], C. Valencia-Flores[4], G. Menchaca[2], G. Gaytán[1], M. Reséndiz[1], M. Memetla[1], R. Morales-Navarro[1], M. Valencia-Flores[1,2]
[1]National Institute of Medical Sciences and Nutrition Salvador Zubirán (INCMNSZ), Sleep Disorders Clinic, Neurology and Psychiatry Department, Ciudad de México, Mexico, [2]National Autonomous University of Mexico (UNAM), School of Psychology, Ciudad de México, Mexico, [3]National Institute of Medical Sciences and Nutrition Salvador Zubirán (INCMNSZ), Neuropsychology Service, Neurology and Psychiatry Department, Ciudad de México, Mexico, [4]National Autonomous University of Mexico (UNAM), Ciudad de Mexico, Mexico

Introduction: The sleep disorders (SD) in elderly people have a high prevalence (40-70%); however, are often underestimated and undertreated. The more common SD are insomnia, snoring, obstructive sleep apnea (OSA), restless legs syndrome (RLS), periodic limb movement during sleep (PLMS), REM sleep behavior disorder and circadian rhythm sleep-wake disorders, which has negative consequences for health (cardiovascular/metabolic diseases, cognitive deficit, depression/ anxiety). Nocturnal polysomnography (PSG) is the gold standard for diagnosis of major sleep disorders. However, PSG has many limitations in clinical practice (high cost, long waiting lists, limited availability). A Questionnaires as screening instrument for SD in elderly people, have been considered as an alternative method, but there are few for this population.
Objective: Convergent validity of the Sleep Disorders Questionnaire for elderly people with complains cognitive dysfunction in Mexican population. **Design:** Retrospective study
Materials and Methods: The Sleep disorders questionnaire for elderly people with complains cognitive dysfunction (CCD) in Mexican (SDQEP-CCD) was developed by multidisciplinary expert group (sleep disorders, linguist, and clinical neuropsychologist). The construct of items was supported on diagnostic criteria of the International classification of sleep disorders and clinical experience. The SDQEP-CCD evaluated six sleep disorders (OSA, Insomnia, RLS/PLMS, REM sleep behavior disorder, circadian rhythm sleep disorder). **Validation process:** In the initial phase, a total of 116-items were obtained with 5-point Likert scale. The SDQEP-CCD was assessed content and face validity in three pilot studies of patients with CCD attended by the neuropsychologist at Neurology and Psychiatry Department in the INCMNSZ that provides third level medical care in México City. After a discriminant analysis (frequencies, Mann-Whitney U test), some items were partially rephrased and others eliminated. We obtained a preliminary version of SDQEP-CCD 63-items (SDQEP-63).
Participants were consecutive patients (n=26) with an age ≥60 years old (69.28±8.7), BMI=32.4±6.22, 38% with elementary/high school, 55% married and 22% employees. All patients were referred from the Neuropsychology Service to the Sleep Disorders Clinic for suspected of sleep disorders. The SDQEP-63 was administered before to the PSG. We determined convergent validation, by Spearman´s correlation (Rho) for quantifying the association between SDQEP-63, and PSG variables, and considered significant Rho≥0.4, p-value ≤0.05 two sided.
Results: 65% of patients were diagnosed for PSG with OSA (AHI≥5), and 31% OSA+PLMS (index≥15). The Spearman´s correlation analysis showed an association with 16-items (SDQEP-16). The PLMS 3-items were correlated with oxygen desaturation index (Rho ≥0.400, p≤0.04); the somnolence/fatigue 5-items were associated negatively with TST, %sleep efficiency, %N3 (Rho≥ -0.403, p<0.04), WASO and arousal index (Rho ≥0.506, p=0.05); while snoring/OSA 7-items were associated with number of snoring (Rho≥0.505, p=0.03); and an item of parasomnia was correlated with REM latency Rho=-0.435, p=0.034.
Conclusions: Our work provides evidence that the SDQEP-16 seems to be a screening instrument for OSA/snoring, PLMS and parasomnia for older people with CCD. Neuropsychology specialists and physicians could use the SDQEP-16 to identify early patients with SD, and to referred at Sleep Clinic for the opportune diagnosis and treatment.**This work was supported by UNAM-PAPIIT 32-IN216919**

Effects of sleep deprivation and recovery sleep on serum biomarkers of Alzheimer's disease in retired night shift workers and retired day workers

H.M. Lehrer[1], X. Zeng[1], K.A. Wilckens[1], R.T. Krafty[2], D.J. Buysse[1], T.K. Karikari[1]
[1]University of Pittsburgh, Department of Psychiatry, Pittsburgh, United States, [2]Emory University, Department of Biostatistics and Bioinformatics, Atlanta, United States

Introduction: Short sleep is a risk factor for Alzheimer's disease, and sleep is critical to the clearance of brain metabolites involved in Alzheimer's pathogenesis. Blood-based biomarkers of Alzheimer's disease (e.g., beta amyloid [Aβ] 42/40 ratio, phosphorylated tau181 [p-Tau181], neurofilament light chain [NfL], glial fibrillary acidic protein [GFAP]) are validated and increasingly used in clinical studies, yet the impact of sleep deprivation and recovery sleep on these markers is unclear. If sleep deprivation hinders clearance of Alzheimer's-associated metabolites, we expect serum levels to be lower after sleep deprivation but increase with recovery sleep when proteins can be cleared from the brain into the blood. Furthermore, clearance may be impaired in populations with chronic poor sleep, such as retired night shift workers. This study determined the effects of sleep deprivation and recovery sleep on serum biomarkers of Alzheimer's disease and explored whether effects differed between retired night shift workers and retired day workers.

Materials and methods: Participants were 58 cognitively normal retired night shift workers ($n = 28$) and retired day workers ($n = 30$) who completed a 60-hour laboratory study. The protocol included a baseline night of sleep, one night of total sleep deprivation, and one night of recovery sleep. Blood was collected the morning after each night. Serum samples were analyzed for Aβ40, Aβ42, p-Tau181, NfL, and GFAP using ultra-sensitive immunoassay. Linear mixed models determined effects of sleep deprivation and recovery sleep on biomarker levels adjusted for age, sex, race/ethnicity, and years of education.

Results: This was a sex-balanced (52% females), mostly White (86% non-Hispanic White), educated (mean education: 16.0 +/- 1.9 years) sample of older adults (mean age: 67.8 +/- 5.5 years). Sleep deprivation was associated with decreased levels of Aβ42/40 ratio, NfL, and GFAP. In the recovery sleep phase, the Aβ42/40 ratio remained lower than baseline, while serum NfL and GFAP concentrations increased back to baseline levels. Serum pTau-181 did not change in response to sleep deprivation, but pTau-181 levels decreased after recovery sleep. The pattern of serum biomarker changes was similar between retired night shift workers and retired day workers.

Conclusions: In retired adults, acute sleep deprivation and recovery sleep impact levels of Alzheimer's disease biomarkers measured in serum. Sleep may therefore affect the diagnostic accuracy of serum Alzheimer's biomarker tests. Former night shift work exposure does not appear to influence serum biomarker response to sleep deprivation and recovery sleep, suggesting that any such potential effects of long-term shift work exposure ameliorate over time. Future work will focus on active shift workers.

Hearing loss in patients with Obstructive Sleep Apnea

M. Milkov[1], M. Stoykov[1], S. Baycheva[2], Z. Terzieva[3]
[1]Medical University "Prof. Dr. Paraskev Stoyanov", University Medical and Dental Center, Faculty of Dental Medicine, Varna, Bulgaria, [2]Medical University "Prof. Dr. Paraskev Stoyanov", Faculty of Dental Medicine, Varna, Bulgaria, [3]Medical University "Prof. Dr. Paraskev Stoyanov", Varna, Bulgaria

Introduction: Obstructive sleep apnea is a clinical condition that affects a growing number of patients nowadays, especially in our country. Sleep apnea can have medical implications, affecting other anatomical systems of the human organism. Connections between hearing loss and obstructive sleep apnea have been proven. More scientific data is to be gathered.

Materials and Methods: During the last campaigns for free sleep screenings on World Sleep Day, we also conducted a hearing test. We decided to look for a certain regularity in how the suspicion of sleep apnea affects the hearing loss of these patients. Over a period of four years, we summarized data from 64 men and 28 women between the ages of 45 and 75 with proven sleep apnea and various hearing loss. In 70 percent of patients, hearing diagnostics showed presbyacusis, and in the remaining patients - auditory nerve neuritis.

Results: The majority of patients associate the onset of hearing loss with sleep problems. In addition to daytime fatigue and morning headaches, they also reported a gradual decrease in hearing. We started following up these patients, despite the fact that a large number of them already have undergoing treatment for sleep apnea and treatment for hearing loss.

Conclusions: Definitive evidence of this relationship and impaired inner ear oxygenation during sleep will be a priority in our future research.

Impact of COMISA as a risk factor for falls in community-dwelling robust older adult: preliminary results

A.R. Silva[1], R.B. Silvão[1], C.M. Guimarães[1], C. Villa Nova Aguiar[1], E.B. Pinho[1], C. Dias[1], C. Salles[1,2,3]
[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]Federal University of Bahia, Salvador, Brazil, [3]Jorge Amado University Center, Salvador, Brazil

Introduction: The growing aging population and the incidence of age-related diseases have increased, accompanied by the prevalence of falls in the older adult, occupying the second position in causes of death by unintentional injury. Comorbid insomnia and obstructive sleep apnea are common disorders in the older adult, affecting about 10% to 20% of the population. When these disorders co-occur, they are classified as COMISA; this association can result in functional impairments such as fatigue and daytime sleepiness. Despite the knowledge about risk factors for falls, there needs to be more understanding of the association between COMISA and the risk of falls. The objective of this study was to evaluate the impact of COMISA as a risk factor for falls in community-dwelling older adults.

Materials and Methods: This study is part of a more extensive study entitled "Sleep disorders and metabolomic profile related to the occurrence of falls in older adults community-dwelling: a prospective longitudinal study". This is a prospective longitudinal study. The participants were selected through non-probability sampling using the snowball method. Inclusion criteria: robust older adult, 65 years or older, residents in Salvador- BA, approved in the Clinical-Functional Vulnerability Index (IVCF-20) and the Montreal Cognitive Assessment. Exclusion criteria: institutionalized older adult, with neurological or osteoarticular disorders that affect balance, and inability to understand instructions. Instruments used: sociodemographic questionnaires, history of falls in the last year, and clinical questionnaires, such as the Insomnia Severity Index and the Berlin questionnaire. The data collected were analyzed utilizing the SPSS program.

Results: Data from a sample of 77 participants were analyzed. Mean sample characteristics included a mean Body Mass Index (BMI) of 26.3±4.1; a mean neck circumference of 38.8±3.6 cm; an abdominal circumference of 92.9±10.9 cm; and a mean age of 71.0±5.0 years. Of the participants analyzed, 68.8% (n=53) were female, and 76.6% (n=59) self-declared as black or brown. Furthermore, 26.3% of the participants reported having suffered at least one fall in the previous 12 months. Within the analyzed sample, a total of 07 patients with COMISA were evaluated. The mean age of the patients analyzed was 68.6±3.1 years; the mean BMI was 24.8 kg/m^2, ranging from 24.2 to 35.0 kg/m^2; the mean neck circumference was 37.2±3.7 cm, the mean abdominal circumference was 95.6±9.4 cm. Of those, 57.1% (n = 4) were female, and 57.1% (n = 4) were white. In addition, 71.4% of patients (n = 5) reported having fallen at least once in the previous 12 months.

Conclusions: The present study found that OSA and comorbid insomnia were associated with falls in older adult individuals over 65 years of age. The prevention and management of OSA and comorbid insomnia may be essential in reducing the risk of falls and promoting health and general well-being.

Influence of physical activity on sleep quality in older adult aged ≥ 65 years

M. Freitas[1], L. Albuquerque[1], G. Neiva[1], M.C. de Freitas[1], R. Guimarães[2], C. Aguiar[1], C. Dias[1], C. Salles[1]

[1]Bahiana School of Medicine and Public Health, Salvador, Brazil, [2]University of Illinois at Urbana Champaign, Urbana-Champaign, United States

Introduction: In recent decades, population aging has been marked by increased life expectancy and reduced birth and death rates in most countries worldwide. The aging process brings neuromuscular and physiological changes, in addition to changes in sleep patterns, increasing the state of wakefulness. Poor sleep quality can damage the older adult health, causing them difficulty carrying out their daily tasks. Regular physical activity has been recommended for improving and maintaining the health of older adult people and may prevent or mitigate functional, physical, cognitive, and psychological impairments. The objective of this study is to assess the influence of physical activity on sleep quality in older adult men and women aged ≥ 65 years.

Materials and Methods: This cross-sectional study comprises 101 non-institutionalized older adult people, with a mean age of 74.74 ± 6.97 years, 77.2% of whom were women. Data were collected online (through message apps and video calls) or by phone calls between March and May 2021. This study included: older adult men and women aged ≥ 65 years, with the ability to interact with the evaluator and internet and/or telephone access to answer the questionnaires. The International Physical Activity Questionnaire (IPAQ) adjusted for the older adult was used to determine the level of physical activity, and the Pittsburgh Sleep Quality Index (PSQI) was used to investigate the variable "quality of sleep". The population was characterized using statistical analyzes such as Student's t-test and linear regression.

Results: The mean age of the older adult was 74.74 ± 6.97 years, the mean body mass index was 27.54 ± 5.34 Kg/m^2, and the mean systolic and diastolic blood pressures were 125.69 ± 9.18 mmHg and 78.23 ± 7.83 mmHg, respectively. The older adult were classified as having poor sleep quality (68.3%). Regarding the level of physical activity, they were classified as physically active (80.4%). The most significant contribution to the energy demand measured by IPAQ was domestic activities (240 minutes per week), followed by sports/leisure activities (40 minutes per week). Linear regression showed a significant relationship between variables domain 3 (domestic physical activity) and domain 4 (sport and leisure physical activity) with the overall score of the Pittsburg questionnaire. Domains 3 and 4 were able to explain 12.4% of the older adult sleep quality. The higher the value of domain 4, the better the sleep quality of the older adult [$F_{(2, 95)} = 6,589$; $p = 0.002$; $R^2=0,124$].

Conclusions: The present study showed that spending more time practicing sports and leisure physical activities is related to good sleep quality. On the other hand, the more time spent in physical activities in and around the house, the worse the older adult sleep quality. Thus, this study suggests including sports and leisure physical activity in the older adult aged ≥ 65 years daily routine, such as walking, cycling, running, and swimming.

Interactive association between insomnia symptoms and sleep duration for incident dementia – a prospective study in the Swedish National March Cohort

X. Tan[1,2], T. Åkerstedt[2], H.-X. Wang[3]
[1]Zhejiang University, School of Public Health and Sir Run Run Shaw Hospital, Hangzhou, China,
[2]Karolinska Institutet, Stockholm, Sweden, [3]Stockholm University, Stockholm, Sweden

Introduction: Given the importance of sleep in maintaining neurocognitive health, both sleep duration and quality are potential key factors for the prevention of dementia. Insomnia is the most prevalent sleep disorder. However, whether insomnia symptoms predispose incident dementia, and whether sleep duration moderates the possible link between insomnia symptoms and dementia remain uncertain.

Materials and Methods: This prospective study involved 22,078 participants (age at baseline: 59.9±8.8 years, 62% women) from the Swedish National March Cohort. Participants were free from dementia and stroke at baseline. Incident dementia was documented by national registers in Sweden during a median follow-up period of 19.2 years. Status of insomnia symptoms and subjective sleep duration was ascertained by Karolinska Sleep Questionnaire. Cox proportional hazard models adjusted for age, sex, education, depression, and other potential confounders were used to estimate hazard ratios (HR) and 95% confidence intervals (CI) of dementia in relation to insomnia symptoms and sleep duration.

Results: Compared to participants without insomnia at baseline, those who reported any insomnia symptom were associated with a greater risk of incident dementia (HR [95%CI]: 1.08 [1.03, 1.35]). Specifically, difficulty initiating sleep (vs. non-insomnia, 1.24 [1.02, 1.52]), but not difficulty maintaining sleep or early morning awakening was correlated with an increased risk of dementia. Short sleep duration was associated with higher risk of incident dementia (6 hours vs 8 hours, 1.29 [1.11-1.51]; 5 hours vs 8 hours, 1.26 [1.00-1.57]). An interaction between status of insomnia and sleep duration for the risk of dementia was detected. Stratified analyses suggested that insomnia symptoms increased the risk of dementia only among participants with ³7 hours sleep (vs. non-insomnia, 1.24 [1.00-1.54], P=0.047), but not among short sleepers (<7 hours). Short sleep duration also did not further inflate the risk of dementia among insomniacs.

Conclusions: Insomnia symptoms and subjective sleep duration are interactively associated with the risk of dementia among middle aged to older adults.

Language development and sleep quality in children with Congenital Zika Syndrome: a longitudinal study

N. Silva[1], E. Ribeiro[2], M.C. Couto[1], I. Silva[1], K. Rosa[1], M. Proença[3], C. Giacheti[1], L. Pinato[1]
[1]Paulista State University, Speech & Hearing Sciences, Marilia, Brazil, [2]Albert Sabin Children's Hospital, Genetics, Fortaleza, Brazil, [3]Paulista State University, Physiotherapy, Marilia, Brazil

Introduction: The Congenital Zika Syndrome (CZS) is caused by the Zika virus, whose infection in pregnant women resulted in children with microcephaly and central nervous system alterations. The complete phenotype of CZS is still in delineation since the first births occurred in late 2015 and clinical consequences can still be presented during the children's development. Considering that sleep problems may aggravate neurodevelopmental disorders and that early diagnosis may mitigate the consequences on behavior, cognition, and language acquisition, it is important to investigate possible relationships between neurodevelopment and sleep quality for therapeutic planning in children with CZS. Thus, the objectives were to investigate whether there would be evolution in the development of language and sleep from 13 to 36 months of age and the possible relationships between sleep and language in CZS children.

Materials and Methods: This study was approved by the Ethics Committee under protocol 1.743.023. Eighty children diagnosed as SCZ participated in this research, subdivided into groups according to age range: group 1, 13 to 18 months (N=20), group 2, 19 to 24 months (N=20), group 3, 25 to 30 months (N=20), group 4, 31 to 36 months (N=20). The Early Language Milestone Scale (ELM) and the Brief Infant Sleep Questionnaire (BISQ) were used. The comparison between ELM or sleep data in different age groups was performed using a non parametric multiple comparison test. The Spearman r coefficient was used to measure the degree of association between sleep and ELM parameters. Values were considered significantly different at $p < 0.05$.

Results: In the language development, there was no difference between the groups 1-4 in the auditory receptive language (4[3.7-4], 3.5[1.7-4], 4[3-5],3[2.2-5]), auditory expressive language (4[3-5], 3[3-4.2], 3[3-4], 3[3-4]) and visual language (3.5[2-5], 2.5[2-4], 4[2-5], 3[2-4]), indicating no improvement in language skills. In the sleep development it was found that there was a worsening in sleep latency at more advanced ages (p= 0.03) and there was a decrease in hours of sleep at night (p= 0.003). There was a negative correlation between expressive auditory language and the number of awakenings (p= 0.01, r= -0.67), between visual language and time awake at night (p=0.04 , r= -0.85), visual and sleep latency (p =0.02, r= -0.72); receptive auditory and latency (0.02, r= -0.63). There was a positive correlation between visual language and hours of sleep (p= 0.02, r= 0.57), between expressive auditory language and hours of sleep (p=0.01, r= 0.60).

Conclusions: From 13 to 36 months, children with CZS showed no evolution in language development or sleep quality. Sleep quality worsened over time. Sleep latency, time awake at night and number of awakenings had a negative impact on language development. The more hours of sleep at night, the better the language performance.

Night shift work and menopause: Association between climacteric symptoms, reported psychic symptoms, and hormonal profile of female night shift workers during the menopause

S. Saraiva[1], C. D'Aurea[2], P. Nehme[3], F. Amaral[4], J. Cipolla-Neto[5], E. Marqueze[6], C. Moreno[1]
[1]University of São Paulo, São Paulo, Brazil, [2]Catholic University of Santos, Santos, Brazil, [3]Bertioga City Hall, Bertioga, Brazil, [4]Federal University of São Paulo, Pineal Neurobiology Laboratory, São Paulo, Brazil, [5]University of São Paulo, Institute of Biomedical Sciences, São Paulo, Brazil, [6]Butantan Institute, São Paulo, Brazil

Introduction: The climacteric or menopausal transition is defined as all the physiological and pathological events that lead to the onset of decreased ovarian follicular function, both before and after menopause (last menstruation). This threshold, which marks the end of reproductive life, is characterized by reduced fertility, changes in the frequency, intensity, and duration of the menstrual cycle, and often a variety of symptoms, with hot flashes being the most characteristic manifestation. Epidemiological studies indicate that sleep disturbances and the risk of depression increase during the menopausal transition, regardless of other factors. The objective was to evaluate the association between climacteric symptoms, reported psychological symptoms (stress, anxiety, and depression), and Follicle-Stimulating Hormone (FSH) concentration in night shift workers, as well as to describe the profile of the analyzed population, including social and reproductive aspects.

Materials and methods: This study is a cross-sectional analysis of a larger project (a randomized, double-blind clinical trial) involving eight nursing professionals working night shifts at a hospital in greater São Paulo. Data were collected through a self-administered questionnaire that included questions about sociodemographic aspects, climacteric symptoms (Kupperman Menopausal Index), and psychological symptoms (DASS-21). In addition, a blood sample was collected after a 12-hour fast to determine the FSH concentration.

Results: The mean age of the analyzed group is 44.1 years (SD=4.1 years). It was observed that half of the workers had already experienced menopause (mean age of 43 years, SD=3.9 years). A positive correlation was found between blood FSH concentration and climacteric symptoms ($r=0.76$; $p=0.03$). Furthermore, a strong positive correlation ($r=0.81$; $p=0.01$) was also found between psychological symptoms (stress, anxiety, and depression) and climacteric symptoms.

Conclusions: The findings support evidence from previous studies regarding increased depressive and anxiety symptoms during the menopausal transition. In addition, a positive linear increase in climacteric symptoms was observed as FSH concentration increased.

Obstructive sleep apnea during rapid eye movement sleep and cognitive performance in adults

X. Tan[1,2], E. Lindberg[1]
[1]Uppsala University, Medical Sciences, Uppsala, Sweden, [2]Zhejiang University, School of Public Health and Sir Run Run Shaw Hospital, Hangzhou, China

Introduction: Obstructive sleep apnea (OSA) during rapid eye movement (REM) sleep is often characterized with more frequent and lengthy breathing events and greater oxygen desaturation than during other sleep stages. Current evidence suggests an association between OSA and cognitive decline, however whether OSA during REM sleep plays a vital role in this link is understudied.

Materials and Methods: A cross-sectional sample of 728 men and women (aged 59.1±11.3 years) underwent a full night polysomnography for determining apnea-hypopnea index (AHI) and sleep stages. Trail Making Test (TMT) part A and B were conducted during the following day for assessing participants' cognitive function. Linear regression analyses were performed to test the possible association between AHI and AHI during REM sleep with TMT-A and B results. Similar analyses were carried out in a subsample involving participants aged $\geq$60 years with $\geq$30 minutes of REM sleep (n=356).

Results: Despite a slight difference in TMT-B between participants with and without OSA (AHI $\geq$ 5 vs AHI <5, β-coefficient: -4.83, 95% CI: [-9.44, -0.22], P=0.040), no other association between AHI or REM-AHI and TMT results were found. In older participants (aged $\geq$60 years), a REM-AHI $\geq$ 5 events/hour was associated with longer time taken to finish TMT-A (vs REM-AHI < 5 events/hour, 3.93, [0.96, 6.90], P=0.010). There was no association between REM-AHI and time taken to finish TMT-B in older participants.

Conclusions: OSA during REM sleep may be of particular concern for attention-related cognitive function in older adults.

Obstructive sleep apnea screening in different age groups: performance of the Berlin, STOP-Bang questionnaires and Epworth Sleepiness Scale

D. Silva[1], D. Alves[2], M. Nobrega[3], L. Franco[3], I. Silva[3], F. Ribeiro[3], L. Joffily[1], M. Rocha[1], P.H. Godoy[1]
[1]Federal University of the State of Rio de Janeiro, Sleep Laboratory, Rio de Janeiro, Brazil, [2]Federal University of the State of Rio de Janeiro, Department of Quantitative Methods, Rio de Janeiro, Brazil, [3]Federal University of the State of Rio de Janeiro, Rio de Janeiro, Brazil

Introduction: Obstructive Sleep Apnea (OSA) is a very prevalent respiratory disorder. Its pathophysiology results from the interaction of several factors, which are influenced by age, making it difficult to identify just one site or cause of obstruction. A trend of increased prevalence is observed in the general population, possibly due to factors such as population aging, reaching approximately 84% between the ages of 60 and 85. Young and old people may have a different presentation of the disease, and the latter tend to present mild or unusual symptoms of the disease, making it even more difficult to suspect the presence of the disease and, consequently, recommend type 1 Polysomnography (PSG). Thus, given the difficult access to PSG, clinical instruments for OSA screening have gained increasing importance in clinical practice, helping in a standardized assessment and in the more accurate selection of individuals who should undergo PSG. These instruments present different performances depending on the characteristics of the population studied, whether elderly, sleep laboratory patients, surgical patients or those who suffer from a comorbidity. Among the instruments already validated and widely used, we have the Berlin (BQ) and STOP-Bang (SBQ) Questionnaires, as well as the Epworth Sleepiness Scale (ESS). In this context, the aim of this study was to evaluate the performance of the BQ, SBQ, and the ESS in screening for obstructive sleep apnea syndrome in adults of different age groups, comparing them to the results of the gold standard, type 1 polysomnography.

Materials and methods: Cross-sectional study with prospective patient allocation, in which individuals underwent a medical interview, completion of the three screening instruments, and polysomnography. Individuals were categorized into three age groups: 18---39, 40---59, and ≥60 years. The results of the screening instruments were compared to the diagnostic criteria of the International Classification of Sleep Disorders----third edition. Performance was assessed using 2×2 contingency tables, estimating sensitivity, specificity, predictive value, likelihood ratio, accuracy. ROC curves were also constructed and the area under the curve was estimated for each instrument by age group.

Results: We obtained a sample with 321 individuals suitable for analysis. The mean age was 50 years, with a predominance of females (56%). The prevalence of the disease in the overall sample was 79%, more prevalent in males in any age group and more frequent in the middle age group. The analyzes revealed that SBQ performed better, both for the overall sample and for all age groups, followed by BQ and ESS.

Conclusions: In an outpatient setting with individuals with characteristics similar to those in this study, it seems sensible to choose the STOP-Bang as a screening tool for the disease, regardless of age group.

Pericyte biology, sleep fragmentation, and cognitive decline in community dwelling older adults

M. Hamid[1,2], S.J. Tripathy[1,3,4,5], V. Menon[6], L. Yu[7,8], A.S. Buchman[8,7], D.A. Bennett[7,8], P.L. De Jager[6], A.S.P. Lim[1,2]
[1]University of Toronto, Institute of Medical Science, Toronto, Canada, [2]University of Toronto, Division of Neurology, Department of Medicine, Hurvitz Brain Sciences Program, Sunnybrook Health Sciences Centre, Toronto, Canada, [3]Centre for Addiction and Mental Health, Krembil Centre for Neuroinformatics, Toronto, Canada, [4]University of Toronto, Department of Psychiatry, Torontoc, Canada, [5]University of Toronto, Department of Physiology, Toronto, Canada, [6]Columbia University Irving Medical Center and the Taub Institute for Research on Alzheimer's Disease and the Aging Brain, Center for Translational & Computational Neuroimmunology, Department of Neurology, New York, United States, [7]Rush University Medical Center, Rush Alzheimer Disease Center, Chicago, United States, [8]Rush University, Department of Neurological Sciences, Chicago, United States

Introduction: Sleep fragmentation is common in older adults and is associated with cognitive impairment and dementia, as well as key histopathological correlates including small vessel disease and cerebral infarcts. Pericytes play a key role in regulating small vessel structure and function, including functional hyperemia and blood brain barrier (BBB) integrity. In model organisms, sleep disruption is associated with pericyte dysfunction and BBB breakdown. Recent advances in single-nucleus RNA sequencing (snRNAseq) technology have identified two transcriptionally distinct subtypes of pericytes: extracellular matrix maintaining M-pericytes, and solute carrier-expressing T-pericytes. However, the relationship between sleep, pericyte biology, and cognition in humans remains unclear.

Materials and Methods: We tested the hypothesis that differences in the composition of brain pericyte subpopulations, as inferred from marker gene expression, may link sleep fragmentation and cognitive decline,. We leveraged snRNAseq data from the dorsolateral prefrontal cortex of 424 older adults to identify specific marker genes for M- and T- type pericytes. We then used bulk RNA sequencing to quantify expression of these marker genes in 1080 older adults in the Religious Orders Study and Rush Memory and Aging Project (ROSMAP), among which 415 individuals underwent antemortem multi-day wrist actigraphy recordings. We used multivariate linear regression to relate marker gene expression to sleep fragmentation, measured by actigraphy, and cognitive decline.

Results: Sleep fragmentation was associated with greater expression of M-pericyte marker genes (b = 1.03×10^{-1}, SE= 4.8×10^{-2}, p=0.035) but not T-pericyte marker genes (b = 3.2×10^{-2}, SE= 4.9×10^{-2}, p=0.52). Expression of M-pericyte (b = -9.44×10^{-5}, SE = 3.01×10^{-5}, p= 0.0017) but not T-pericyte marker genes was associated with more rapid cognitive decline in the 10 years leading up to death.

Conclusions: Sleep fragmentation is associated with greater expression of M- but not T-type marker genes in bulk RNAseq, which is in turn associated with more rapid cognitive decline in the years leading up to death. These findings identify a potential role of M-pericytes in linking sleep fragmentation and cognitive trajectories in older adults.

Quality of sleep and life in postmenopaused women practice or not of physical exercise: cross-sectional observational study

I.D. Narcisio[1], I.O. dos Santos[1], V.M.R. Vallejos[2], L.T. Pasqualotto[3], N.S. Faria Júnior[1]
[1]University of the State of Minas Gerais - Divinópolis Unit, Department of Health and Rehabilitation, Divinopolis, Brazil, [2]Federal University of Minas Gerais, Belo Horizonte, Brazil, [3]State University of Campinas, Faculty of Medical Sciences, Graduate Program in Surgical Sciences, Campinas, Brazil

Introduction: Human health, during the aging process, undergoes specific changes, and with regard to women, the end of the reproductive phase is a moment of great importance. The signs and symptoms that accompany this process of change may vary according to the age and specificity of each woman, including endocrinological, biological and clinical alterations that may be associated with a worsening of sleep quality and an increase in sleep disorders. Although basic health care for postmenopausal women is still precarious and little discussed, PE groups and programs developed in Primary Health Care can have repercussions on the reduction of costs related to the health service, thus promoting the dissemination and awareness of the benefits that you have in your regular practice. Thus, the aim of the study was to evaluate the quality of sleep, presence of sleep disorders and quality of life in postmenopausal women who practice regular physical exercise (PE) or not, assisted in Primary Health Care in the city of Divinópolis, Minas Gerais, Brazil

Materials and methods: Cross-sectional observational study carried out with women recruited from Basic Health Units in the city of Divinópolis. These women were divided into two groups: non-practitioners of physical exercise (NPPE) and practitioners of physical exercise (PPE). Sociodemographic, anthropometric and cardiovascular comorbidities, sleep quality and presence of sleep disorders were evaluated using the following instruments: Pittsburgh Sleep Quality Index, Epworth Sleepiness Scale (ESS), Berlin Questionnaire and Quality Questionnaire. of Life Short-Form-36

Results: The sample consisted of 31 patients, 14 from the practitioner group and 17 from the non-practitioner group. The mean age of the PEF and NPEF groups was 61.8 ± 8.7 years and 65.0 ± 5.9 years, respectively, and the mean body mass index was 25.3 ± 3.5 kg/m2 and 27.0 ± 3.5 kg/m2. Comparing the groups, the PEF group had a lower average in the total ESS (7.9 ± 4.5 vs 11.1 ± 4.4 p= 0.039). Regarding the total IQSP, there was a statistically significant difference between the PEF and NPEF groups (6.6 ± 3.3 vs 9.1 ± 3 p = 0.023). As for the risk for apnea, there was no statistical difference, despite a higher percentage of high risk for the NPEF group. Regarding the quality of life domains, the PEF group showed higher values, but there was no statistically significant difference in the SF-36 domains.

Conclusions: The regular practice of PE in postmenopausal women assisted in Primary Health Care seems to favor the improvement of sleep quality, which may be associated with lower levels of excessive daytime sleepiness.

Right hippocampus volume correlates with sleep spindle generation probability in good sleepers: a neuroloop gain analysis study in older adults

R. Soni[1], N. Akhtar[1], V. Garfield[2], S.S. Kumaran[3], L.J. Devarajan S[4], A. Chakrawarty[5], G. Kaloiya[6]
[1]All India Institute of Medical Sciences, Physiology, New Delhi, India, [2]University College of London, Institute of Cardiovascular Science, London, United Kingdom, [3]All India Institute of Medical Sciences, Nuclear Magnetic Resonance Imaging, New Delhi, India, [4]All India Institute of Medical Sciences, Neuroradiology, New Delhi, India, [5]All India Institute of Medical Sciences, Geriatrics, New Delhi, India, [6]All India Institute of Medical Sciences, Psychiatry, New Delhi, India

Introduction: Large changes in sleep pattern are seen in the elderly population. Sleep disturbances are associated with neurocognitive dysfunctions, attention deficits, impaired cognitive performance, depression, anxiety, stress, and poor impulse control. Whether and how acute and chronic sleep loss affects brain morphology remains largely unknown. Elucidating brain-morphological changes due to insufficient or poor-quality sleep can help to gain insights regarding the impact of sleep loss. This can bridge the gap regarding the understanding of the inter relationship between insufficient sleep and neurological or psychiatric disorders

Materials and Methods: 17 older male adults with mean age 64.36 ±6.23 years underwent overnight polysomnography and brain MRI. They were also given Sleep questionnaire Pittsburg Sleep Quality Index to assess the quality of sleep. Sleep studies were manually scored and data was exported to EDF format. The data was then run in YASA (Yet Another Spindle Algorithm) sleep analysis toolbox in python using Spyder (Anaconda) platform for neuroloop gain anaylsis. T1 and T2 weighted MRI brain scans were performed. The T1-weighted images were used for cortical as well as subcortical analysis by the Computational Anatomy Toolbox (CAT-12), which covers diverse morphometric methods such as voxel-based morphometry (VBM), surface-based morphometry (SBM), deformation based morphometry (DBM), and region- or label-based morphometry (RBM).

Results: n older adults, those who had a higher PSQI score, indicating a poorer quality of sleep, had higher sigma and delta power during the N1 sleep stage. REM sleep duration was more in poor sleepers. N3 sleep latency correlates positively with white matter hyperintensity volume. Good sleepers among older adults show a negative correlation between left hippocampal volume and wake as well as WASO percentage of TIB. There is a negative correlation between N2 sleep percentage and left hippocampal volume. There is a positive correlation between N3 sleep latency and white matter hyperintensity volume (WMHV). There is a positive correlation between spindle generation probability and right hippocampal volume.

Conclusions: IRight cuneus thickness correlates positively with neuroloop slow waves and spindles. Sleep duration correlates positively with the thickness of the right middle cingulate gyrus. Thus, sleep architecture affects some aspects of brain morphometry. In good sleepers, relationship between spindle activity and the ability of the hippocampus to support memory consolidation are positively correlated.

Seep quality, sleep perception and quality of life in advanced age

E. Nascimento[1], M. De Martino[2], J. Sonati[3], T. Célia Morais[3], A. Foroni[4], M. Meira e Cruz[5,6]
[1]Universidade Paulista, São Paulo, Brazil, [2]Universidade Estadual de Campinas, Campinas, Brazil, [3]Universidade de Taubaté, São Paulo, Brazil, [4]Universidade Santo Antonio, São Paulo, Brazil, [5]Centro Cardiovascular da Universidade de Lisboa, Sleep Unit, Lisbon, Portugal, [6]Centro Europeu do Sono, Lisbon, Portugal

Introduction: Sleep is an absolute requirement for health and well-being, but its amount, and particular characteristics, largely vary within the aging process. Sleep quality and sleepiness, as an indicator of disturbed sleep, are often affected by senescence and may impact quality of life overall contributing for a better life. This study aimed to assess sleep quality, sleepiness and its relationship with quality of life in advanced age.

Materials and methods: 300 adults aged 50 years old and above, registered at an extension university program, were enrolled in this exploratory study. Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), World Health Organization Quality of Life - Bref (WHOQOL-Bref) were applied for assessment of sleep quality, sleepiness and quality of life, respectively. Perception of sleep quality was additionally assessed by the question of "how do you feel your sleep quality is?".

Results: The study sample within a range of ages between 50 and 87 (mean age of 63,8±7,7) years old and a female predominance (76,3%), showed a high prevalence of PSQI scores above 5 (51,7%) with 84,9% of those experiencing difficulties in either maintaining sleep or waking to early. Only 20,8% of the sample revealed to perceive excessive sleepiness (ESS >= 10). Both physical (70,8±17,9) and psychological (70,6±16,1) domains from the WHOQOL-Bref showed to score high in this sample.

Conclusions: The quality of sleep was significantly affected by age with almost half of the patients complaining for poor sleep quality related to maintenance and terminal insomnia. The high prevalence of self reported poor sleep quality contrasts with the perception of a good life quality, specially in the physical and psychological domains, what seems to reflect a constellation of different physiological/patophysiological aspects, others than actual sleep disorders itself that may interact in this specific group of age. This is corroborated by a low index of excessive sleepiness in this sample and, wether psychosocial stress or some other hidden mechanisms would contribute to such contrasting results warrant the need of future studies on similar age group population for clarification.

Shorter total sleep duration and lower sleep efficiency are associated with higher beta amyloid deposition in precuneus and cortical regions in cognitively normal older adults

C.F. Siengsukon[1], M.N. Key[2], E.D. Vidoni[2], R. Ludwig[1], E. Nelson[1], A. Glaser[1], M. Drerup[3], M.A. Phadnis[4], J. Bruce[5], J.M. Burns[2]

[1]University of Kansas Medical Center, Department of Physical Therapy, Rehabilitation Science, and Athletic Training, Kansas City, United States, [2]University of Kansas Alzheimer's Disease Research Center, Fairway, United States, [3]Cleveland Clinic, Sleep Disorders Center, Cleveland, United States, [4]University of Kansas Medical Center, Department of Biostatistics & Data Science, Kansas City, United States, [5]University of Missouri-Kansas City, Department of Biomedical and Health Informatics, Kansas City, United States

Introduction: Poor sleep quality and insomnia symptoms increase the risk of developing Alzheimer's disease. Emerging evidence suggests that short sleep duration, sleep fragmentation, poor sleep quality, and presence of sleep disorders are associated with increased amyloid- β (Aβ) levels. However, sleep is often assessed using self-report measures, and Aβ levels in the brain are often inferred by cerebrospinal or plasma biomarkers. It remains unclear how sleep assessed using polysomnography (PSG) is associated with Aβ assessed using positron emission tomography (PET). The purpose of this study was to determine the association between sleep and Aβ accumulation in cognitively normal older adults using gold-standard, objective measures.

Materials and Methods: This data is from a baseline assessment of an ongoing clinical trial assessing the impact of cognitive behavioral therapy for insomnia on cognitive function in older adults (NCT03954210). Cognitively normal (MMSE ≥ 25 and AD8 < 3) older adults (60-85 years old) who have symptoms of insomnia (≥ 10 on Insomnia Severity Index) underwent baseline assessment including PET with Florbetapir and overnight PSG within a two-week period. Partial Pearson correlations were used to determine the association between sleep variables of interest (total sleep time, TST; sleep efficiency, SE, and percent time in N3, N3%) and the standard uptake values ratio (SUVRs) of the precuneus and cortical regions (combined average of frontal, parietal, temporal, and occipital cortex, anterior and posterior cingulate gyrus, and precuneus based on Spira et al. (2014)) while controlling for age. Alpha was set at < 0.1.

Results: Thirty-five adults (70.0 ± 5.3 years old; 91% White; 94% Not Hispanic or Latino; 74% female) have enrolled in the study. Shorter TST and lower SE was significantly associated with higher Aβ deposition in the precuneus (r = -0.335, p = 0.053 and r = -0.391, p = 0.022) and the cortical regions (r = -0.308, p = 0.076 and r = -0.367, p = .033). N3% was not significantly corrected with either ROIs (precuneus r= 0.150, p = 0.397; cortical regions r = 0.143, p = 0.420).

Conclusions: Shorter total sleep duration and lower sleep efficiency are associated with higher Aβ deposition in the precuneus and the cortical brain areas while controlling for age in older adults with normal cognitive function. The results indicate the role of poor sleep as an early risk factor for the accumulation of Aβ and a potential target for lifestyle interventions targeting sleep enhancement.

Acknowledgements: This study is funded by an NIA grant awarded to CS (R01AG058530)

Sleep duration and occurrence of falls in robust older adults $\geq$ 65 years

C.M. Guimarães[1], A.L.L. Noronha Filho[1], A.R. Silva[1], F. Perrucho[1], C. Dias[1], E.B.C. Pinto[1], M. Meira e Cruz[2,3,4], C. Salles[1,5,6]
[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]European Sleep Center, Lisbon, Portugal, [3]University of Lisbon, Sleep Unit, Cardiovascular Center, Faculty of Medicine in Lisbon, Lisbon, Portugal, [4]College Sao Leopoldo Mandic, Campinas, Brazil, [5]Federal University of Bahia, University Hospital Professor Edgard Santos, Salvador, Brazil, [6]Jorge Amado University Center, Salvador, Brazil

Introduction: Falls affect approximately 30% of the older adult population and rank third among the causes of accidental deaths within this age spectrum in both the United States and Brazil. The reduction of hours of sleep promotes slow responses and a generalized reduction of the wakefulness state, predisposing the older adults to have a higher probability of falling. Therefore, the objective of the present study was to evaluate the association between sleep duration and reports of previous falls in community-dwelling older adults.
Materials and Methods: This study is part of a more extensive study entitled "Sleep disorders and metabolomic profile related to the occurrence of falls in older adults community-dwelling: a prospective longitudinal study". This is a cross-sectional study in which non-institutionalized individuals aged 65 years or older were included through non-probability sampling. Data were collected at the Physiotherapy Clinic of the Bahiana School of Medicine and Public Health in Salvador - BA (Brazil). Inclusion criteria: robust older adults after screening with Clinical-Functional Vulnerability Index (CFVI-20). Exclusion criteria: older adults diagnosed with a stroke, dementia, vestibulopathy, and osteoarticular disorders. As instruments, anthropometric measurements were assessed, and sociodemographic questionnaires, clinical questionnaires and polysomnography were applied.
Results: The total sample comprised 36 patients who underwent nocturnal polysomnography. The mean age was 70.7$\pm$4.6 years. Self-declared black was 75%(n=27) of patients; female=63.9%(n=23); mean BMI=26.0$\pm$4.8Kg/m^2; mean neck circumference=36.2$\pm$3.9 cm; mean systolic blood pressure=131.0$\pm$10.3 mmHg; mean diastolic blood pressure=76.2$\pm$14.8mmHg. Regarding the occurrence of falls, 38.9%(n=14) of the older adults reported at least one fall in the previous twelve months. The median total sleep duration per night was 487.6 (400.0-562.6) minutes; awake time after sleep=60.2(31.1-85.0) minutes; mean sleep efficiency=78.7$\pm$8.8%. When comparing the frequency of falls between individuals with restful sleep and non-restful sleep, it was observed that the older adults with non-restful sleep had a higher frequency of falls in the previous 12 months (64.3% vs 22.7%; p=0.013), respectively. Meanwhile, comparing the frequency of falls between individuals with and without excessive daytime sleepiness, it was found that the older adults with excessive daytime sleepiness had a higher frequency of falls in the previous 12 months (62.5% vs 20.0%; p =0.009), respectively. A positive correlation was observed between the number of falls and awake time after sleep (R^2=0.730; p=0.040). A negative correlation was noted between the number of falls and sleep efficiency (R^2= -0.818; p=0.013).
Conclusions: Based on the present study, it was observed that the reduction in sleep duration leads to non-restorative sleep, sleepiness, and daytime tiredness. Moreover, awake time after sleep and decreased sleep efficiency are factors related to the occurrence of falls in the older adult population.

Sleep duration predicts the risk of falls in older people: results from a systematic review

L. Ferreira Barreto Santos[1], M. Meira e Cruz[2,1,3,4], C.M. Carvalho Costa Dias[1], C. Salles[5,6,1]
[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]European Sleep Center, Lisboa, Portugal, [3]University of Lisbon, Sleep Unit, Cardiovascular Center, Faculty of Medicine in Lisbon, Lisboa, Portugal, [4]College Sao Leopoldo Mandic, Campinas, Brazil, [5]Federal University of Bahia, University Hospital Professor Edgar Santos, Salvador, Brazil, [6]Jorge Amado University Center, Salvador, Brazil

Introduction: Senility causes changes in sleep stages, making it more superficial, fragmented, and short compared to previous life stages. Falls increase with aging, as well as their consequent injuries, and rise in rates of hospitalization and morbimortality, leading to a significant public health problem. Studies show that excessive sleepiness, daytime naps, and being female are fall risk factors. However, it is unclear whether the number of hours of sleep is also associated with a higher risk of falls in older adults. Therefore, the objective of this study was to evaluate the relationship between objective sleep duration and the occurrence of falls in older adults according to gender.
Materials and Methods: The search was performed in PubMed, SciELO, LILACS, MEDLINE, and CAPES databases. A manual search was also carried out. The following descriptors were used: "actigraphy" AND "sleep duration" AND "falls" AND " elderly". Inclusion criteria were: individuals $\geq$ 65 years old; actigraphy to quantify hours of sleep; questionnaire to assess episodes of falls. Exclusion criteria were: case reports; animal studies.
Results: Among the studies searched, 680 were initially eligible; after reading the abstracts, 21 were included for full text evaluation. Finally, 04 articles met the eligibility criteria. Female participants comprised 3,852 subjects (about 48.10%); male subjects were 4,156 (about 51.89%). This systematic review had n total=8,008 individuals. The mean age of women ranged from 83.3 $\pm$ 3.4 years to 83.5 $\pm$ 3.8 years; men ranged from 77 years to 76.4 $\pm$ 5.5 years. Among the individuals who comprised the present study, 764 older women fell (about 51.69%) versus 714 men who had fallen in the previous year (about 48.30%). The total number of older adults who fell was =1,142, divided into two major groups according to sleep duration: < 6 hours and $\geq$ 7 to 8 hours. Of the older adults who slept < 6 hours and fell, 293 were women and 341 men, totaling 634 individuals (55.51% approximately). Among the older adults who slept $\geq$ 7-8 hours, there were 296 women and 212 men, totaling 508 older adults who fell (approximately 44.48%). Stone et al., 2008 and Stone et al., 2014 reported that fallers slept for a few hours. Swanson et al. 2021 found high rates of falls in older adults with short sleep duration, however, without association. Swanson et al., 2019 described higher values of falls among older adults with longer sleep duration (> 9 h).
Conclusions: This systematic review demonstrated solid evidence that reinforces the association between sleep duration and falls in older adults. These findings should be involved in a predictive algorithm that promotes decision-making because of their potential to guide basic health care. Thus, it provides clinical information to assist older adults in preventing, diagnosing, and treating sleep disorders since falls involve high economic repercussions.

Sleep pattern clusters, physical function and fall risk: geriatric syndromes among older ambulatory women

A. Garduno[1], V. Viswanath[2], B. Smarr[2,3], L. McEvoy[4,5], Q. Xiao[6,7], K. Full[8], L. Gallo[9,10], H. Parada[11], C. Crandall[12], J. Cauley[13], L. Tinker[14], A. LaCroix[4]
[1]University of California San Diego / San Diego State University Joint Doctoral Program in Public Health, San Diego, United States, [2]University of California San Diego, Bioengineering, San Diego, United States, [3]University of California San Diego, Halicioğlu Data Science Institute, San Diego, United States, [4]University of California San Diego, Herbert Wertheim School of Public Health and Human Longevity Science, San Diego, United States, [5]Kaiser Permanente Washington Health Research Institute, Seattle, United States, [6]The University of Texas Health Science Center at Houston School of Public Health, Epidemiology, Human Genetics, and Environmental Sciences, Houston, United States, [7]The University of Texas Health Science Center at Houston, Center for Spatial-Temporal Modeling for Applications in Population Sciences, School of Public Health, Houston, United States, [8]Vanderbilt University Medical Center, Medicine, Nashville, United States, [9]San Diego State University, Psychology, San Diego, United States, [10]South Bay Latino Research Center, San Diego, United States, [11]San Diego State University, Epidemiology and Biostatistics, San Diego, United States, [12]University of Pittsburgh, Epidemiology, Pittsburgh, United States, [13]University of California, Medicine, Los Angeles, United States, [14]Fred Hutchinson Cancer Research Center, Public Health Sciences, Seattle, United States

Introduction: Sleep disturbance is a common geriatric syndrome that may influence physical functioning in older adults. Existing studies often lack objective data regarding sleep, rest-activity rhythm, or falls measured prospectively among older adults. Another gap in knowledge is the simultaneous influence of multiple sleep features or patterns on aging. The first objective of this analysis was to identify sleep-circadian sleep clusters, and the second objective was to evaluate the relationships among sleep and rest-activity rhythm clusters with fall risk and physical functioning among 4,543 older, ambulatory women from the Objective Physical Activity and Cardiovascular Health (OPACH) study.
Materials and Methods: ActiGraph GT3X+ triaxial accelerometers were worn on the right hip by WHI participants continuously for up to 7 consecutive days. Incident falls were documented using a 13-month fall calendar (following accelerometer wear) that were completed on a daily basis and mailed monthly. Short Physical Performance Battery (SPPB) measured physical functioning as an overall score derived from a balance test, chair stand, and gait speed. Sleep-circadian clusters were identified from uniform manifold approximation projection, followed by K-Means clustering, to further distinguish healthy and unhealthy sleep patterns. We performed cross-validation to evaluate clustering and to tune the model in the presence of class imbalance between participants. We examined associations with fall risk using negative binomial models after adjusting for sociodemographic and behavioral factors. Linear regression models estimated associations between sleep clusters with the SPPB physical functioning score, and the sub-scores, including the balance test, chair stands, and gait speed. We tested for the presence of a statistical interaction between clusters and physical functioning (sleep*SPPB) with respect to fall risk.
Results: Five sleep clusters were identified including C1 ("sleep disturbed", n=1051), C2 ("healthy", n=1043), C3 ("mild fragmentation", n=1446), C4 ("earlier rest period", n=105), and C5 ("shorter duration and later chronotype", n=898). Unhealthy sleep clusters C1 and C4 were associated with a higher fall risk compared to healthy cluster C2 after adjustment (C4, IRR: 1.76 (95%CI:1.15-2.69)). These same clusters were also associated with lower balance scores (score: 0-4) after adjustment (C1, beta: -0.11 (95% CI:-0.21 to -0.01); C4, beta: -0.30 (95%CI: -0.55 to -0.05)).
Conclusions: Older adults with unhealthy sleep-RAR patterns are at greater risk of falling, and this relationship may be potentially explained by the role of sleep quality on balance and overall physical functioning.

Sleep quality is associated with sedentary behavior in older adults: a quantile regression analysis

F. Fank[1], D. Lauricio Matte[1], G. Zarpellon Mazo[1]
[1]Santa Catarina State University, Health and Sports Sciences Center, Florianopolis, Brazil

Introduction: Sleep quality and sedentary behavior are critical determinants of health and well-being, particularly in the context of older adulthood. Adequate sleep is essential for cognitive function, physical health, and emotional well-being. At the same time, excessive sedentary behavior has been linked to various adverse health outcomes, including cardiovascular disease, obesity, and decreased overall functional capacity. Despite the individual importance of sleep quality and sedentary behavior, there is limited research exploring their relationship in older adults, particularly across different quantiles of sedentary behavior distribution. Thus, this study aimed to investigate the association between sleep quality and sedentary behavior using quantile regression analysis in older adults.

Materials and Methods: A sample of 88 older adults aged 60 years and above (mean age = 71.6, SD = 6.3) participated in this cross-sectional study. Sedentary behavior was assessed using the Longitudinal Aging Study Amsterdam - Sedentary Behavior Questionnaire (LASA-SBQ). Sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI), capturing subjective sleep quality, duration, latency, disturbances, efficiency, use of medication, daytime dysfunction, and overall sleep quality. Quantile regression analysis was performed to examine the association between sedentary behavior and sleep quality at various quantiles of sedentary behavior distribution, adjusting for potentially confounding variables such as age, gender, and moderate to vigorous physical activity.

Results: The results revealed a significant association between sleep quality and sedentary behavior across different quantiles. Higher scores on the total PSQI were consistently associated with more daily time spent in sedentary behavior, with stronger associations observed at higher quantiles. Each one-point increase in the PSQI score was associated with an additional 12.7 minutes of sedentary behavior at the 25th quantile and 48.5 minutes at the 75th quantile, regardless of confounding variables. Furthermore, higher scores on subjective sleep quality, sleep duration, use of sleep medication, and daytime sleepiness were associated with increased daily time spent in sedentary behavior.

Conclusions: This study provides evidence of a significant association between sleep quality and sedentary behavior in older adults. Poorer sleep quality was consistently associated with higher levels of sedentary behavior across different quantiles. The findings suggest that improving sleep quality may contribute to reducing sedentary behavior in this population. Targeted interventions focusing on improving sleep could have substantial implications for promoting healthy aging and reducing sedentary habits among older adults. Further experimental and longitudinal studies are warranted to establish causality and explore potential mechanisms underlying this association.

The occurrence of Restless Leg syndrome and attention deficit hyperactivity disorder: how about the role of age?

D.P. Migueis[1], M.C. Lopes[2], E.B. Casella[3], P.V. Soares[4], L.M.S.F.A. Soster[3], K. Spruyt[5]
[1]Fluminense Federal University, Niteroi, Rio de Janeiro, Brazil, [2]University of São Paulo, Child and Adolescent Affective Disorder Program (PRATA), Department and Institute of Psychiatry at University of Sao Paulo Medical School, São Paulo, Brazil, [3]University of São Paulo, Children Institute, HCFMUSP, São Paulo, Brazil, [4]Rio de Janeiro State University, Neurology Departament, Rio de Janeiro, Brazil, [5]Université de Paris, NeuroDiderot, INSERM, Paris, France

Introduction: ADHD and RLS symptoms may have a bidirectional effect. There are several articles including both topics. However, the role of age in the association is still unclear. This review aimed to investigate the relationship between attention deficit hyperactivity disorder (ADHD) and restless legs syndrome (RLS) across the lifespan.

Materials and methods: We searched original articles published in English up to January 2023 in the PubMed, SciELO, and BVS databases, according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to conduct a systematic review of studies that reported prevalence data on ADHD and RLS. The National Institutes of Health assessment tool was used to evaluate the quality of the articles by two independent reviewers. Validated questionnaires quantified RLS and ADHD symptomatology according to the current criteria.

Results: Twenty-nine studies were included among the 208 articles identified. The studies applying polysomnography had sample sizes between 25 and 144 participants, while ADHD or RLS surveys in the general population involved between 942 and 25,336 individuals.

In general population studies without exclusion criteria, the prevalence rate of ADHD ranged between 7.6%–15.3% in children and teenagers, 4.6–20% in adults, whereas the prevalence rate of RLS symptoms ranged between 3.2–23.9% in adulthood. An age-by-age pattern was found in the ADHD group, where RLS symptoms ranged from 11% to 42.9% in children and 20.0% to 33.0% in adults. This suggests that a relevant co-occurrence between RLS and ADHD might be modulated by aging processes. The potential overlap of RLS/ADHD is estimated to be about 20%. Besides, the combined type of ADHD was the most frequent subtype in children with RLS symptoms and adults with RLS/PLMD complaints.

In clinical samples, ADHD-diagnosed participants had RLS symptoms more frequently in adolescence and adulthood. Likely, reporting RLS symptoms in their own words may lead to misdiagnosis in children, mainly among the younger ones. Alternatively, RLS symptomatology was more prevalent in ADHD-diagnosed samples than in the general population, possibly due to its shared pathophysiology. So, the pathophysiological pathway of sleep instability and dopaminergic system impairment may explain the age-by-age pattern of the interaction between ADHD and RLS.

Conclusions: Sleep fragmentation may be associated with sleep-related movements exacerbating ADHD-like complaints across the lifespan in patients with RLS and RLS-like complaints in those with ADHD. We advocate that it is necessary to evaluate the potential overlap of RLS/ADHD complaints in all age groups.

Basic Research

Acetate alleviates sleep deprivation-induced male reproductive dysfunction by activating Nrf2 and suppressing oxido-inflammatory iNOS/NO/NF*k*B response and Bax/Bcl-2/caspase 3 apoptotic signaling in rats

R. Akhigbe[1,2], T. Akhigbe[3,2]
[1]Ladoke Akintola University of Technology, Physiology, Ogbomoso, Nigeria, [2]Reproductive Biology and Toxicology Research Laboratory (ReBTReL), Oasis of Grace Hospital, Osogbo, Nigeria, [3]Osun State University, Nigeria, Agronomy, Osogbo, Nigeria

Introduction: Sleep deprivation (SD) is a growing global concern with attendant adverse effects, such as reproductive dysfunction. Oxidative stress mediated-signaling has been incriminated in SD-induced male reproductive dysfunction. On the flipside, acetate has been reported to exert antioxidant property. However, the effect of acetate on SD-induced male reproductive dysfunction is yet to be reported. Hence, this study was investigated the effect of SD, with or without acetate, on male reproductive function and the role of Nrf2, iNOS/NO/NF*k*B pathway and Bax/Bcl-2/caspase 3 apoptotic signaling as a possible mechanistic pathway.

Materials and Methods: Ten-week old male Wistar rats weighing 190 ± 5 g were randomly assigned into vehicle-treated control (0.5 mL of water), sodium acetate (200 mg/kg), SD, and SD + acetate. SD was induced by exposing the animals to continuous SD for 72 h using modified multiple platform technique. Acetate treatment was *per os* and lasted for 72 h. After this period, male sexual competence as well as biochemical and histopathological parameters were evaluated in the serum and testicular tissues.

Results: Acetate improved mount, intromission and ejaculation latencies and frequencies in SD-exposed rats. Also, acetate attenuated SD-induced reduction in the levels of serum nitric oxide and cGMP in the corpus carvenosum, mating index and fertility index as well as circulating gonadotropins and testosterone levels. These events were associated with acetate-induced rise in sperm quality (count, motility, viability and morphology), testicular Nrf2 and reduced glutathione levels and superoxide dismutase and catalase activities, and a decline in malondialdehyde, uric acid, and testicular injury markers in SD-exposed rats. In addition, acetate abrogated SD-induced upregulation up-regulation of inducible nitric oxide synthetase, nitric oxide, tumor necrotic factor-α, interleukin-1β, interleukin-6, nuclear factor-kappa B, Bax and caspase 3, and downregulation of Bcl-2 in the testis.

Conclusions: Summing up, the findings of this study demonstrate that acetate improves male reproductive functions viz. libido, male sexual, sperm quality, circulating testosterone and testicular integrity by activating Nrf2 and suppressing oxido-inflammatory iNOS/NO/NF*k*B response and Bax/Bcl-2/caspase 3 apoptotic signaling in rats.

Acetate restores cardiac metabolic flexibility in sleep-deprived rats via modulation of uric acid-driven oxidative stress, iNOS/NO/NF*k*B-mediated inflammation, and caspase 3-dependent apoptosis

T. Akhigbe[1,2], R. Akhigbe[3,2]
[1]Osun State University, Nigeria, Agronomy, Osogbo, Nigeria, [2]Reproductive Biology and Toxicology Research Laboratory (ReBTReL), Oasis of Grace Hospital, Osogbo, Nigeria, [3]Ladoke Akintola University of Technology, Physiology, Ogbomoso, Nigeria

Introduction: Sleep deprivation (SD) has been shown to alter several biological processes such as cardiac function and metabolism. The effects of SD have been demonstrated to be via the induction of oxidative stress. On the other hand, acetate confers cardio-protection by modulating oxidative stress-sensitive signaling. Nonetheless, the effect of acetate on SD-induced cardiac dysmetabolism is unknown. This study evaluated the roles of xanthine oxidase (XO)/uric acid (UA) and iNOS/NO/NF*k*B/caspase 3 pathways in SD-induced cardiac injury and dysmetabolism. In addition, the effect of acetate in SD-induced cardiac injury was probed.

Materials and Methods: Forty 10-week old male Wistar rats of similar weights were randomly assigned into four groups (n= 10); vehicle-treated control (0.5 mL of water), sodium acetate (200 mg/kg), SD, and SD + acetate. SD was induced by exposing the rats to continuous SD for 72 h using modified multiple platform technique. Acetate treatment was *per os* and lasted for 72 h. After this period, biochemical and histopathological parameters were evaluated in the serum and cardiac tissues.

Results: SD altered the relative cardiac mass, but spared the body weight and absolute cardiac mass. Also, SD led to insulin resistance, impaired β-cell function, increased fasting levels of insulin and plasma and cardiac lactate, lactate dehydrogenase, creatinine kinase, troponin I and T, C-reactive protein, total cholesterol, triglycerides, LDL-C, iNOS, NO, TNF-α, IL-1β, IL-6, and NF-kB levels. These alterations were accompanied by increased plasma and cardiac XO, UA, and caspase 3 activities, reduced HDL-C, GSH, SOD and catalase activities, and distorted cardiac histo-architecture. Nevertheless, acetate administration attenuated SD-led cardiac injury and metabolic derangement.

Conclusions: In conclusion, these findings revealed that SD induced cardiac injury and dysmetabolism via the upregulation of XO/UA and iNOS/NO/NF*k*B/caspase 3 signaling. In addition, acetate ameliorated SD-induced defective cardiac metabolic flexibility by downregulating UA generation, NF*k*B-mediated inflammation, and caspase 3-dependent apoptosis.

An implementation and evaluation of sound activated noise display for the reduction of noise levels and enhancement of staff's sleep and noise awareness

C. Aparício[1]
[1]Anglia Ruskin University, Faculty of Health Education and Medicine, Cambridge, United Kingdom

Background: Noise has been shown to have a noticeable impact on patients' sleep patterns, with Healthcare Professionals being the primary source of noise during nighttime.
Aim: To implement Sound-Activated Noise Display [SAND] to reduce noise and raise staff awareness.
Method: A mixed method data collection by recording noise levels, followed by interviewing staff.
Findings: The actual mean noise levels showed a deviation of 20.67dB(A) above the recommended levels [55.66dB(A) vs 35dB(A)]. Participants expressed their reservations about adhering to the recommended levels, citing that they were too low to be practical. The intervention resulted in a mean short-term reduction of 1.48dB(A) [55.66dB(A) vs 54.18dB(A)] on account of the raised awareness among participants. However, the mean long-term impact was a 1.18dB(A) increase [55.66dB(A) vs 56.84dB(A)], as patient confusion, staff shortage and complacency among staff, and prioritising care over intervention affected the increase in noise levels. However, the peak count noise level revealed a notable trend of consistent reduction throughout all three intervention phases. In the pre-intervention, the peak count on the ward totalled 127 occurrences over two weeks. Following the short-term intervention, these numbers were significantly reduced to 74 occurrences within the same timeframe. Subsequently, the peak count was further reduced to 35 occurrences in the post-intervention period. This finding suggests that the SAND device can effectively reduce peak count within the unit. Qualitatively, this study classified the noise sources into three broad categories: relational noise & interruption, including communication, care activities, and patient interaction. Functional noise & interruptions, including admissions and medical equipment; and structural noise & interruptions, including physical buildings, beds, and trolleys.
Conclusion: The current study produced a novel 5-cycle night-time noise reduction model which focused on introduction of behavioural change measures, modifying relational, functional, structural sources as well as focus on training, education, and research on the topic. Additionally, participants recommended continuously used the SAND device within the ward supplement with the e-learning modules on noise awareness as part of mandatory training for staff every two years.
Keywords: Sleep-disturbances, sleep-interruptions, noise-display, noise-reduction, noise-awareness

A novel and flexible closed-loop method for precise modulation of brain signals during various sleep-wake stages

S.L. Jongejan[1]
[1]University of Amsterdam, Amsterdam, Netherlands

Recent advances in signal processing have led to the development of novel methods to monitor and modulate online (neuro)physiological signals. Existing open- and closed-loop (neuromodulation) methods have been limited to targeting narrow ranges of frequencies, phases, or activity. The closed-loop method developed by our group allows for flexible targeting and modulation of signal frequencies and phases and has been utilized to precisely modulate brain signals during various sleep-wake stages. Methods to align stimuli with ongoing brain activity have been crucial to the study of the functional relevance of brain activity. Modulation of brain signals during sleep has been shown to enhance slow oscillations (SO) and sleep spindles, which has brought causal evidence on their role in (emotional) memory reprocessing and consolidation. Manipulation of brain signals using acoustic stimuli has also led to exciting therapeutic findings such as boosting sleep and its stability, as well as memory manipulation during sleep. Evidence suggests that the effects of modulation depends on the accuracy of stimulus alignment. We tested the performance of our flexible method by modulating brain signals during wake and sleep using EEG (Fpz-M1M2) data from eighteen participants (9 males; age: M = 21.17, SD = 1.82 years). We targeted slow oscillations (SO; 0.5 – 1.5 Hz) during NREM3, theta waves (4 – 7 Hz) during REM, and alpha waves (8 – 12 Hz) during wake after sleep onset (WASO) using SHAM acoustic stimulation. The target phases were 0, 45, 90, 135, 180, 225, 270, and 315 degrees. Stimulus markers were recorded in the EEG data. During NREM3 a total of 36693 stimulus markers were recorded. The stimulus density was 16.41 (+/- 2.07) per 30 second epoch. The average stimulus onset phase was 3.86 (+/- 48.41) degrees before target. During REM 27092 markers were recorded with a density of 14.15 (+/- 2.13) per epoch. The average theta stimulus phase was 2.39 (+/- 51.84) degrees after target. During WASO 40445 stimuli were recorded with a density of 30.16 (+/- 4.52). The average recorded alpha stimulus phase was 6.38 (+/- 55.01) degrees before target phase. Our findings demonstrate that our method allows for accurate stimulus presentation targeting a wide range of frequencies and phases. To our knowledge our method is the first and only method for which such flexibility has been demonstrated.

A novel, highly potent and orally available orexin 2 receptor-selective agonist, TAK-861, ameliorates narcolepsy-like symptoms in two mouse models of narcolepsy

K. Mitsukawa[1], M. Terada[1], H. Kimura[1]
[1]Neuroscience Drug Discovery Unit, Research, Takeda Pharmaceutical Company Limited, Fujisawa, Japan

Introduction: Narcolepsy type 1 (NT1) is a neurologic disorder of central hypersomnolence characterized by multiple symptoms including excessive daytime sleepiness (EDS) and cataplexy and associated with loss of orexin-producing neurons. Currently available medications for NT1, including psychostimulants (e.g., modafinil for EDS), antidepressants (e.g., venlafaxine for cataplexy), and sedatives (e.g., sodium oxybate for both EDS and cataplexy), are symptomatic treatments with suboptimal efficacy and adverse effects. Thus, novel drugs with improved efficacy and safety profiles are needed. Orexin receptor agonists, particularly acting on orexin 2 receptor (OX2R), are considered as promising therapeutic options for NT1. We previously discovered two OX2R compounds, TAK-925 (danavorexton) a parenteral OX2R agonist, and TAK-994, an orally available OX2R agonist, both of which improved NT1-like phenotypes in mouse models and showed promising therapeutic effects in NT1 patients. However, danavorexton has limited oral availability and TAK-994 has a risk of off-target liver toxicity. To avoid these limitations, a highly potent molecule with a low effective dose is preferred. In this study, we assessed the effect of TAK-861, a novel, highly potent and orally available OX2R-selective agonist, on narcolepsy-like symptoms in two orexin neuron-ablated mouse models of NT1, orexin/ataxin-3 mice and orexin-tTA;TetO diphtheria toxin A (DTA) mice.
Materials and Methods: TAK-861 was administered orally to mice at zeitgeber time 12, and the sleep/wakefulness states were evaluated and classified as wakefulness, non-rapid eye movement (NREM) sleep, or rapid eye movement (REM) sleep, based on electroencephalogram/electromyogram measurements. The fragmentation of wakefulness was assessed by the episode number and duration of wakefulness. The number of cataplexy-like episodes was determined by counting the number of episodes of direct transition from wakefulness to REM sleep.
Results: Oral administration of TAK-861 significantly increased wakefulness time, and ameliorated fragmentation of wakefulness in orexin/ataxin-3 mice and orexin-tTA;TetO DTA mice during their active phase. TAK-861 also significantly suppressed cataplexy-like episodes in both NT1 mouse models during their active phase.
Conclusions: The highly potent and orally available OX2R agonist, TAK-861, could have potential to treat a broad range of symptoms including EDS and cataplexy in NT1.

An overview of chronobiology and sleep medicine education in Brazil

Y.C. Novais[1], J.B. Reis[1], E.K. Tamura[1]
[1]State University of Santa Cruz, Health Sciences, Ilhéus, Brazil

Introduction: Considering the importance of biological rhythms, such as the sleep-wake cycle, in clinical medical practice, this research provides an overview of the situation in Brazil regarding the teaching of chronobiology and sleep medicine in national medical schools.

Materials and methods: The study was conducted from December 2021 to June 2022 using an online questionnaire distributed via an online platform (Google Forms). The questions included demographic details, and disciplines, and subtopics covered regarding chronobiology and sleep medicine. The sample was obtained by searching student social media networks associated with the Brazilian medical schools registered with the Ministry of Education. The study included students who agreed to the Informed Consent Form, and self-identified as being in the final two years of the program. Ethical approval was obtained from the State University of Santa Cruz ethics committee (CAE: 52462921.0.0000.5526). Comparisons between groups were conducted using the independent samples t-test. Logistic regression analyses were performed to assess the associations between predictor and outcome variables using IBM SPSS Statistics Version 21, with a significance level set at 5%.

Results: A total of 241 responses to the questionnaire were analyzed after excluding one duplicate response and one individual who did not meet the target criteria. The sample consisted of 37% males and 63% females, with the predominant age group being 22 to 29 years old. Geographically, the distribution in Brazil included 18.6% from the northern region, 36.5% from the northeastern region, 10.3% from the central-west region, 20% from the southeastern region, and 14.5% from the southern region, covering all 27 Brazilian states and 96 educational institutes. Overall, 4.5% of respondents reported no academic contact to sleep medicine and chronobiology throughout their undergraduate education, and comparative analyses of the medical school phases (basic, clinical, and internship cycle) indicated a gradual decrease in the provision of these topics. Participants in the 18 to 24 age group, females, and those from the southern region of the country were associated with a higher exposure to these topics, as demonstrated in logistic regression analysis. During the basic cycle, 211 respondents indicated that the content offered mainly covered the basic knowledge of sleep physiology (84.8%). During the clinical cycle, 186 respondents highlighted sleep hygiene (64.6%), but there was less contact with sleep diagnostics and investigation (25.4%). Additionally, when asked if they received guidance from professors on approaching sleep in patient history taking and diagnosis, 34% responded that they had not received such guidance. When asked about recommendations for improving the teaching and learning of these subjects, 98 respondents emphasized the need for increased class hours, more in-depth instruction by qualified faculty, and greater immersion of students in clinical contexts (offering outpatient clinics and practical experiences).

Conclusions: In conclusion, the sample demonstrated a basic knowledge of chronobiology and sleep medicine, and there is a perceived need for greater exposure to these topics.

Aperiodic brain activity tracks temporal fluctuations during sleep: an (i)EEG study

M.S. Ameen[1], J. Jacobs[2], K. Hoedlmoser[1], T. Donoghue[2]
[1]University of Salzburg, Psychology, Salzburg, Austria, [2]Columbia University, New York, United States

Introduction: Electrophysiological data exhibit an aperiodic (1/f-like) characteristic, where power decreases with increasing frequencies. The magnitude of this decrease, quantified as the aperiodic exponent, has been linked to states of consciousness. In this study, we delve deeper into aperiodic activity across different sleep stages, extending methodological approaches to address limitations of prior investigations, including
(a) reliance on simplistic estimation models, and
(b) inadequate temporal resolution for aperiodic parameter estimation.
Materials and Methods: To overcome these constraints, we explore modifications in both the frequency range and model complexity employed for aperiodic activity estimation during sleep. Additionally, we employ time-resolved analyses to capture fluctuations within and between sleep stages. We analyzed an intracranial electroencephalography (iEEG) dataset (n=91) collected from sleeping human patients and high-density EEG data obtained from 17 healthy individuals during overnight sleep. Spectral parameters were computed utilizing the specparam toolbox (formerly 'fooof'), involving comparisons of various model forms and computation of time-resolved estimates.
Results: Our findings reveal that switching from the narrowband frequency range (30-45Hz), often used in sleep literature, to a broader frequency range enhances model performance. Furthermore, adopting a more intricate model formulation that integrates the knee frequency - the point at which the spectral exponent changes - reveals that sleep-stage-specific alterations in the spectral exponent of iEEG data are primarily driven by changes in the knee frequency. In the realm of EEG, we present temporally detailed estimations of aperiodic activity, showcasing time courses that mirror transitions between sleep stages.
Conclusions: Overall, our results demonstrate that by expanding the model complexity and temporal resolution of the applied methods, aperiodic activity is able to capture changes in sleep dynamics. Additionally, we propose updated guidelines for aperiodic activity estimation in neural data, facilitating a more precise delineation of electrophysiological signals.

A pilot study to evaluate efficacy of brief behavioral and sleep hygiene education with mindfulness intervention on sleep duration, timing, quality, anxiety, depression and quality of life in adolescents

I. Magnusdottir[1], S. Magnusdottir[2], A.K. Gunnlaugsdottir[1], H. Hilmisson[2], L. Hrolfsdottir[3], A.E. Eiriksdottir[4]
[1]University of Akureyri, Akureyri, Iceland, [2]MyCardio, SleepImage, Denver, United States, [3]University of Akureyri and Akureyri Hospital, Institution of Health Science Research, Akureyri, Iceland, [4]Akureyri College, Akureyri, Iceland

Introduction: Short sleep duration (SD) and social jetlag (SJL) negatively affect health and quality of life. This pilot-study was conducted as a part of Erasmus+ project *"Supporting Students' and Educators ́Mental and Physical Well-being in Challenging Times"* utilizing subjective and objective measures of sleep to evaluate if implementing brief behavioral sleep education and mindfulness intervention may positively affects sleep, anxiety and depression symptoms in adolescents.

Materials and methods: After ethics approval (VSN-22-174) and study-registration (NCT05748496) participants were recruited from one junior college in northern Europe. During regular school schedule, all participants (29 in intervention-group (IG); 39 in control-group (CG)) recorded their sleep for 3-school- and 2-free-nights with FDA-cleared/CE-marked home sleep test, SleepImageÒ, recorded sleep-diary and responded to questionnaires; Epworth sleepiness-scale and insomnia severity-index to evaluate daytime sleepiness and insomnia symptoms, general anxiety disorder-7-scale to evaluate anxiety, patient health questionnaire-9 and becks depression inventory-II to evaluate depression symptoms and the Morningness-Eveningness questionnaire (MEQ) to evaluate chronotype. Baseline-data was collected during the last week of February and first 2-weeks of March 2023 and repeated, after intervention including education about importance of sleep and good sleep hygiene followed by mindfulness and breathing practices for one-hour, twice a week for four weeks.

Results: Twenty-five (89%) in the IG and 30 (81%) in the CG finished the study, average age was 17.3-years. Group of 10-participants (QUIT) dropped out (all females).
IG differed from CG having higher PHQ-9 (2.0, p=0.043) scores and from QUIT having more wake after sleep onset, (16 minutes; p=0.033).
Comparing QUIT to IC and CG, QUIT are significantly sleepier (3.0, p=0.017; 4.5, p<0.0001), with more insomnia- (4.5, p<0.0001; 5.6, p<0.0001), anxiety- (3.2, p=0.034; 4.3, p=0.002) and depressive-symptoms (18.6, p<0.0001; 20.9, p<0.0001), and tendencies to be late-chronotypes based on lower MEQ-scores (15.7, p<0.0001; 13.1, p<0.0001).
After intervention, IG changed their sleep timing, on average falling-asleep 24-minutes earlier (p=0.027), waking-up 17-minutes earlier (p=0.034) and increased their sleep-regularity evaluated from the sleep midpoint (p=0.01) compared to CG.
Prevalence of severe-SJL decreased 24% during the intervention (52% to 28%) and minor-SJL increased 24% (20% to 44%), respectively. CG increased severe-SJL 7% (23% to 30%) and 10% decreased minor-SJL (37% to 27%). No significant difference in average SD, SQI or change in sleepiness-, depression-, or anxiety-symptoms was observed comparing IG and CG at follow-up.

Conclusions: The study identifies group of individuals that are late-chronotype and present with shorter SD and increased sleepiness, insomnia- and depression-symptoms. Implementing brief behavioral sleep education decreased prevalence of SJL and improved sleep regularity in the short-term, more long-term studies are needed to evaluate if the change is maintained and on effects on anxiety, depression. Utilizing modern technologies to deliver the behavioral education and relaxation intervention may possibly increase acceptation and adherence in this population and with appropriate "rewarding systems" could be utilized to improve adolescents sleep on a large scale. This information also leaves a question in the discussion about delaying school-start times if that is necessary for all or should have a narrower focus?

Assessing the Karolinska Drowsiness test for markers of alertness using the odds ratio product

N. Stuart[1,2], J. Manners[3,2], A. Guyett[3], P. Ngyuen[3], M. Younes[4], B. Gerardy[4], E. Kemps[2], H. Scott[3], P. Catcheside[3]
[1]Flinders University, Flinders Health and Medical Reserach Institute, Adelaide, Australia, [2]Flinders University, College of Education, Psychology and Social Work, Adelaide, Australia, [3]Flinders University, Flinders Health and Medical Research Institute, Adelaide, Australia, [4]University of Manitoba, Sleep Disorders Centre, Department of Internal Medicine, Winnipeg, Canada

Introduction: The Karolinska Drowsiness Test has been used previously as a measure of objective alertness by assessing for the presence of electroencephalography (EEG) sleep during eyes open and closed periods. The odds ratio product (ORP) is a continuous measure of alertness/sleep depth that considers the relationships between power across all frequencies relative to each other. ORP ranges from deep sleep (0) to full wakefulness (2.5), scored in consecutive, non-overlapping, 3-sec epochs. Prior research has shown strong correlations between average ORP in 30-sec epochs and probability of arousal/awakening in the following 30-sec epoch. Given that ORP can assess differences in degree of wakefulness in EEG, ORP is a novel metric of alertness during wakefulness to help monitor and predict alertness failures. The present study explored changes in ORP (calculated during KDTs) across simulated night shifts, where two lighting conditions were administered over 4 days during a night shift-work study protocol.

Materials and Methods: Nineteen healthy sleepers (12 males, mean±SD aged 28±10years) undertook four consecutive simulated night shifts (00:00 – 08:00), each including four KDTs, repeated under two lighting conditions. KDT involves monitoring the EEG for 7-mins, when subjects are behaviourally awake with eyes-open and eyes-closed segments, to determine if sleep epochs are seen during the monitored time. A total of 634 KDTs were recorded, each with simultaneous EEG, electrooculography, and electromyography for conventional sleep staging. ORP was calculated using the C3 and C4 electrodes in 3-sec epochs based on an established algorithm, with values < 0.50 considered deep sleep, 0.51-1.00 light/moderate sleep, 1.00-1.75 transitional sleep, 1.75-2.25 drowsy wake, and >2.25 full wakefulness.

Results: Linear mixed models demonstrated a significant main effect of KDT order on average ORP ($F_{(3,434)} = 24.15$, $p<0.001$) implying decreased alertness as the night progressed. Pairwise comparisons showed a significant decrease in average ORP_{KDT} across a simulated shift $(p<0.05)$, excepting for the difference between the first and second KDTs ($p=.90$). There was also a significant two-way interaction (day*KDT) ($F_{(9,440)} = 3.26$, $p<0.001$). Pairwise comparisons showed a significant increase in average ORP at the latest timepoint (KDT#4) across days, from shift 1 (M=1.91) to 3 (M=2.017, $p = 0.02$) and 4 (M=2.07, $p <0.001$) and from shift 2 (M=1.93) to 4 (2.07, $p <0.001$), implying adaptation. There were no main effects of lighting condition ($p=0.212$) or day ($p=0.341$), and no other significant interactions (p>0.05).

Conclusions: ORP as a continuous measure of sleep depth and alertness during KDT is a promising marker for alertness during night shift. Ongoing analyses will explore whether ORP is related to near-term cognitive impairments and alertness failures.

Beneficial effects of photoperiod lengthening on sleep characteristics and pain sensitivity for injured rats

T. Vanneau[1,2], M. Quiquempoix[1,2], M.-C. Erkel[1,2], C. Drogou[1,2], A. Trignol[1], F. Sauvet[1,2], D. Léger[2,3], D. Gomez-Merino[1,2], M. Chennaoui[1,2]
[1]French Armed Forces Biomedical Research Institute, Brétigny-sur-orge, France, [2]Paris Cité University, UPR 7330 VIFASOM, Paris, France, [3]APHP, APHP-Centre Université de Paris, Paris, France

Introduction: The relationship between sleep and pain has been widely studied for their negative interaction, demonstrating that lack of sleep increases pain sensitivity. In contrast, the potential benefits of sleep extension on pain sensitivity are still poorly explored. In the painful context of muscle injury, pain management is crucial to optimize muscle recovery. A previous study has shown that the adaptive sleep response to muscle injury in rats is characterized by an increase in TST, specific to non-rapid eye movement (NREM) sleep. In this study, we asked whether the potentiation of this adaptive sleep response by lengthening the photoperiod could be beneficial on pain sensitivity after induction of muscle injury in rats.

Materials and Methods: First, the objective was to evaluate if the change of the photoperiod (from LD 12:12 to LD 16:8) induces an increase in the sleep time of animals after muscle injury. Based on telemetry EEG/EMG recordings, we analysed the total sleep time (TST) as the NREM/REM sleep time sleep for injured animals submitted to the extended photoperiod (16:8; n=8) and for control animals group submitted to the extended photoperiod (16:8; n=8). Then, to assess the effects of the LD 16:8 photoperiod on mechanical pain sensitivity post-injury, a Von Frey test was applied from Day -3 to Day +13 on EEG-nonimplanted injured animals (Pain-animals groups) submitted either to the LD 12:12 or the LD 16:8 photoperiod

Results: The results show that injured animals take advantage of the opportunity to sleep faster than control animals, and this adds to the adaptive sleep response to muscle injury (increased NREM sleep time during the dark period), reflecting the high need for sleep after injury. Additionally, NREM sleep of injured animals during the extended light period was associated with greater stability and higher relative delta power. Finally, the extended photoperiod limits mechanical pain sensitivity, assessed by a Von Frey test, in muscle injured animals, and allows a faster recovery of baseline values. This is associated with lower pro-inflammatory cytokines levels in the hippocampus, a brain structure involved in the central processing of painful information.

Conclusions: In conclusion, our results demonstrate the efficiency of photoperiod change to induce sleep extension in animals after skeletal muscle injury. Furthermore, they show a cumulative effect of the adaptive sleep response to muscle injury *plus* sleep extension-related to photoperiod change, revealing a high need for sleep after muscle injury. This is corroborated by the increase in sleep quality during the extended light period for injured animals. In addition, the photoperiod changes decreased sensitivity to mechanical pain induced by muscle injury and enabled faster recovery of baseline values, which was associated with a decrease in pro-inflammatory markers in the hippocampus.

Characterizing the power spectrum dynamics of the nrem to rem sleep transition

D. Serantes[1], M. Cavelli[2], J. González[1], A. Mondino[3], L. Benedetto[1], P. Torterolo[1]
[1]Facultad de Medicina, Universidad de la República, Departamento de Fisiología, Montevideo, Uruguay, [2]Department of Psychiatry, University of Wisconsin-Madison, Madison, United States, [3]North Carolina State University, Department of Clinical Sciences, College of Veterinary Medicine, North Carolina, United States

The transition from NREM to REM sleep is considered a transitional or intermediate stage (IS), characterized by high amplitude spindles in the frontal cortex and theta activity in the occipital cortex. Early reports in rats showed an IS lasting from 1 to 5 s, but recent studies suggested a longer duration of this stage. To further characterize the IS, we analyzed its spectral characteristics on electrocorticogram (ECoG) recordings of the olfactory bulb (OB), motor (M1), somato-sensory (S1) and secondary visual cortex (V2) in twelve Wistar male adult rats. By comparing the IS to consolidated NREM/REM epochs, our results reveal that the IS has specific power spectral patterns that statistically differ from both NREM and REM sleep states. Specifically, the main findings were that sigma (11-16 Hz) and beta (17-30 Hz) power in OB, M1, and S1 increased during the IS compared to NREM and REM sleep and began 55 s before REM sleep onset. Additionally, low gamma (31-48 Hz) in the OB started transitioning from NREM levels to REM ones 65 s before its onset. Finally, the high-frequency oscillations (102-198 Hz) in OB, M1, and S1 showed a power increase that began 40 s before REM sleep and reached REM sleep values 10 s after its onset. Thus, we argue that the NREM to REM transition contains its own spectral profile and is more extended than previously described.

Cholinergic regulation of network dynamics during NREM and REM sleep mediates their differential roles in sleep consolidation

M. Satchell[1], D. McKinstry[2], S. Aton[2], <u>M. Zochowski</u>[2]
[1]Brandeis University, Waltham, United States, [2]University of Michigan, Ann Arbor, United States

Introduction: Across vertebrate species, sleep states are known to cycle consistently from non-rapid eye movement (NREM) to REM sleep. These states are defined by different neuromoduatory melieau, and specifically different levels of cholinergic release. However, the functional significance of these transitions is unknown. We use a simplified biophysical network model to show that state-specific changes in cholinergic signaling during NREM and REM sleep can mediate dramatic changes in network activity patterns and subsequently can play differential and critical role in sleep dependent memory consolidation.

Materials and methods: The in silico network consists of Hodgkin-Huxley type biophysical models of excitatory and inhibitory neurons expressing differentially slow potassium current associated with cholinergic activation/inactivation of M1 receptor. The low and high level of M1 expression (i.e., the magnitude of the m-current) define NREM and REM-like see states, respectively. The network undergoes spike timing dependent plasticity (SDTP) during the sleep like states. The states are sequentially iterated and the outcomes of learning during these states are analyzed after each sequence. We monitor changes in excitatory/inhibitory balance in the network, recruitment of new cells into the representations and the overlap of the representations before and after sleep consolidation.

Results: We show that the sequential, bidirectional changes in cholinergic neuromodulation during these sleep states plays a vital role in consolidation, particularly when multiple memory traces are being stored simultaneously. In the low-ACh (NREM-like) state, the inhibitory interneurons regulating the activity of the principal cells are less active leading to network disinhibition and allowing for rapid recruitment of new cells into the memory engram, and their consequent enlargement. In the subsequent high-ACh (REM-like) state, ACh mediates activation of these interneurons that competitively suppress activity among newly recruited excitatory pyramidal neurons during prior NREM, leading to the orthogonalization of newly enhanced representations of different memory traces. We observe analogous suppression experimentally when Medial Septum cholinergic cells are activated optogenetically during NREM. We further find that, in the in silico model, this iterative sequence of state-specific activations during NREM/REM cycling is essential for memory storage in the network, serving a critical role during simultaneous consolidation of multiple memories. These results are contrasted to NREM-like only and, separately, REM-like only sleep to highlight their individual importance. Finally, when the sequence is reversed the memory consolidation fails.

Conclusions: In all, our results show that NREM and REM can play critically different roles during sleep dependent memory consolidation, with NREM sleep recruiting new neurons into the memory engram and REM separating the overlapping representations. the work, highlights their differential cognitive function and role of acetylcholine in regulating them.

Closed-loop auditory stimulation (CLAS) of slow-wave sleep in mouse models of neurodegeneration

I. Dias[1,2,3], M. Lopez[1], S. Kollarik[1], C. R. Baumann[1,3,4], C. G. Moreira[1], D. Noain[1,3,4]
[1]University Hospital Zürich (USZ), Department of Neurology, Schlieren, Switzerland, [2]ETH Zürich, Department of Health Sciences and Technology (D-HEST), Zürich, Switzerland, [3]Neuroscience Center Zürich (ZNZ), Zürich, Switzerland, [4]Center of Competence Sleep and Health, Zürich, Switzerland

Literature in murine models of neurodegeneration suggests that long-term slow-wave activity (SWA) enhancement may be neuroprotective. Boosting SWA via manipulation of slow waves through techniques such as closed-loop auditory stimulation (CLAS), may provide a powerful non-pharmacological and non-invasive tool to investigate the link between sleep and neurodegeneration. Nevertheless, CLAS's parameter optimization and overall effect in the neurodegenerative brain still need to be tackled before implementing this technique in the clinic.

We aimed at establishing CLAS-mediated SWA enhancement by targeting the up-phase of slow waves in mouse models of Alzheimer's (AD, Tg2576 line) and Parkinson's disease (PD, A53T line). For this effect, we tracked four frequency components (1, 1.5, 2 or 2.5 Hz) of the ongoing EEG signal, and subsequently tested three up-phase targets ($30º$, $40º$ or $60º$) of auditory stimuli. We assessed online NREM staging performance through a set of diagnostic outcomes (precision, specificity and sensitivity), calculated stimuli distributions, and delta power percentage of change from baseline, across conditions and genotypes. We then defined the optimal combination of CLAS parameters for each transgenic line, and explored their effects onto sleep architecture (total duration and fragmentation of NREM, microarousals), slow oscillation characteristics (number of oscillations, peak amplitude, slopes, wavelength), and inferred on stimuli metrics (interstimulus intervals, trains).

We found that tracking a 2 Hz component of slow waves led to highest precision of online NREM detection in mice (~60%). Following this result, we continued tracking a 2 Hz component and tested three up-phases of auditory stimuli delivery. We observed that the $30º$ target encompasses highest precision, specificity and sensitivity among all up-phase targets in WT_{AD} (65%, 97% and 12%, respectively) and TG_{AD} mice (72%, 98% and 7%, respectively). Contrastingly, the $40º$ target amounted for the highest precision, specificity and sensitivity among all up-phase targets in WT_{PD} (73%, 99% and 6%, respectively) and TG_{PD} mice (61%, 98% and 9%, respectively). The 2Hz/30° combination produced a significant delta power increase in WT_{AD} and TG_{AD} mice (WT_{AD}, 29 ± 8 %, $p<0.001$; TG_{AD}, 15 ± 6 %, $p<0.05$), in comparison with a MOCK group (no sound stimuli). Conversely, the 2Hz/40° combination yielded a significant delta power increase in WT_{PD} and TG_{PD} mice (WT_{PD}, 35 ± 21 %, $p=0.053$; TG_{PD}, 31 ± 6 %, $p<0.001$). Moreover, we observed a significantly decreased sleep fragmentation in transgenic mice upon CLAS, which co-occurred with a strong decrease in microarousals during the resting period. In turn, wild-type mice displayed steeper ascending slow oscillation slopes and decreased wave and down-state lengths. The remaining parameters evaluated were not altered in each genotype/line.

Our results indicate that tracking a 2 Hz component coupled with model-tailored phase-targeting is key to successfully modulate SWA using murine CLAS. Further experiments assessing the long-term effect of CLAS in mice may have a major impact on the therapy of neurodegenerative diseases, benefiting preclinical/clinical studies and setting CLAS as a novel treatment candidate.

Comparison of actigraphy measurements and sleep diary against polysomnography according to insomnia and sleep apnea

S.H. Moon[1], I.-Y. Yoon[1], M. Lee[1]
[1]Seoul National University Bundang Hospital, Psychiatry, Bundang-gu, Seongnam-si, Korea, Republic of

Introduction: The purpose of this study is to compare the correlation of actigraphy and sleep diaries with home polysomnography (PSG) according to insomnia and sleep apnea.
Materials and methods: There were 63 participants. Among them 36 had insomnia (Pittsburgh Sleep Quality Index >5) with 21 having sleep apnea (apnea-hypopnea index ≥ 15). For four sleep parameters (sleep latency (SL), sleep efficiency (SE), total sleep time (TST), and wake after sleep onset (WASO)), we calculated the correlation of actigraphy and sleep diary with polysomnography.
Results: Overall, sleep diary was more accurate than actigraphy when including all participants (correlation of sleep diary and actigraphy with PSG: SL; 0.817 vs. 0.438, SE; 0.670 vs. 0.609, TST; 0.568 vs. 0.497, WASO; 0.446 vs. 0.325). In the insomnia group sleep diary was more accurate than actigraphy (correlation of sleep diary and actigraphy with PSG: SL; 0.866 vs. 0.550, SE; 0.669 vs. 0.683, TST; 0.612 vs. 0.457, WASO; 0.480 vs. 0.328).
On the other hand, in the presence of sleep apnea on PSG (AHI >15), actigraphy was better correlated with PSG on all measures than sleep diary (correlation of sleep diary and actigraphy with PSG: SL; 0.281vs. 0.732, SE; 0.186 vs. 0.590, TST; 0.359 vs. 0.576, WASO; 0.270 vs. 0.558).
Conclusions: The results of this study demonstrated that the accuracy of actigraphy and sleep diary differed according to the presence of insomnia or sleep apnea states. The choice and interpretation of ambulatory sleep measurements should be performed in consideration of disease states.

Differential brain and eye responses to external auditory information in phasic and tonic REM sleep

M. Ameen[1], P. Topalidis[1], M. Schabus[1], P. Simor[2], K. Hoedlmoser[1]
[1]University of Salzburg, Psychology, Salzburg, Austria, [2]Eötvös Loránd University, Faculty of Education and Psychology, Budapest, Hungary

Introduction: Rapid eye movement (REM) sleep, can be categorized into phasic and tonic episodes. Phasic REM sleep, typically associated with dreaming, is conventionally considered a phase of brain isolation, detached from external influences. In contrast, tonic REM sleep phases are believed to foster a heightened connection with the environment and enhanced receptiveness to external stimuli. Despite this understanding, there is limited knowledge regarding processing external information during these distinct REM stages. The objective of this study is to elucidate the contrasting characteristics of phasic and tonic REM sleep stages by examining brain and eye responses to different auditory stimuli in these distinct REM episodes.

Materials and Methods: To this end, we analysed high-density electroencephalography (EEG) data from 17 healthy human subjects who underwent a full night of sleep (~8 hours). Throughout the night, participants were presented with auditory stimuli, including their own name (SON) and two unfamiliar names (UNs), spoken by either a familiar voice (FV) or an unfamiliar voice (UFV). We classified REM sleep into four-second phasic and tonic episodes based on the presence or absence of rapid eye movements. Our analysis included multivariate decoding, event-related and time-frequency analyses, as well as differences in aperiodic EEG activity.

Results: Our findings revealed notable differences between phasic and tonic REM sleep episodes. During tonic REM, we observed a higher number of microarousals and a shallower slope of the EEG signal as compared to phasic REM, with the former highlighting increased external processing and the latter indicating more excitatory cortical activity. In terms of auditory processing, we discovered distinct event-related potentials (ERPs) and time-frequency responses to voices during tonic REM sleep. Specifically, UFV stimuli elicited stronger responses compared to FVs. Conversely, no significant differences in brain responses were observed during phasic REM sleep, characterized by dream occurrence, for either voices or names. Notably, however, we found significantly stronger eye responses to SONs compared to UNs during phasic REM sleep.

Conclusions: Our results confirm prior evidence suggesting a preference for processing unfamiliar stimuli during sleep, particularly REM sleep. Additionally, we demonstrate that eye movements during phasic REM sleep differentiate between sounds, suggesting that the brain remains partially responsive to the environment during these dream episodes. These findings shed light on the intricate nature of REM sleep and provide insights into the neural activity occurring during this enigmatic sleep stage.

Discovery of a highly potent and orally available orexin 2 receptor-selective agonist, TAK-861, as a novel therapeutic agent for narcolepsy and other hypersomnia disorders

H. Kimura[1], M. Terada[1], R. Yamada[1], Y. Kajita[1], T. Koike[1], K. Mitsukawa[1]
[1]Neuroscience Drug Discovery Unit, Research, Takeda Pharmaceutical Company Limited, Fujisawa, Japan

Introduction: Narcolepsy Type 1 (NT1), a rare neurologic disorder of central hypersomnolence, is associated with the loss of orexin neurons and is characterized by multiple symptoms including excessive daytime sleepiness and cataplexy. Orexin 2 receptor (OX2R) knockout (KO) mice, but not orexin 1 receptor (OX1R) KO mice, exhibit apparent narcolepsy-like phenotypes, thus OX2R agonists can be a promising treatment for NT1. We have previously discovered a parenteral OX2R agonist, danavorexton, and an orally available OX2R agonist, TAK-994, which improved NT1-like phenotypes in mouse models and showed promising therapeutic effects in NT1 patients. However, danavorexton has limited oral availability and TAK-994 has a risk of off-target liver toxicity. To avoid these limitations, a highly potent molecule with a low effective dose is preferred. In this study, we preclinically characterized pharmacological profiles of a novel orally available OX2R-selective agonist, TAK-861, then compared them with profiles of TAK-994.

Materials and Methods: OX1R- or OX2R-agonistic activity was assessed by calcium mobilization assays using human OX1R- or OX2R-expressing Chinese hamster ovary cells, respectively. The arousal effects of TAK-861 were evaluated using electroencephalogram/electromyogram recordings in mice and cynomolgus monkeys during their sleep phase.

Results: TAK-994 activated OX2R with a half-maximal effective concentration (EC_{50}) of 19 nM and 740-fold selectivity over OX1R in *in vitro* calcium mobilization assays, and at 10 mg/kg, significantly increased wakefulness time in mice and cynomolgus monkeys during the sleep phase. In comparison, TAK-861 activated OX2R with EC_{50} of 2.5 nM and 3,000-fold selectivity over OX1R in *in vitro* calcium mobilization assays, and at 1 mg/kg, significantly promoted wakefulness in mice and cynomolgus monkeys during the sleep phase. High dose (10 mg/kg) TAK-861 did not show wake-promoting effect in OX2R KO mice, indicating its OX2R selectivity *in vivo*. Therefore, compared with TAK-994, TAK-861 showed approximately 10-fold more potent OX2R-agonistic activity and 10-fold lower effective dosage for arousal effects in both mice and cynomolgus monkeys.

Conclusions: Compared with TAK-994, the novel orally available OX2R-selective agonist TAK-861 showed approximately 10-fold higher potency in OX2R activation, better selectivity over OX1R, and 10-fold lower effective dosage for arousal in both mice and monkeys.

Early diagnosis of obstructive sleep apnea in young and middle-age adults

J.A.D. Fernandes[1], F.F. Carregosa[1], M.C.P. Scott[1], L.S. Lima[1], M.F.B. Cardoso[1], C.H.L. Martins[1], H.d.S. Nunes[1], J.A. Pinto[1]
[1]Nucleus of Otolaryngology, Head and Neck Surgery and Sleep Medicine of São Paulo, Otolaryngology and Sleep Medicine Department, São Paulo, Brazil

Introduction: Obstructive sleep apnea is a chronic condition, caused by episodes of superior airway obstruction during sleep. Its consequences include overall reduction in quality of life, cardiovascular and metabolic disorders, and the main predisposing factors include male gender, advanced age and high body mass index. The young adult population exhibits a greater risk of long-term morbidity and mortality, which can be explained by the lack of early diagnosis.

Materials and Methods: The objectives of this study is investigate the prevalence, clinical presentation and the importance of early diagnosis of Obstructive Sleep Apnea Syndrome in young adults. Retrospective observational study of 219 medical records from June 2019 to January 2021 in a tertiary otolaryngology service in São Paulo, Brazil. Eighty-three individuals with Obstructive sleep apnea aged between 23 and 45 years were selected and their records analysed, including clinical history, nasal endoscopy and polysomnography.

Results: According to the Polysomnography, each patient's condition was classified as mild (Apnea/Hypopnea Index from 5 to 15), moderate (15 to 30) and severe (higher than 30). Of the 24 (28,91%) classified as mild, 15 had comorbidities and 14 were overweight. Of the 30 (36,14%) classified as moderate, 30 had comorbidities and 27 were overweight. Finally, of the 24 (28,91%) classified as severe, 19 had comorbidities and 22 were overweight.

Conclusions: Obstructive sleep apnea has a considerable prevalence in young adults, particularly associated to overweight and comorbidities. Therefore, it is important this population be investigated to prevent the development or deterioration of disorders.

Effects of aerobic physical exercise on memory and permeability of the blood-brain barrier of sleep deprived Swiss mice

R. Salviano de Matos[1], B. Rafaele Diógenes[1], T. Medeiros da Costa Daniele[1], P.F. Carvalhedo de Bruin[1], R. Barreto Oriá[2], V. Meireles Sales de Bruin[1]
[1]Federal University of Ceara, Sleep and Biological Rhythms Laboratory, School of Medicine, Institute of Biomedicine, Fortaleza, Brazil, [2]Federal University of Ceara, Laboratory of Tissue Healing, Ontogeny and Nutrition, Department of Morphology, Fortaleza, Brazil

Introduction: Sleep deprivation (SD) is a common clinical condition that can lead to acute and chronic damage, both in activities of daily living and in triggering pathological processes. As opposed to the deleterious effects of SD, cumulative evidence indicates that physical exercise provides numerous benefits. Sedentary lifestyle has been recognized as a risk factor for cerebrovascular disease (CVD). Previous evidence indicates that exercise can have positive effects on prevention and treatment of CVD. The integrity of the blood-brain barrier (BBB), a cell membrane that forms the interface between neural and circulating cells can possibly be influenced by previous exercise. In fact, In the present study, the effects of chronic aerobic exercise on a treadmill on spatial working memory and on the permeability of the BBB in the hippocampus of sleep-deprived mice were evaluated.

Materials and methods: The study involved 48 male Swiss mice, 12 weeks old, divided into four experimental groups (n=12 each): control; chronic physical exercise on a treadmill (EXE); SD; exercise prior to sleep deprivation (EXE+SD). Exercised animals performed a treadmill training protocol for 8 weeks (60min/day and 5 days/week). Sleep-deprived animals were subjected to the adapted 72-hour multiple-platform method. After 8 weeks of experiment, the animals were submitted to the behavioral memory test (Y-maze) and the hippocampus was collected for measurement of albumin protein levels.

Results: Regarding memory, there was no difference between groups at baseline. The animals in the EX+SD group showed better performance in the memory test when compared to the SD group (p=0.02). Albumin protein levels, a BBB permeability marker, were lower in the EXE+SD group when compared to the SD group (p=0.02).

Conclusions: In summary, our results show that chronic physical exercise on a treadmill reversed the deleterious effects on spatial working memory and reduced BBB permeability in sleep-deprived mice, therefore, playing a protective role.

Effects of daily fluctuations in seep and intraindividual sleep variability on mood, motivation and sleepiness in university students: a wearable and digital diary approach

A.S.C. Ng[1], S.A.A. Massar[1], G. Yilmaz[1], S.A. Jamaluddin[1], M.W.L. Chee[1]
[1]National University of Singapore, Centre for Sleep and Cognition, Yong Loo Lin School of Medicine, Singapore, Singapore

Introduction: Consumer sleep trackers issue daily guidance on 'readiness' without clear empirical basis. We investigated how self-rated mood, motivation, and sleepiness levels (hereinafter MMS) – which may act as simple and practically deployable indicators of performance readiness – are affected by daily fluctuations in sleep duration, timing, and efficiency as well as overall sleep regularity. We also determined how temporally specific these associations are.

Materials and methods: 119 healthy university students (64 female, mean age=22.54±1.74 years) wore a wearable sleep tracker (Oura Ring) and undertook daily smartphone-delivered ecological momentary assessment of mood, motivation, and sleepiness twice daily (post-wake and pre-bedtime) for 2-6 weeks. Data from a total of 2471 nights with qualifying sleep data were examined. Multilevel models adjusted for age, sex, BMI, day of study and weekends were used to examine within-subject and between-subject associations between sleep duration, timing, and efficiency on following day MMS ratings. Models examining associations with post-wake MMS ratings were additionally adjusted for self-reported nap duration on the previous day, while models examining associations with pre-bedtime MMS ratings were adjusted for self-reported nap durations on the same day. Time-lagged analyses were conducted to examine whether effects were specific to the index day immediately following the sleep period only, or additionally influenced MMS ratings on the previous or second day after. Linear regression models investigated associations between MMS ratings and sleep variability controlling for sleep duration, defined as the standard deviation of weekly nocturnal sleep durations.

Results: On average, nocturnal sleep durations were found to be short (6.03±0.71h), and bedtimes to be late (1:42AM±1:05) in our sample. Within-subjects, nocturnal sleep that was longer relative to the person's average was associated with better mood, higher motivation, and lower sleepiness in the post-wake window, followed by better mood and less sleepiness in the pre-bedtime window (all Ps<.005). Reciprocally, higher sleepiness and lower motivation scores in the pre-bedtime window preceding the sleep episode were associated with longer sleep durations and earlier midsleep times (Ps<.005). Time-lagged analyses showed that effects of sleep on MMS were confined to ratings in the post-wake window on the day immediately following the sleep episode, and pre-bedtime window directly preceding the sleep episode. Between subjects, higher intraindividual sleep variability was associated with worse mood and lower motivation ratings after waking, while longer average sleep duration was associated with less sleepiness after waking and lower motivation in the pre-bedtime window (all Ps<.05).

Conclusions: In a sample of late and short sleeping students, we found evidence of associations between nightly sleep duration and next-day MMS. Greater sleep variability had negative effects on mood and motivation after waking. Our findings suggest that sleep is tightly linked with subjective indicators of next-day readiness to perform, and lend credence to the utility of supplying daily sleep-driven 'readiness' scores.

Effects of the dual hypocretin/orexin receptor antagonist Suvorexant on sleep and maternal behavior in lactating rats

M. Rivas[1], F. Peña[1], C. Carrera-Cañas[2], B. Carrasco[1], A. Ferreira[3], P. Torterolo[1], I. De Andrés[2], M. Garzón[2], L. Benedetto[1]
[1]Universidad de la República, Faculty of Medicine, Physiology, Montevideo, Uruguay, [2]Universidad Autónoma de Madrid, Faculty of Medicine, Anatomy, Histology and Neuroscience, Madrid, Spain, [3]Universidad de la República, Faculty of Sciences, Physiology and Nutrition, Montevideo, Uruguay

Introduction: The postpartum period is characterized by a multitude of physiological changes. Recent findings suggest that the activity of the hypocretinergic system increases in the early postpartum period. Hypocretins, also known as orexins, are two neuropeptides synthesized by hypothalamic neurons, that play a crucial role in various functions, including the regulation of the sleep-wake cycle and motivated behaviors, such as maternal behavior. Our previous research demonstrated that the local administration of the dual orexin receptor antagonist (DORA) into the medial preoptic area modifies sleep-wake states and maternal behavior in postpartum rats. Nevertheless, the systemic effects of DORA on these variables during the postpartum period remain unexplored.

Materials and Methods: On postpartum day 1, eight mother rats were surgically implanted with electrodes for polysomnographic recording. Mother rats received a single dose of Suvorexant (30 mg/Kg, oral administration) and its vehicle on two different days, between postpartum days 4 and 8, using a counterbalanced design. Polysomnographic and video recordings to assess maternal behavior were conducted for six hours during the light phase following the oral administration at 12:00 pm (lights on at 6:00 am). The sleep and wakefulness states, as well as maternal behavior, were diagnosed and staged in epochs of 5 seconds.

Results: Our main findings demonstrate that Suvorexant led to a reduction in the total time spent in wakefulness (from 193.3 ± 8.4 to 160.2 ± 7.6 min, $p = 0.015$), along with an increase in the total slow wave sleep (SWS; from 114.2 ± 5.1 to 132.9 ± 5.3 min, $p = 0.012$), intermediate state (IS; from 3.9 ± 0.7 to 7.9 ± 1.2 min, $p = 0.019$), and REM sleep duration (from 9.0 ± 1.2 to 18.0 ± 3.1 min, $p = 0.035$). These effects were more noticeable in the first two hours of recordings. Furthermore, Suvorexant administration resulted in an increased number of SWS episodes (from 209.9 ± 18.1 to 253.9 ± 16.5, $p = 0.006$), longer duration of IS episodes (from 0.2 ± 0.02 to 0.3 ± 0.02, $p = 0.049$) and REM episodes (from 0.7 ± 0.1 to 1.0 ± 0.1, $p = 0.016$), while reducing REM sleep latency (from 84.9 ± 13.2 to 51.5 ± 12.8 min, $p = 0.018$). In addition, Suvorexant increased the total time spent in nursing posture (from 183.6 ± 16.4 to 209.7 ± 18.2 min, $p = 0.036$) along with an increase in the number of milk ejections (from 20.1 ± 3.4 to 26.0 ± 3.8, $p = 0.026$).

Conclusions: The systemic blockade of hypocretin receptors in mother rats during the postpartum period caused a hypnotic effect that is accompanied by changes in maternal behavior and lactation, highlighting the role of the hypocretinergic system in the postpartum period.

Electrical activity of the suprahyoid and masseter muscles during oropharyngeal exercises for Sleep Disordered Breathing

E.M.G. Bianchini[1], A.S. da Silva[1], E. Thuler[2], F. Kayamori[1], F.A.W. Rabelo[3]
[1]Pontifical Catholic University of São Paulo, Speech, Language and Hearing Sciences, São Paulo, Brazil, [2]University of Pennsylvania, USA, OHNS Department, Pennsylvania, United States, [3]Hospital Samaritano, ENT, São Paulo, Brazil

Introduction: Sleep Disordered Breathing (SDB) represents a challenge for interdisciplinary teams. Literature has been demonstrating that Orofacial Myofunctional Therapy (OMT) is a safe and emergent alternative treatment for SDB, evidenced in randomized trials, systematic reviews and meta-analyses, for increasing muscle tone and mobility in a noninvasive manner. However, the oropharyngeal exercises, advocated in the world literature, have not been fully elucidated, suggesting the need for improving comprehension. Surface electromyography (EMG$_s$) consists in a non-invasive method which allows to detect electric potentials from superficial muscles, and to analyze the myoelectric signal generated by physiological changes in the muscular fibers' membranes, representing the relative level of recruitment in a motor unit, the intensity and duration of muscle demand. Objective: to characterize the electrical activity of the suprahyoid and masseter muscles during the performance of oropharyngeal exercises used in OMT for SDB.
Materials and methods: Ethical processes (CAAE:94754418.4.0000.5482). From the specific literature on OMT for patients with OSA and snoring, six exercises were selected: (1)tongue sliding on hard palate; (2)anterior lingual pressure on hard palate; (3)extra-oral lingual propulsion; (4)tongue coupling in hard palate, (5)lowering the dorsum of tongue, (6)lingual projection against resistance. Fifteen healthy young adults, underwent individual training to perform each exercise. Data collection: EMGs (Miotool Face USB/Miotec®) of the mentioned muscles, with surface bipolar electrodes, during the performance of each exercise, captured in Raw signal, measured in microvolts (µV), and analyzed in rectified signal: Root Mean Square. Data was normalized to avoid bias, tabulated according to the average of the potentials in two types of contraction: isotonic and isometric. Statistical analysis: ANOVA, Mauchly's test with Greenhouse correction - Geisser, Least Significant Difference, Bonferroni, Pearson for correlation between the analyzed muscles.
Results: Analyzes of isotonic exercises showed a significant difference in electromyographic responses ($p<0.001$). For both sides, greater suprahyoid muscle activation responses were obtained in the exercises number: 3, 4 and 6. The exercises: 1, 2 and 5 showed the lowest muscle activation response. Analyzes of isometric exercises also show significant differences in electromyographic responses ($p<0.001$). It is relevant to point out that the type of muscle contraction (isotonic or isometric) doesn't seem to interfere with the electromyographic responses regarding lower and higher electrical activity, since the results were similar in both contractions. Analysis of the correlation (Pearson) between masseter and suprahyoid muscle group, pointed to a positive correlation during the execution of the anterior lingual pressure exercise on the hard palate: the greater the activation of the suprahyoid, the greater the electrical activity of the masseters. The exercises: extra-oral tongue propulsion and tongue sliding on the hard palate had negative correlation: the greater the electrical activity in the suprahyoid, the lower the activity of the masseters.
Conclusions: It was found that the six analyzed exercises provided differentiated electrical activity of the suprahyoid and masseter muscles. The methodology used in this study allowed identifying, among analyzed exercises, which ones present greater electromyographic responses and their correlations.

Elucidating the enigmas of orphan GPCRs: decoding GPR61's role in sleep and cardiometabolic traits through a novel genomic approach

C. Tchio[1,2,3], B. Kameswara[3], H. Taylor[3], J. Williams[4], R. Saxena[1,2]
[1]Massachusetts General Hospital/Harvard Medical School, Center for Genomic Medicine, Boston, United States, [2]Broad Institute of MIT and Harvard, Medical and Population Genetics, Cambridge, United States, [3]Morehouse School of Medicine, Cardiovascular Research Institute, Atlanta, United States, [4]Brigham and Women's Hospital, Department of Medicine Endocrinology, Boston, United States

Introduction: G-protein coupled receptors (GPCRs) are the largest class of membrane receptors. They are involved in various sleep and cardiometabolic disorders; however, 150 out of 900 GPCRs remain orphans (oGPCRs) with unknown endogenous ligands; thereby, limiting our understanding of their biological function. GPCRs are targeted by 36 % of FDA-approved drugs; thus, the understudied oGPCRs are druggable and have a high potential to impact human health once disease associations are made.

Materials and Methods: This study aimed to use a genomic approach from a large dataset to deorphanize oGPCRs whose genetic variations significantly impact sleep and cardiometabolic disorders. First, we used the UK Biobank study summary statistics to identify oGPCRs loci where multiple sleep and cardiometabolic traits colocalized at a false discovery rate < 5%. Next, in the metabolic disease knowledge portal, we performed PheWAS analyses of the variants to identify new phenotypic traits in other datasets of European ancestry. We then used GTex to identify quantitative trait loci to highlight variants that affect gene expression.

Results: Our study identified variants in oGPCRs *GPR61*, *GPR146*, and *GPRC5B* that have a pleiotropic effect on sleep and cardiometabolic traits in the UK Biobank cohort. The variant rs12044778 is an intronic variant in *GPR61* associated with ease of waking up and morningness chronotype. We also found that rs12044778 is also significantly associated with BMI and HDL cholesterol. Moreover, *GPR61* is expressed in suprachiasmatic nuclei (master clock) AVP and VIP neurons suggesting their functional involvement in sleep and circadian rhythmicity. The next phase of de-orphanization story is to identify potential ligands that bind and activate our orphan GPR61. Hence, we used the BLOSUM62 similarity matrices score to help us identify sequence similarity for regions that are key for ligand binding. We were able to validate a ligand that binds to GPR61 and recruit the intracellular binding of Beta arrestin2.

Conclusions: Overall, our study provides new insight into the functions of oGPCRs genetic variants in sleep and cardiometabolic processes. Our study also provides a novel approach to using genomic data to increase our understanding of the implication of understudied orphan GPCRs in human health.

Examining the information flow dynamics (top-down or bottom-up) in the gamma frequency band (≈40 Hz) of the EEG during wakefulness and sleep

S. Castro[1], P. Torterolo[1], J. Gonzalez[1]
[1]Universidad De La República Oriental del Uruguay. Facultad de Medicina, Phisiology, Montevideo, Uruguay

Introduction: Cognitive processes and consciousness rely on extensive thalamocortical and corticocortical recurrent interactions at a large scale. It has been hypothesized that oscillations within the gamma frequency band (30 to 45 Hz) of the electroencephalogram (EEG) are generated as a result of these interactions and play a role in cognitive functions. These oscillations have been implicated in the integration of spatially separated yet temporally correlated neural events, leading to a cohesive perceptual experience. It is widely recognized that top-down processing refers to the brain's ability to utilize our expectations, attentional focus, and other cognitive factors to dynamically influence bottom-up sensory processing. However, the precise directionality of the information flow encoded by gamma band oscillations remains unknown. Therefore, the primary objective of our study is to investigate the specific information flow patterns within the gamma band during both wakefulness and sleep.

Materials and methods: To achieve this, five cats were chronically prepared for polysomnographic recordings, with electrodes placed in various cortical regions. To investigate the directionality of information flow of the gamma band during wakefulness and sleep, we quantified the phase shifts of amplitude envelopes of filtered gamma oscillations and employed the "Granger causality" analysis. This statistical test allowed us to determine if one time series could predict or forecast the other.

Results: In the baseline condition when analyzing 500-second windows, the results revealed that during wakefulness, the primary direction of information flow in the gamma band was from the dorsolateral prefrontal cortex (Pfdl) to the posterior parietal cortex (Pp), as well as from Pfdl to the primary somatosensory cortex (S1), primary visual cortex (V1), and primary auditory cortex (A1). Additionally, there was a predominance of directionality from Pp to the primary cortices (S1, A1, V1). This indicates a significant influence of top-down information processing. However, this top-down flow of information was not observed during both NREM and REM sleep.

Furthermore, when investigating late gamma oscillations induced by click stimuli (analyzed within 1 second windows starting 0.4 seconds after the stimulus), we found a predominant bottom-up directionality from the Pp to the Pfdl, as well as from A1 to Pfdl. In contrast, late gamma oscillations induced by more complex stimuli, such as 0.2 seconds variable sounds, demonstrated a predominant top-down directionality from Pfdl to Pp, A1, and V1 cortex, as well as from Pp to V1 cortex. Notably, these specific directionalities were not observed during sleep.

Conclusions: The data indicate that during wakefulness, different patterns of information flow emerge depending on the nature of the stimuli. Specifically, bottom-up processing was found to predominate in the case of simple repetitive sound stimuli, while top-down processing prevailed for complex and variable sounds, as well as in the baseline condition (without stimuli). In addition, no specific directionality of information flow was observed during NREM and REM sleep, suggesting a different mode of cognitive processing during sleep.

Exogenous Ang-(1-7) inhibited chronic intermittent hypoxia-induced autophagy via HIF-1α/THBS1 axis in mice and cellular models of asthma

J.P. Zhou[1], Q.Y. Li[1]
[1]Ruijin Hospital, Shanghai Jiao Tong University School of Medicine, Shanghai, China

Asthma is a common respiratory disease with high prevalence and incidence worldwide. Obstructive sleep apnea (OSA)-induced chronic intermittent hypoxia (CIH) has been considered as a risk factor of asthma. Airway remodeling played a key role in the process of OSA and asthma. Previous studies have found that Angiotensin-(1-7) [Ang-(1-7)] treatment has therapeutic effects on asthma-induced inflammation, epithelial-to-mesenchymal transition (EMT) and pulmonary fibrosis. In this study we found that CIH increased asthma-induced airway remodeling both in OVA-induced mice and LPS-human bronchial epithelial cells. We found that Ang-(1-7) could dose-dependently inhibit the effects of CIH on the expression of E-cadherin, Vimentin, Snail, α-SMA and Collagen IV. Furthermore, we confirmed by chromatin immunoprecipitation (CHIP) and immunoprecipitation (IP) that Ang-(1-7) inhibits CIH-induced binding of hypoxia-inducible factor 1-alpha (HIF-1α) to the promoter of Thrombospondin 1 (THBS1) and the protein-protein interaction between THBS1 and the autophagy-associated protein Beclin 1 (BECN1), which in turn inhibits autophagy. Our findings demonstrated that Ang-(1-7) might have a curative effect on asthma patients with OSA via inhibiting HIF-1α/THBS1 axis mediated-autophagy.

Factors associated with sleep-wake state discrepancy among healthy adults

R.R. Wang[1], C.X. Chen[2], F.T.W. Cheung[1], N.Y. Chan[2], J.W.Y. Chan[2], W.-K. Hou[3], S.S.-y. Yau[4], F.Y. Liu[5], Y.K. Wing[2], T.M.-C. Lee[6,7], S.X. Li[1,6]
[1]Sleep Research Clinic and Laboratory, Department of Psychology, The University of Hong Kong, Hong Kong, SAR of China, [2]Li Chiu Kong Sleep Assessment Unit, Department of Psychiatry, Faculty of Medicine, The Chinese University of Hong Kong, Hong Kong, SAR of China, [3]Department of Psychology, The Educational University of Hong Kong, Hong Kong, SAR of China, [4]The Mental Health Research Centre, The Hong Kong Polytechnic University, Hong Kong, SAR of China, [5]Department of Computing, Faculty of Engineering, The Hong Kong Polytechnic University, Hong Kong, SAR of China, [6]The State Key Laboratory of Brain and Cognitive Sciences, The University of Hong Kong, Hong Kong, SAR of China, [7]Laboratory of Neuropsychology and Human Neuroscience, The University of Hong Kong, Hong Kong, SAR of China

Introduction: Sleep-wake state discrepancy (SWSD), characterized by differences in objectively and subjectively measured sleep parameters, such as total sleep time and sleep onset latency, is a common phenomenon in individuals with insomnia. Yet limited studies have explored SWSD in the general population, especially the discrepancy in wake after sleep onset (WASO), which is often associated with one's subjective experience of sleep quality and daytime functioning (e.g., mood, cognitive abilities). While previous studies found that individuals who have a higher level of SWSD are more hyper-aroused, they were mainly focused on poor sleepers and were limited by a lack of objective measures of hyperarousal, such as cortical activity during sleep. This study investigated the extent of SWSD of wake after sleep onset in community-dwelling adults and its association with objective macro- and micro-sleep architecture.

Materials and methods: 157 healthy adults (mean age: 29.98±5.42, female: 66.67%) without any sleep or psychiatric disorders as ascertained by the structured clinical interviews were recruited from the community. Participants completed one-night of lab-based or ambulatory polysomnography, post-polysomnography sleep diary, and pre-sleep arousal scale (PSAS). The SWSD index was computed by subtracting objectively assessed WASO by polysomnography from subjectively reported WASO by sleep diary, where a positive value indicates an underestimation of WASO. The results were transformed to absolute values indicating the extent of sleep-wake state discrepancy, and those exceeding the 50th percentile were categorized into the "high discrepancy group". The YASA Python toolbox was used to perform the spectrum power analysis to assess sleep microstructure.

Results: Participants showed a mean of 32.33 minutes of discrepancy between subjectively and objectively assessed WASO and were divided into low and high discrepancy groups in wake after sleep onset using the cutoff of the 50th percentile of the absolute values of SWSD index (21.10 minutes). The high discrepancy group had a longer duration in REM sleep ($t(147)=-2.08$, $p<.05$), decreased relative spectral power value in the EEG sigma band across central ($t(155)=2.30$, $p<.05$) and occipital ($t(153)=2.42$, $p<.05$) brain regions during REM sleep, and elevated EEG absolute beta band ($t(142) = -2.14$, $p<.05$) during sleep latency, and a lower degree of self-perceived pre-sleep somatic arousal ($t(154)=2.09$, $p<.05$). Backward linear regression analysis further indicated that the absolute beta power before sleep onset and the relative sigma power in the central region during REM sleep were significantly associated with the degree of SWSD after controlling for age and gender.

Conclusions: Given that micro-architectural EEG sleep beta and sigma activity are reflections of an index of cortical arousal and sleep stability, respectively, the current findings suggest that the activation of wake-promoting and sleep-protecting neural activity patterns before sleep onset and during REM sleep may be related to the perception of sleep. Future studies should investigate other potential mechanisms underlying the discrepancy between objective and subjective sleep experiences, such as physiological hyperarousal as indicated by heart rate variability.

Fractal cycles of sleep: a new aperiodic activity-based definition of sleep cycles

Y. Rosenblum[1], M. Jafarzadeh Esfahani[1], N. Adelhöfer[1], P. Zerr[1], M. Furrer[2], R. Huber[2], A. Steiger[3], M. Zeising[4], C.G. Horváth[5], B. Schneider[5], R. Bódizs[5], M. Dresler[1]
[1]Radboud University Medical Centre, Donders Institute for Brain, Cognition and Behavior, Nijmegen, Netherlands, [2]University Children's Hospital Zürich, Child Development Center and Children's Research Center, Zürich, Switzerland, [3]Max Planck Institute of Psychiatry, Munich, Germany, [4]Centre of Mental Health, Klinikum Ingolstadt, Ingolstadt, Germany, [5]Semmelweis University, Budapest, Hungary

Introduction: Nocturnal human sleep consists of 4–6 ninety-minute cycles defined as episodes of non-rapid eye movement (non-REM) sleep followed by an episode of REM sleep. While sleep cycles are considered fundamental components of sleep, their functional significance remains to a large extent unclear. One of the reasons for a lack of research progress in this field is the absence of a "data-driven" definition. Here, we propose to base the definition of sleep cycles on fractal (aperiodic) neural activity, a well-established marker of arousal and sleep stages.

Materials and Methods: We explored temporal dynamics of fractal neural activity over the course of nocturnal sleep using electroencephalography. Based on the observed pattern of fractal fluctuations, we introduced a new concept, the "fractal" cycle of sleep, defined as a time interval during which fractal activity descends from its local maximum to its local minimum and then leads back to the next local maximum. Next, we assessed correlations between "fractal" and "classical" sleep cycle durations. We also analyzed the cycles with "skipped" REM sleep, i.e., cycles where only a "lightening" of sleep is observed instead of a REM phase due to too high non-REM pressure. Regarding the sample, we examined fractal cycles in healthy participants (n=205) as well as in children and adolescents (n=21), the group characterized by deeper sleep, which (among other features) is also reflected by a higher frequency of "skipped" cycles. Finally, we studied "fractal" cycles in major depressive disorder (n=111), the condition characterized by altered REM sleep (besides its clinical symptoms).

Results: "Fractal" and "classical" cycle durations (89±34 min vs 90±25 min) correlated positively (r=0.5, p<0.001). Cycle-to-cycle overnight dynamics showed an inverted U-shape of both fractal and classical cycle durations and a gradual decrease in absolute amplitudes of the fractal descents and ascents from early to late cycles. The fractal cycle algorithm detected "skipped" cycles in 53/55 (96%) cases. Children and adolescents (range: 8–17 years, n=21) had shorter "fractal" cycles compared to young adults (range: 23–25 years, n=24) (mean: 76±34 vs 94±32 min, p<0.001). 38 unmedicated patients with depression showed shorter "fractal" cycles compared to their own medicated state (92±38 min vs 107±51 min, p<0.001). 111 medicated patients showed longer "fractal" cycles compared to 109 age-matched controls (104±49 vs 88±31 min, p<0.001).

Conclusions: "Fractal" cycles are an objective, quantifiable, continuous and biologically plausible way to display sleep neural activity and its cycles, useful in healthy, pediatric and clinical populations that should be extensively studied to advance theoretical sleep research.

High-density EEG recordings in the European jackdaw (*Coloeus monedula*): sleep deprivation increases NREM sleep time and EEG power while reducing hemispheric asymmetry

S.J. van Hasselt[1], D. Martinez-Gonzales[2], G.-J. Mekenkamp[1], A.L. Vyssotski[3], S. Verhulst[1], G.J. Beckers[4], N.C. Rattenborg[2], P. Meerlo[1]
[1]University of Groningen, GELIFES, Groningen, Netherlands, [2]Max Planck Institute for Ornithology, Avian Sleep Group, Seewiesen, Germany, [3]Institute of Neuroinformatics, Zurich, Switzerland, [4]Utrecht University, Cognitive Neurobiology, Utrecht, Netherlands

Introduction: Sleep is a wide-spread phenomenon that is thought to occur in all animals. Mammals and birds have similar sleep states, yet there are large differences in sleep regulation between these taxonomic groups. One reason might be that the avian brain has a more nuclear organisation rather than the laminar mammalian brain. Yet, it is not known what the regional differences are in sleep regulation over the avian cortex. Therefore, we studied sleep architecture and sleep homeostatic responses to sleep deprivation using high-density electroencephalogram (EEG) in the European jackdaw (*Coloeus monedula*).

Materials and Methods: A total of nine young adult birds were implanted with 28 epidural electrodes and equipped with miniature data loggers for recording movement activity (accelerometery) and EEG. Individually-housed jackdaws were recorded under controlled conditions with a 12:12-h light-dark cycle. Every individual underwent two 3-day recordings that contained a 4 or 8 hour sleep deprivation starting from lights off on the second night in a randomized order.

Results: Jackdaws showed a homeostatic response to sleep deprivations of 4 and 8 hours in a dose-dependent manner for both NREM and REM sleep time. After both sleep deprivations, all 28 derivations showed a similar bi-modal increase in relative NREM sleep spectral power over a broad-range of frequencies (1.5-25 Hz) with peaks at 2.5 and 12.5 Hz. The lower frequencies were most pronounced in the posterior electrodes whereas the higher frequencies were most pronounced in the anterior electrodes. While there was little true unihemispheric sleep in the jackdaws, there was a certain degree of hemispheric asymmetry in NREM sleep EEG power during baseline, which reduced after sleep deprivation in a dose-dependent manner. This increased symmetry between the electrodes after sleep deprivation reflects that sleep need promotes synchrony in spectral EEG power between hemispheres.

Conclusions: Jackdaws have a clear homeostatic response to sleep deprivation in both sleep time and sleep EEG spectral power. Even though the entire cortex shows a relative similar response to sleep deprivation, there are regional differences in NREM sleep EEG power for certain frequencies. Importantly, the amount of lateralization was reduced during recovery. Together, this study shows the heterogeneity of the avian cortex in sleep regulation.

High-resolution evaluation of day-to-day sleep, wellbeing, and cognition in medical residents on two different night shift schedules

S.A.A. Massar[1], X.Y. Chua[1], J.L. Ong[1], C.S. Soon[1], R.L.F. Leong[1], A.S.C. Ng[1], M.W.L. Chee[1]
[1]National University of Singapore, Singapore, Singapore

Introduction: Extended work and night shifts are standard practice in the healthcare sector to ensure the delivery of continuous patient care around the clock. While necessary, such demanding work schedules put a strain on the physical and mental health of medical workers, and present a risk of cognitive failure. Different shift schedules have been created to meet the healthcare demands. Schedule type may affect day-to-day sleep, subjective wellbeing, and cognitive performance. Here, we evaluated two types of shift schedules: 1) a traditional "night-call" schedule, where residents work regular daytime hours on most days, and 24-h+ overnight shifts 5-7 times every month, 2) a "float" schedule, where residents work regular daytime hours on most weeks, intercalated with 5-7 days of consecutive night shifts, once every 2-3 months.

Materials and Methods: 96 PGY1 residents (N = 41 night-call, N = 55 float) provided sleep and activity data from a consumer sleep tracker (Oura ring), daily wellbeing ratings and cognitive performance measures through a phone app, and filled in an electronic time-use diary, for 8 weeks. Wearable and time-use data were integrated into a single sleep/wake timeseries. Daily sleep durations were calculated and compared over 12-h and 24-h periods containing either day shift work (regular days) or night shifts (night-call or float). Subjective wellbeing and cognitive performance following regular work days or night shift days were compared between schedules.

Results: Across subjects, sleep was recorded for 2471 regular shift days (per person average: M = 21.5 for night-call group [85.1% completion], 28.9 for float group [87.4% completion]) and 616 night shift days (per person average: M = 7.59 for night-call group [88.1% completion], 5.55 for float group [91% completion]). For both night-call and float residents, sleep duration within each 24-h period was shorter on night shift days as compared to regular shift days (regular M = 6.45h, night shift M = 5.94h; $p < .001$), but the difference did not differ across schedule types. The groups, however, differed on how their sleep was distributed across the day; night-call residents obtained more sleep during their night shift (8PM – 8AM; night-call M = 2.04h, float M = 0.96h; $p < .001$) as compared to float residents who obtained more sleep post-shift (8AM – 8PM; night-call M = 4.07h, float M = 5.12h; $p < .001$). Daily self-report ratings showed that participants on a night-call schedule were more sleepy and less motivated (both $p < .05$) after a night shift. Moreover, night-call participants had worse cognitive performance after their night shifts as compared to float residents (vigilance and working memory tasks; both $p < .01$).

Conclusions: High-resolution tracking of day-to-day sleep, wellbeing, and cognition demonstrated a marked differential distribution of sleep over the day for medical residents on a night-call versus a float schedule. Night calls were accompanied by higher levels of sleepiness, lower levels of motivation, and poorer cognitive performance.

Hippocampal neurons change spike rates before the episodes of central sleep apnea

A. Limanskaya[1], E. Levichkina[1,2], I. Pigarev[1]
[1]IITP RAS, Moscow, Russian Federation, [2]The University of Melbourne, Melbourne, Australia

Introduction: Breathing is under control of respiratory centers in the brainstem and higher order structures such as amygdala, hypothalamus, hippocampus. They provide autonomic breathing regulation during sleep and allow conscious control of breathing during wakefulness. Central sleep apnea (CA) is the absence of breathing during sleep for a minimum of 3 breathing cycles, caused by a command from the breathing center to the thoracoabdominal muscles. CA is common for healthy people and animals as well as in some diseases. As hippocampus is heavily influenced by breathing but is also capable of changing breathing patterns, we hypothesized that hippocampus can be involved in triggering or influencing CA. In this case its cells are expected to change their activity before apnea episodes.

Materials and methods: Cats have natural episodes of CA, therefore we performed chronic recordings of neuronal activity from dorsal hippocampal areas in 2 adult cats during sleep/wake cycles. EEG, ECG, eye movements, air flow and thoracic respiratory muscles movements were also registered. Spiking activity was analysed individually for every neuron as well as for multi unit activity (MUA) to observe apnea-associated changes. We compared spike rates in sixty 100 ms intervals (6 s) before apnea onsets to the spike rates in all 100 ms intervals recorded in the same stage of sleep as the apnea (baseline spike rate). The same analysis was performed for the intervals during and after apnea. Wilcoxon rank sum test was used for this analysis.

Results: We observed 54 episodes of central apnea in two cats and analysed activity of 180 neurons. Most episodes (26) of CA occurred during transition from slow wave sleep (SWS) to rapid eye movement (REM) sleep, 20 during the transition from REM to SWS, 8 in REM sleep and only 2 in SWS. 56 cells reliably changed their activity before apnea and 29 cells - after apnea episodes. 14 of these cells changed activity both before and after CA episodes. 27 out of 56 cells were less active before CA and 29 were more active before apnea in comparison to baseline sleep. All cells were less active after apnea then during sleep. MUA had apnea-associated changes in 30 out of 50 cases before and in 21 cases after apnea episodes.

Conclusions: The timeline of neuronal responses suggests that hippocampal activity represents a part of the command necessary to initiate central sleep apnea, or even coordinates this process.

Histamine and sleep/wake changes with wake modulatory compounds in mice

C.G. Hviid[1,2], G. Sørensen[1], B.R. Kornum[2], K.F. Herrik[1]
[1]H. Lundbeck A/S, Department of Circuit Biology, Copenhagen, Denmark, [2]University of Copenhagen, Department of Neuroscience, Copenhagen, Denmark

Introduction: Histamine (HA) plays a crucial role in the regulation of sleep-wake cycles. However, the underlying mechanism behind this regulation remains unknown. By studying how histamine (HA) release is modulated by wake-inducing compounds, we can understand its role in controlling sleep/wake cycles better. We investigated the wake-inducing compounds TAK-925 (Orexin receptor 2 (OxR2) agonist), pitolisant (histamine-3 receptor antagonist/inverse agonist) and modafinil (dopamine transporter/norepinephrine transporter activator) as well as the sleep-inducing compounds MK-8133 (Ox2R antagonist) and Lu AF11167 (phosphodiesterase 10 inhibitor). We evaluated modulation of histamine (HA) release and sleep/wake behavioral changes in wild-type mice in the acute phase after treatment with these drugs.

Materials and methods: We implanted male C57Bl/6JCrl mice with microdialysis probes targeting the HA in hypothalamus or PFC. Microdialysis samples were collected in 20 min intervals and analysed for HA levels using liquid-chromatography mass spectrometry (LC-MS). In another cohort of male mice, we implanted electrodes for electroencephalography (EEG), electromyography and added a head-mounted accelerometer. Recordings were performed in the light phase (inactive period). The mice were administered a wake-modulatory compound or vehicle during the EEG recordings. We analysed the data in Somnivore and MATLAB for changes in sleep/wake states.

Results: TAK-925 (20 mg/kg) increased HA levels in hypothalamus and PFC. This increase could be reversed by administration of MK-8133 (20 mg/kg TAK-925 + 0.3 mg/kg MK-8133). TAK-925 (0.3, 3 and 10 mg/kg) increased locomotion and wake and TAK-925 (10 mg/kg) reduced NREM and REM. Pitolisant (10 and 20 mg/kg) increased HA levels in hypothalamus. However, pitolisant (1, 3, 10 mg/kg) exerted no significant effect on locomotion or sleep/wake states. Modafinil (16 and 32 mg/kg) had no effect on HA levels in hypothalamus however, 64 mg/kg Modafinil kept the mice awake and hyperactive for 4 h. Modafinil (16, 32, 64 mg/kg) increased wake and suppressed NREM and REM. MK-8133 (3, 10, 30 mg/kg) reduced locomotion and wake, but NREM or REM was not increased significantly. Lu AF11167 (0.3, 1, 3 mg/kg) reduced locomotion and wake and increased NREM.

Conclusion: Wake-promoting effects can be achieved through various compounds regardless of whether they increase histamine release. Both orexin agonists and antagonists influence wakefulness and histamine release. Additionally, compounds like modafinil can modulate wakefulness without impacting histamine release.

Influence of acceptance of continuous positive airway pressure on 90-day adherence among patients with moderate-severe obstructive sleep apnea: a cohort study

Y.-W. Wu[1], Y.-C. Chen[2,3], S.-S. Pan[4], C.-Y. Lin[4]
[1]Taichung Veterans General Hospital, Nursing, Taichung, Taiwan, [2]College of Medicine, National Cheng Kung University, Department of Nursing, Tainan, Taiwan, [3]National Cheng Kung University Hospital, Department of Nursing, Tainan, Taiwan, [4]National Cheng Kung University Hospital, Otolaryngology, Tainan, Taiwan

Introduction: Continuous positive airway pressure (CPAP) therapy is the gold standard for treatment of obstructive sleep apnea (OSA), and has been proven to improve daytime sleepiness, cognitive performance, and cardiovascular system. However, poor adherence to its use has regularly been observed and predictors of CPAP use are largely based on the Western population. The study aimed to investigate acceptance and adherence of CPAP rates and identify the influence of acceptance of CPAP on 90-day adherence to CPAP among moderate and severe OSA patients.

Materials and methods: The study used a retrospective cohort design. The inclusion criteria were an age of 20 years or older, diagnosis with moderate to severe OSA (defined as an Apnea Hypopnea Index [AHI] of more than 15 events per hour) treated with CPAP following polysomnography (PSG), and willingness to receive CPAP treatment. Acceptance was defined as CPAP use for at least 4 hours on at least 70% of the nights during the first 14 days of treatment, and adherence was defined as the same CPAP use of at least 4 hours on at least 70% of nights for 90 days. The influence of acceptance of CPAP on 90-day adherence to CPAP were analyzed by multiple logistic regression.

Results: A total of 618 patients with OSA were diagnosed during the study period (2020–2022), of whom 294 were included in the study. The median age was 47.74 years, 83.3% of the sample were men, and the median AHI was 50.48 events per hour during the baseline sleep study. During the first 14 days, 256 out of the 294 patients (87.1%) were accepted with CPAP. At the 90-day follow-up, 220 of the remaining 293 (75.1%) participants had persisted with treatment. A higher BMI (AOR= 0.65, 95% CI:0.50-0.86, p= 0.002) and who experienced less snoring (AOR= 1.05, 95% CI:1.02-1.09, p= 0.002), shared a bed with a partner (AOR= 3.00, 95% CI:1.17-7.70, p= 0.023), had anxiety improvement as measured by the hospital's anxiety and depression scale (AOR= 1.25, 95% CI:1.00-1.56, p= 0.046), and initially good acceptance of CPAP (AOR= 3.29, 95% CI:1.00-10.28, p= 0.049) were more likely to have regular adherence to CPAP.

Conclusions: The present study demonstrates a significant high-positive correlation between acceptance and 90-day adherence to CPAP. It is recommended that the patient's family be invited to support initial use of CPAP and keep tracking the patient's body weight. Establishing an alliance with the patient to support and improve their adherence to CPAP treatment in the cases of patients with anxiety and snoring problems and of patients with low CPAP acceptance levels is particularly advised.

Isoflurane exposure causes delayed NREM sleep rebound and when preceded by sleep deprivation causes delayed disruption of REM sleep

L. Joyce[1], V. Meedt[1], C. Carrillo Mas[1], M. Kreuzer[1], G. Schneider[1], T. Fenzl[1]
[1]Technical University Munich, Clinic for Anesthesiology and Intensive Care, Munich, Germany

Introduction: Isoflurane anesthesia is thought to compensate for NREM sleep (NREMS) requirement and not REM sleep (REMS) requirement inducing post-anesthetic REMS rebound. Sleep deprivation builds a homeostatic sleep pressure resulting in NREMS and REMS rebound during recovery sleep. Clinical settings prior to an upcoming surgery potentially lead to impaired sleep behavior similar to sleep deprivation. The combination of such a pre-anesthetic sleep load together with the sleep-related rebound effects after isoflurane anesthesia may cause complex post-anesthetic sleep impairments. The present study investigates such combined homeostatic effects on prolonged post-anesthetic sleep.

Materials and Methods: Neuronal EEG activities were recorded in freely behaving mice at baseline conditions, during isoflurane exposure (general anesthesia: GA, 90 mins), during isoflurane exposure preceded by sleep deprivation (SD, 6 hours; gentle handling) and during post-anesthetic sleep/wake behavior for 3 consecutive days. EEG-recordings were analyzed at temporal and spectral level and statistically compared along the experimental timeline.

Results: : Irrespective of the preceding sleep pressure (GA or SD), delayed post-anesthetic effects of isoflurane on recovery sleep including NREMS rebound, REMS rebound and decreased wakefulness were present mostly during the dark period in nocturnal mice. These effects were amplified when the homeostatic load was increased (GA and SD), leading to a decrease in REMS proportions after the recovery from the REMS rebound. This delayed REMS decline was associated with a reduced theta power and an increased delta power during REMS.

Conclusions: Delayed NREMS rebound following GA suggests that isoflurane may not or only partly substitutes for natural NREMS during prolonged recovery sleep. The study also reveals that the isoflurane exposure preceded by SD causes a delayed and potentially prolonged disruption of REMS. Pre-operative sleep impairments may facilitate sole GA-induced effects on extended post-operative recovery.

K-complex and heart rate dynamics during varying arousal levels in human NREM sleep

M. Carro-Domínguez[1], S. Huwiler[1], S. Oberlin[1], T.L. Oesch[1], G. Badii[2], A. Lüthi[3], N. Wenderoth[1,4,5], S. Meissner[1], C. Lustenberger[1,5,6]
[1]ETH Zurich / Institute of Human Movement Sciences and Sport, Department of Health Sciences and Technology, Zurich, Switzerland, [2]FMH Ophthalmology, Zurich, Switzerland, [3]University of Lausanne, Department of Fundamental Neurosciences, Lausanne, Switzerland, [4]Future Health Technologies, Singapore-ETH Center, Campus for Research Excellence and Technological Enterprise (CREATE), Singapore, Singapore, [5]University of Zurich, Neuroscience Center Zurich (ZNZ), Zurich, Switzerland, [6]University of Zurich, Center of Competence Sleep & Health Zurich, Zurich, Switzerland

Introduction: K-complexes are a prominent characteristic of NREM sleep stage N2 which may reflect an arousal response or, paradoxically, sleep promotion in the form of synchronised changes in excitability across the cortex. K-complexes have been investigated from an autonomic nervous system (ANS) perspective where they are associated with temporary increases in autonomic activity. We aimed to further elucidate their role in varying arousal levels during sleep by investigating their occurrence relative to (i) infraslow fluctuations (ISFs) in sigma power (12-16Hz), a proposed marker for variations in arousal levels during NREM sleep, and (ii) heart rate fluctuations, indicating ANS activity.

Methods: 17 healthy participants (10 females, 21-46 years of age) underwent one night in the sleep lab where polysomnography and ECG were recorded. K-complexes were visually inspected in the Fpz electrode using AASM guidelines and were marked when they occurred in isolation during N2. ISFs were detected by lowpass filtering Cz sigma power during N2 and applying a peak detection approach. The timing of heart rate fluctuations and K-complex occurrence during ISFs were renormalised to the troughs of each ISF.

Results: K-complexes were more likely to occur during the rise of arousal levels in ISFs than during the fall. K-complexes were also accompanied by temporary fluctuations in heart rate. A cross-correlation analysis between sigma power during ISFs (source) and heart rate revealed a delay of heart rate fluctuations with respect to sigma power (max. R=0.26 at a -6% ISF cycle lag).

Conclusions: The systematic relationship of heart rate changes and K-complexes to ISFs in N2 points toward varying autonomic levels and likelihoods of K-complex occurrence during fluctuating arousal levels. Characterising K-complexes and the corresponding autonomic activity at times of varying levels of arousal may help further elucidate when these changes in cortical excitability may reflect arousal or sleep promoting mechanisms.

Knowledge about sleep-wake cycle and chronobiology by medicine students in Brazil

J.B. Reis[1], Y.C. Novais[1], E.K. Tamura[1]
[1]State University of Santa Cruz, Health Sciences, Ilhéus, Brazil

Introduction: Chronobiology is a discipline that studies the ability of organisms to express their behaviors and control their physiology in a periodic manner known as biological rhythms. Sleep Medicine and Chronobiology directly interact with population health. In this sense, the aim of this work was to investigate the teaching of these disciplines in Brazilian medical schools and assess the actual knowledge of medical students during their internships in these areas.

Materials and methods: The research was conducted through online forms (Google Forms) with a questionnaire comprising sociodemographic data and also questions related to sleep-wake cycle, and others human circadian rhythms, as well as questions about the influence of substance use and the impact of work schedules on sleep habits. The questionnaires were directed to students in their final two years of study (internship cycle) in medical institutions across all territories in Brazil. Data collection was conducted between December 2021 and June 2022. Ethical approval was obtained from the State University of Santa Cruz ethics committee (CAE: 52462921.0.0000.5526). Furthermore, the IBM SPSS (v20) was used to analyze the variables through regression analysis and descriptive statistics in order to compare the collected information.

Results: In total, 241 responses were obtained from participants of 96 educational institutions across the country. The average individual score for the 10 questions related to chronobiology or sleep medicine of the participants was 80.00% ± 10.8% (range 50-100%). A total of 129 students (53.5%) answered 80% or more questions correctly, while 112 (46.5%) did not. The regression analysis showed that answering ≥ 80% of the chronobiology questions correctly was not associated with the age or gender of the students, neither with the characteristics of the medical school (Brazilian region and public/private). However, it was significantly more prevalent in individuals who had contact with chronobiology or sleep medicine disciplines during all three cycles of their undergraduation course (basic, clinical, and internship), compared to students who did not have academic contact or only had it during one or two cycles. Additionally, it was significantly associated with students who had specific contact with disciplines during the internship cycle, compared to students who did not have this academic experience.

Discussion: The results indicate a distribution of Chronobiology and Sleep Medicine content throughout the undergraduate programs of Brazilian medical schools. Moreover, most of the interviewees acquired more knowledge in the field when exposed to the subject in disciplines at all the stages of their university education. Within this group, there was the greatest discrepancy in the number of correct answers compared to students who had contact in 1 or 2 stages or those who had no contact at all.

Conclusions: The results so far demonstrate a moderate level of knowledge regarding biological rhythms and provide perspectives for further studies on this subject that could serve as a basis for increased attention to this branch of science, which is of great relevance to the practice of medical professionals.

Medical University – Varna's traditions in celebrating World Sleep Day

M. Milkov[1], M. Stoykov[1], S. Peev[1], S. Baycheva[2], G. Georgieva[1], D. Petrova[3], P. Petrov[4], M. Petrova[4], R. Tiholov[5], M. Enchev[1], M. Milkova[6], J. Kostadinov[7]
[1]Medical University "Prof. Dr. Paraskev Stoyanov", University Medical and Dental Center, Faculty of Dental Medicine, Varna, Bulgaria, [2]Medical University "Prof. Dr. Paraskev Stoyanov", Faculty of Dental Medicine, Varna, Bulgaria, [3]Medical University "Prof. Dr. Paraskev Stoyanov", Specialized Eye Hospital for Active Treatment, Varna, Bulgaria, [4]Medical Center 'Avicena', Sofia, Bulgaria, [5]Multiprofile Hospital for Active Treatment 'Kozloduy', Kozloduy, Bulgaria, [6]Eye Clinic St. Petka - Varna, Varna, Bulgaria, [7]Medical University - Varna, Varna, Bulgaria

Introduction: World Sleep Day is organized by the World Sleep Day Committee of the World Sleep Society. World Sleep Society was founded in 2008, in collaboration with World Association of Sleep Medicine (WASM). World Sleep Day was first celebrated worldwide in 2008. Medical University "Prof. Dr. Paraskev Stoyanov" – Varna, Bulgaria has had long traditions in organizing the stated event, which date back to 2016. In 2023, the event was organized for the 7th consecutive time. All activities, organized by Medical University - Varna were reported on the official website of the event as usual. They include: organizing early multidisciplinary, international symposiums, free prophylactic sleep check-ups for sleep disturbances and obstructive sleep apnea, students' elective disciplines, participations in national and local television interviews, newspapers publications, pajama party, educational lectures for the society, swimming marathons, etc.
The aim of this paper was to report the most frequent clinical findings organizers of the events come across.
Materials and methods: More than 100 patients were enrolled in 2023 edition of the World Sleep Day activities, under the prophylactic campaign branch. Individuals, who visited the "Audio-vestibular and sleep medicine" sector of University medical and dental center, Faculty of Dental medicine, Medical University – Varna, were between 18 and 65 years of age. Males were more than females (60:40%). All completed specialized questionnaires – Berlin questionnaire, Epworth Sleepiness Scale, and a special questionnaire, designed by the team, working in the Sector. All participants filled in written informed consent forms. Thorough clinical and dental examinations were executed, implementing the method of HSAT (polygraphy testing) and rhinomanometry.
Results: The results obtained from the prophylactic campaign once again confirm that obstructive sleep apnea diagnosis is still not of adequate level in the country. More frequently severe forms of obstructive sleep apnea were diagnosed and their count was more in the male population. Patients tend to lack knowledge in the field of sleep apnea comorbidities, healthy and quality lifestyle.
Conclusions: Patients' knowledge in the field of obstructive sleep apnea and snoring syndrome should be raised. Prophylactic and educational campaigns, television and newspapers interviews, lectures for the society definitely help in educating individuals. Legislative measures promoting those activities can raise awareness about the detrimental effects of sleep apnea on the human organism.

Midbrain raphe-hypothalamic serotonergic pathway influences REM sleep by glia-mediated energy metabolism and dendritic upscaling

B. Sharma[1], A. Roy[2], M. Tripathi[3], J. Banerjee[4], A. Singh[5], T.C. Nag[5], R.K. Netam[1], N. Akhtar[1], S. Jain[1], H.N. Mallick[6]
[1]All India Institute of Medical Sciences, Physiology, New Delhi, India, [2]Interdisciplinary Institute of Neurosciences, Univ. of Bordeaux, Department of Center for Broca Nouvelle-Acquintaine, Bordeaux, France, [3]All India Institute of Medical Sciences, Neurology, New Delhi, India, [4]All India Institute of Medical Sciences, Biophysics, New Delhi, India, [5]All India Institute of Medical Sciences, Anatomy, New Delhi, India, [6]Shree Guru Gobind Singh Tricentenary University, Physiology, Gurugram, India

Introduction: Neurons of supraoptic nucleus i.e. magnocellular neurosecretory cells (MNC) are known to be associated with paradoxical or REM sleep. These neurons receive serotonergic inputs from raphe, furthermore these cells interactively crosstalk to glia present in the vicinity. Effect of REM sleep deprivation on the interaction between MNCs and glia are elusive. Therefore, in the present study, we examined the effects of 24 hr REM sleep deprivation (SD) on dendritic arborization, glial architecture of supraoptic nucleus.

Materials and Methods: The study was conducted as per the guidelines of the Institutional Animal Ethics Committee (960/IAEC/16).Total 18 rats were randomly divided into three groups: Control, 24hr sleep deprivation (SD), 24hr recovery sleep (Rec). After 24hr sleep deprivation using modified multiple platform method animals were sacrificed and tissues were collected and processed either for GFAP, IBA1, mt-COX and Golgi-Cox staining or serotonin measurement using ELISA.

Results: We have observed ($4.3 \pm 0.9\%$ to $0.3 \pm 0.1\%$) reduction in the REM sleep on 24h paradoxical sleep deprivation. Immunofluorescence imaging showed increase in number and intensity of microglial and astrocyte markers in SD as compared to other counterparts. Sholl analysis exhibited a significant increase in the number of intersections, bifurcations and length after 24hr SD as compared to Control and Recovery sleep. Further, mt-COX positive cell density was found to be increase in SD group as compared to Control and 24hr recovery. Serotonin was found to be significantly increased upon 24hr SD ($p<.01$) as compared to control group of animals in the hypothalamic homogenate well serum samples.

Conclusions: Hence, present findings suggest that sleep debt can alter dendritic plasticity mnc through remodelling energy metabolism supraoptic nucleus via glia-mitochondrial cyclooxygenase pathway. Further, we speculate these changes are plausibly due serotonergic stimulation from raphe nucleus.

Modafinil-induced wakefulness exhibits heightened alertness in the cat

A. Costa[1], D. Mateo[2,3,4], C. Pascovich[1,5], S. Castro[1], V. Bisagno[6,4], F.J. Urbano[7,4], P. Torterolo[1]
[1]Universidad de la República, Facultad de Medicina, Unidad Académica de Fisiología, Montevideo, Uruguay, [2]Universidad Autónoma de Entre Ríos (UADER), Faculty of Science and Technology, Entre Ríos, Argentina, [3]Instituto de Matemática Aplicada del Litoral (IMAL-CONICET-UNL), CCT CONICET, Santa Fe, Argentina, [4]Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Buenos Aires, Argentina, [5]University of Cambridge, Department of Psychology, Cambdrige, United Kingdom, [6]Universidad Austral, Instituto de Investigaciones en Medicina Traslacional (IIMT), CONICET, Buenos Aires, Argentina, [7]Universidad de Buenos Aires, Instituto de Fisiología, Facultad de Ciencias Exactas, Buenos Aires, Argentina

Introduction: Persistent declines in vigilance linked to narcolepsy, aging, circadian disruptions, and societal demands have substantial health repercussions. Modafinil (MOD), a wake-promoting psychostimulant, addresses these concerns. MOD's approval for narcolepsy, hypersomnia, shift work sleep disorder, and cognitive deficits attests to its efficacy. Noteworthy are MOD's effects on adrenergic, histaminergic, serotonergic, and dopaminergic pathways, glutamate transmission, and GABA attenuation, impacting cognitive domains, glucose metabolism, and memory. Interestingly, MOD's cognitive enhancement extends beyond therapeutic contexts, encompassing the healthy population. The objective of this study was to comprehensively characterize the wakefulness induced by modafinil in an experimental cat model.

Materials and Methods: We conducted semi-restrictive polysomnographic recordings in cats to investigate the effects of modafinil on wakefulness. Electrodes were chronically implanted for electrocortical monitoring. Polysomnographic recordings were obtained during both modafinil (5mg/kg oral administration) and control (empty capsule) conditions.

Results: Our findings revealed that modafinil administration led to a sustained wakefulness state. The mean time spent in wakefulness per hour of recording significantly increased from 2057.8 ± 299.7 SEM in controls to 3564.6 seconds ± 155 in the modafinil group (p < 0.001). Additionally, the total time spent in wakefulness significantly increased from 8231 seconds ± 1208.2 SE in control conditions, to 14258.5 seconds ± 622.8 SE (p < 0.001), representing more than 90% of the recording time.

To evaluate the extent of alertness attained during modafinil-induced wakefulness, we devised an alertness index (AI), which was calculated as the ratio between low gamma (30-45Hz) and theta (5-8 Hz) frequency bands. The selection of these frequency bands was guided by previous findings from our laboratory, which demonstrated that low gamma frequency oscillations (30-45Hz) are indicative of heightened alert wakefulness in cats. In contrast, cortical theta activity (5-8 Hz) has been shown to correlate with a state of quiet wakefulness.

Our investigation unveiled that modafinil-induced wakefulness was characterized by a significantly elevated AI in both the neocortex (AI: 2.04 ± 0.05 SEM) and the thalamus (AI: 1.57 ± 0.55 SEM) in comparison to control conditions. Particularly, control conditions exhibited lower AI values, with the neocortex registering at 1.64 ± 0.04 SEM and the thalamus at 1.24 ± 0.54 SEM (p < 0.001 for both comparisons). This distinctive pattern of augmented AI values in modafinil-induced wakefulness suggests a heightened engagement of these brain regions in cognitive processing mechanisms. Importantly, this discernible effect was evident from the initial hour of modafinil treatment and demonstrated a progressive intensification with successive administrations (data to be provided). Collectively, these findings highlight the capacity of modafinil to induce wakefulness, a state of elevated alertness, particularly evident through the AI assessment in both the neocortex and thalamus.

Conclusions: Our study provides comprehensive insights into the wakefulness-promoting effects of modafinil in the cat. These results demonstrate that modafinil-induced wakefulness is associated with increased alertness, particularly in the neocortex and thalamus. This study contributes to the understanding of modafinil's potential for promoting sustained wakefulness with heightened alertness. Such insights are relevant for individuals facing challenges of maintaining attention and vigilance, including those with sleep disorders or demanding cognitive tasks.

Modafinil's impact on gamma band activity: a preliminary study

M. Mendoza[1], P. Torterolo[1], V. Bisagno[2,3], F.J. Urbano[4,2], A. Costa[1]
[1]Universidad de la República/Facultad de Medicina, Departamento de Fisiología/Laboratorio de Neurobiología del Sueño, Montevideo, Uruguay, [2]Consejo Nacional de Investigaciones Científicas y Técnicas, Buenos Aires, Argentina, [3]Instituto de Investigaciones en Medicina Traslacional/ Universidad Austral, Buenos Aires, Argentina, [4]Instituto de Fisiología, Biología Molecular y Neurociencias, Facultad de Ciencias Exactas-UBA, Buenos AIres, Argentina

Introduction: The sleep-wake cycle is a well-known variation in cortical activity, comprising three distinct states: wakefulness (W), non-rapid eye movement (NREM) sleep, and rapid eye movement (REM) sleep, each characterized by distinct electrophysiological and behavioral features. One kind of electroencephalographic activity during W is gamma band activity (30-100 Hz), an oscillatory phenomenon associated with cognitive functions such as attention and memory. Our research group previously demonstrated that during W, cortical neuronal populations display higher coherence in the gamma frequency band while it diminishes during sleep.
Modafinil (MOD) is a drug originally developed for the treatment of central disorders of hyper-somnolence such as narcolepsy, but its use expanded to other sleep medical conditions. We seek to examine how MOD, a compound renowned for its potential vigilance-promoting and cognitive-enhancing effects, may impact cortical oscillations, with a specific focus on the Gamma frequency band, closely linked to cognitive function. Our working hypothesis is that MOD administration will lead to heightened gamma band activity (power and coherence).
Materials and Methods: To test our hypothesis, we conducted 6-hour polysomnographic recordings at the beginning of light phase in freely moving conditions in three rats implanted with electrodes on several cortical regions. Animals received 200 mg/kg MOD or its vehicle (oral administration via gavage) just prior to the recordings. Firstly, we quantified the time spent in W and the EEG power of the gamma frequency band via fast Fourier transform.
Results: Our results confirm that in our experimental conditions modafinil administration yielded consolidated W, with a significant increase in W time. This effect was higher during the second and third hour of the recordings (percentage of time spent in W: at the second hour: 90 ± 14 vs 40 ± 34, at the third hour: 89 ± 13 vs 26 ± 18; mean ± SD, MOD vs control respectively). Secondly, our results show an increase in the power of the gamma band activity relative to the total power in bands (0.18% ± 0.06% vs 0.04% ± 0.03%; mean ± SD, MOD vs control respectively). These preliminary results provide empirical support for modafinil's potential involvement in promoting cognitive engagement through its modulation of gamma-band oscillations.
Keywords: Modafinil, wakefulness, gamma band, cognitive enhancement

Neural signals of predictive codes in sleep: implicit grammar learning in a full night E/MEG study

P. Topalidis[1], M. Wislowska[1], M. Schabus[1]
[1]Salzburg University, Psychology, Salzburg, Austria

Introduction: The ability of the human brain to rapidly extract the underlying rules of seemingly random information is considered fundamental. Such ability to learn the statistical relationship between adjacent perceptual signals has been well documented in language processing literature. Here, we look for predictive signals in the human brain during sleep using a grammar learning paradigm in a full night EEG/MEG study.

Materials and Methods: 18 participants implicitly learned grammatical rules underlying an auditory sequence of syllables stimuli on DAY 1 and were subsequently re-exposed to the same stimuli 2 days later before going to bed (passive listening) as well during overnight sleep, while simultaneous Electroencephalography (EEG) and Magnetoencephalography (MEG) were recorded. We used an auditory grammar learning task that consisted of random and predictable syllable pairs. We searched for predictive signals looking at event-related potentials (ERPs), prestimulus time-frequencies/induced responses, as well as stimulus decodability using multivariate pattern analysis (MVPA). Cluster-based permutation was used to statically compared our conditions across all methods.

Results: Although the event-related responses between amplitudes of the random and predictable syllables could not be differentiated, predictable syllables were characterised by lower prestimulus beta activity (15-30) during learning (DAY 1), but higher beta activity during subsequent passive listening as well as during light sleep (DAY 3). Using MVPA we found that the brain distinguishes random from predictable syllables in N1 and N2 but not in N3 and REM Sleep.

Conclusions: The results suggest that predictive signals are restricted in light sleep.

Non-invasive detection of narcolepsy type I phenotypical features and disease progression by continuous homecage monitoring of activity in two mouse models: the HCRT-KO and DTA model

L. Rose[1], L. Piilgaard[1], J.L Justinussen[1], C.G. Hviid[1], R. Lemcke[1], P. Wellendorph[1], B.R. Kornum[1]
[1]University of Copenhagen, Department of Neuroscience, Copenhagen, Denmark

Introduction: Narcolepsy type I (NT1) is a chronic disorder caused by disruption of hypocretin signaling in the brain. Patients and mouse models of NT1 show fragmented sleep/wake states and cataplexy among other symptoms. Electroencephalography and electromyography (EEG/EMG) measurements are used to examine sleep/wake behavior for identification of the NT1 phenotype in mice. Although EEG/EMG is widely used, it is a very time-consuming procedure and requires invasive surgery. The Digital Ventilated Cage (DVC) framework is a non-invasively system that allows for continuous measurement of locomotor activity in a home-cage environment. We here explore how the DVC system can serve as an alternative to EEG/EMG measurements for detecting narcolepsy in two mouse models: the HCRT-KO and the DTA Model.

Materials and Methods: The DVC framework consist of a cage and a sensor board. The sensor board is located underneath the cage and is composed of 12 electrodes. The electrodes measure electrical capacitance changes four times pr. second. Based on the capacitance changes, it is possible to obtain weighted X-Y positions of the mouse and the locomotor activity. In this study we have used the weighted X-Y position to develop an automatic nest detector, which was validated against manually identified nest locations in eight mice. The automatic nest detector makes it possible to use inactivity-in-nest as a proxy for sleep and inactivity-out-of-nest, activity-in-nest, and activity-out-of-nest as a proxy for wakefulness. To validate these sleep/wake states from the nest identifier, we correlated the states with sleep/wake behavior from EEG/EMG measurements. We further used the locomotor activity to examine the activity distribution, activity transitions, activity duration, and activity maintenance score to distinguish WT (littermates, c57/B6 background) mice (n=43), HCRT-KO mice (n=51) and DTA mice (n=17) from each other.

Results: We found a significant correlation between the duration of the sleep/wake states identified with the nest detector and the sleep/wake behavior from the EEG/EMG measurements. This indicates that the non-invasive DVC framework has the potential to facilitate faster evaluation of sleep studies on a large-scale. Furthermore, we compared the activity features activity distribution, state transitions, duration, and activity maintenance score between mice models. We here found that WT exhibit a characteristic three-peak activity pattern during dark phase which was disturbed in both HCRT-KO mice and DTA mice. It was further shown that neither DTA nor HCRT-KO mice could sustain long periods of activity indicating lack of stable wakefulness. HCRT-KO and DTA mice showed significant more transitions and shorter duration of activity states compared to WT. The activity maintenance score was further significantly reduced in DTA and HCRT-KO mice, indicating that the mice spent less time in activity episodes lasting more than 32 min and/or more time in inactivity episodes less than 8 min.

Conclusions: We here show that the DVC framework may serve as a fast and non-invasive approach to distinguish between WT and NT1 mice through activity metrics.

Noribogaine effects on wakefulness and sleep

J.P. Castro[1], D. Serantes[1], P. Rodriguez[2], B. Gonzalez[2], I. Carrera[2], P. Torterolo[1], J. Gonzalez[1]
[1]Facultad de Medicina, Montevideo, Uruguay, [2]Facultad de Quimica, Montevideo, Uruguay

Ibogaine is a potent atypical psychedelic that has gained considerable attention due to its antiaddictive and antidepressant properties in preclinical and clinical studies. Previous research from our group showed that ibogaine suppresses sleep and produces an altered wakefulness state which resembles natural REM sleep. However, after systemic administration, ibogaine is rapidly metabolized to noribogaine, which also shows antiaddictive effects and a distinct pharmacological profile, making this drug a promising therapeutic candidate. Therefore, whether the sleep/wake alterations depend on ibogaine or its principal metabolite noribogaine remains unknown. To answer this question, we conducted polysomnographic recordings in rats following the administration of pure noribogaine. Our results show that noribogaine promotes wakefulness while reducing slow-wave sleep and blocking REM sleep. Thus, like ibogaine, noribogaine significantly alters the sleep-wake architecture, highlighting the possible role of serotonin reuptake inhibition as a likely candidate underlying the wake-promoting and REM sleep-suppressing effects.

Phase-targeted auditory stimulation during sleep to boost cross-frequency coupling between slow waves and spindles in children with ADHD

E. Krugliakova[1], C. Volk[1], N. Birnbaum[1], D.M. Gutjahr[1], M. Gerstenberg[1], M.L. Ferster[2], G. Da Poian[2], W. Karlen[2,3], V. Jaramillo[1], R. Huber[4,5]
[1]University Children's Hospital Zurich, University of Zurich, Children's Research Center, Zurich, Switzerland, [2]ETH Zurich, Mobile Health Systems Lab, Institute for Robotics and Intelligent Systems, Department of Health Sciences and Technology, Zurich, Switzerland, [3]University of Ulm, Institute of Biomedical Engineering, Ulm, Germany, [4]University Children's Hospital Zurich, Children's Research Center, Zurich, Switzerland, [5]Psychiatric Hospital, University of Zurich, Department of Child and Adolescent Psychiatry and Psychotherapy, Zurich, Switzerland

Introduction: Healthy non-rapid eye movement (NREM) sleep is important for attentional and memory performance, which is often impaired in children with attention-deficit hyperactivity disorder (ADHD). Two dominant electrophysiological features of NREM sleep, slow waves (0.5-4 Hz) and spindles (9-16 Hz), are both believed to contribute to memory consolidation and attentional performance. According to recent findings, not only isolated instances of these events but also their temporal coordination – a phenomenon known as cross-frequency coupling – facilitates memory consolidation (Staresina et al., 2015). Phase-targeted auditory stimulation (PTAS) can be used to boost both slow waves and spindles, and their coupling (Krugliakova et al., 2020). In this study, we tested whether (1) PTAS might enhance coupling in children with ADHD, and (2) the effects of PTAS are associated with overnight memory consolidation and attentional performance.

Materials and methods: We collected sleep hd-EEG data of 16 children with ADHD (11±1.3 years; 6 children not medicated). Two conditions separated by 1 week were carried out: (1) non-stimulation (SHAM) and (2) up-PTAS (STIM) of the slow waves detected over the right prefrontal area. During the stimulation, pink (1/f) noise pulses (50 ms, 50 dB) were delivered in 6-s blocks (ON-windows), followed by a 6-s pause (OFF-windows). Coupling strength between the phase of slow slow waves (1-2 Hz) and spindles (9-11 Hz) was assessed with the normalized modulation index (Tort et al., 2010), separately for STIM-ON, STIM-OFF, SHAM-ON and SHAM-OFF. Before and after sleep participants performed a word-pair memory task and a reaction time test (a readout of attentional performance).

Results: PTAS resulted in a boost of slow-wave-spindle coupling in fronto-central regions during ON windows as compared to OFF windows (contrast STIM-ON vs SHAM-ON, cluster corrected $p<0.02$). The PTAS-driven increase of coupling was positively correlated with baseline coupling strength. There was no significant PTAS-dependent change in memory and attentional performance. The boost of coupling in the right prefrontal area was positively correlated with memory consolidation (Rho=0.7, p=0.03) and negatively with the standard deviation of reaction times (Rho=-0.5, p=0.04).

Conclusions: Supporting previous findings, our results suggest that PTAS can not only enhance coupling in adults (Krugliakova et al., 2020) but also in children. The dependence of the boost in PTAS-driven coupling on the baseline coupling levels suggests that the PTAS effect is achieved by engaging the existing neural circuits. Whether boosting slow-wave spindle coupling by PTAS can improve overnight memory consolidation and attentional performance beyond their baseline level needs to be determined in future studies. Moreover, which PTAS parameter is critical to do so is unknown, and confounding factors (e.g., motivation) need to be considered.

Phenotypic interindividual differences in the dynamic structure of sleep in healthy young adults

A. Kishi[1], H.P.A. Van Dongen[2,3]
[1]The University of Tokyo, Graduate School of Medicine, Tokyo, Japan, [2]Washington State University, Sleep and Performance Research Center, Spokane, United States, [3]Washington State University, Department of Translational Medicine and Physiology, Spokane, United States

Introduction: Evaluating the dynamic structure of sleep may yield new insights into the mechanisms underlying human sleep physiology. Here we studied whether interindividual differences in aspects of the dynamic structure of sleep – specifically sleep stage transitions and NREM/REM sleep cycles – are phenotypic, and whether and how sleep stage transitions within non-rapid eye movement (NREM) sleep are associated with NREM/REM sleep cycles.

Methods: N=17 healthy young adults (aged 28.6 ± 5.7 years; 9 females) participated in a 12-day, 11-night, strictly controlled laboratory study with an adaptation night, 3 iterations of a baseline night followed by a recovery night after 36 h of total sleep deprivation, and a final recovery night. All eight sleep opportunities in this study design were 12 h in duration (22:00–10:00) and recorded with polysomnography (PSG). The PSG records were scored for REM sleep, NREM stage 1 sleep (S1), stage 2 sleep (S2), and slow wave sleep (SWS), and wake (W). Indices of the dynamic structure of sleep – i.e., sleep stage transitions and features of the NREM/REM sleep cycle – were assessed, and systematic interindividual differences across the eight sleep opportunities were quantified with intraclass correlation coefficients.

Results: NREM/REM sleep cycles and sleep stage transitions exhibited significant, substantial and stable interindividual differences that were robust across baseline and recovery nights, suggesting that mechanisms underlying the dynamic structure of sleep are phenotypic. In addition, the dynamics of sleep stage transitions were found to be associated with NREM/REM sleep cycle characteristics; the degree to which S2-to-W/S1 and S2-to-SWS transitions were in equilibrium was significantly related to the length of NREM/REM sleep cycles.

Discussion: Our findings are consistent with a model for the regulation of dynamic sleep structure based on underlying mechanisms comprised of three subsystems – characterized by S2-to-W/S1, S2-to-SWS, and S2-to-REM transitions – with S2 playing a hub-like role. The balance between the two subsystems operating within NREM sleep (characterized by S2-to-W/S1 and S2-to-SWS transitions) may serve as a basis for the regulation of the dynamic structure of sleep. Manipulation of this balance by means of brain stimulation or other interventions during sleep may represent a novel therapeutic target for improving people's sleep.

Real time monitoring of Xbp1 activity reveals distinct responses to different stress modalities

J.A. Williams[1], E. Strus[2], M.K. O'Hara[1], N. Naidoo[2]
[1]Perelman School of Medicine, University of Pennsylvania, Department of Neuroscience, Philadelphia, United States, [2]Perelman School of Medicine, University of Pennsylvania, Division of Sleep Medicine, Philadelphia, United States

Introduction: Sickness and stress promote sleep through mechanisms which are poorly understood. However, aspects of the unfolded protein response (UPR) and the innate immune response are known to mediate responses to stressors that lead to sleep induction, including bacterial infection and sleep deprivation. The UPR typically responds to proteotoxic stress through three signaling axes: PERK (protein kinase R (PKR)-like ER kinase), IRE1 (inositol requiring enzyme 1), and ATF6 (Activating Transcription Factor 6). The IRE1-dependent signaling axis in particular is a highly conserved and rapidly activating component of the UPR. Taking advantage of this, to investigate how the UPR is involved in inducing sleep, we developed a method to monitor IRE1-dependent activation of the X box Binding Protein 1 (XBP1) transcription factor in real time in living *Drosophila* fruit flies.
Materials and Methods: Xbp1 is activated via IRE1-dependent splicing of a 23 bp intron thereby generating a full-length functional transcript. Using CRISPR/Cas9 technology, a firefly luciferase transgene was inserted into the reading frame of the spliced form Xbp1 (*Xbp1-luc*). Thus, we expected a reporter signal only upon translation of the activated XBP1 transcription factor.
To assess responsiveness of the *Xbp1-luc* transgene, flies carrying *Xpb1-luc* were subjected to varying doses of an ER (endoplasmic reticulum) stress inducing drug, tunicamycin. Separate groups were also subjected to treatment which included sleep deprivation, bacterial infection (*E. coli*), or aseptic injury and placed on a sucrose/agar medium with 10 mM luciferin substrate (Gold Bio) and monitored in a lumicycler (Actimetrics) for several days. Control flies received equivalent handling, but without treatment.
Results: *Xbp1-luc* flies showed dose dependent and significant sex dimorphic responses to tunicamycin. Splicing of endogenous *Xbp1* mRNA was identical to that of *Xbp1-luc* mRNA and occurred several hours earlier than the reporter signal, indicating a prolonged lag time between transcription and translation of XBP1. Consistent with earlier findings, *Xbp1-luc* activity increased with sleep deprivation and quickly reversed during the recovery period. In contrast, *Xbp1-luc* decreased during bacterial infection in a time-of-day dependent manner, and rapidly reverted to baseline values.
Conclusions: Real-time monitoring of Xbp1 reveals temporal dynamics that are widely sex dimorphic and unique to the stress modality to which the flies were subjected. Female flies showed higher sensitivity to tunicamycin and a greater dynamic range of responses than males. We hypothesize that this differential response signal is dependent on the specific tissue(s) that mediate these responses and is a topic for future investigation.

Scalp recorded direct current brain potentials during human sleep – a revisit

S. Fulda[1]
[1]Neurocenter of Southern Switzerland, EOC, Sleep Medicine Unit, Lugano, Switzerland

Introduction: Direct current (DC) EEG recording has become technically feasible in the last decades, but data on DC EEG during sleep and variations of DC level over the course of the night are still sparse.

Materials and Methods: DC EEG (19 channels) was recorded together with standard polysomnography signals (EOG, EMG, respiration) in young healthy sleepers during a whole night. To describe the variations in DC level during nocturnal sleep, we referenced six EEG electrodes (F3, F4, C3, C4, P3, P4) to the average mastoid signal and computed the mean DC level for each 30 second epoch aligned to the sleep scoring. Preprocessing included outlier removal based on the range of DC signal in 30 seconds and the slope of the DC level across 1 minute, scaling by the mean of the first 5 minutes of recording and detrending across the selected bouts. We then set out to replicate and extend the components (see below) described by Marshall et al. (Eur J Neurosci, 1998:1167-1178) in young healthy sleepers and linear mixed models and spline regression.

Results: Using data from 20 young healthy sleepers (20 – 40 years) our analyses confirm
(1) the steep Wake-to-NREM transition negative shift (across four 5-minute bins, wake followed by 15 minutes of NREM sleep, $p < 0.001$, 11 subjects, 15 bouts) and
(2) the gradual within REM negative slope (across the last 15 min of REM sleep followed by 5 minute of NREM sleep, $p < 0.001$, 6 subjects, 9 bouts);
(3) modelling the DC level time course across the NREM bout of the first three NREM-REM cycles with hierarchical spline regression confirmed a gradual positive slope during the middle-to-end part of the NREM bout and re-confirmed the steep Wake/REM-to-NREM negative shift (cycle length < 150 min, NREM bout > 30 min, 18 subjects, 49 cycles),
(4) modelling across the REM bout revealed a cubic time course that differed between frontal and central vs. parietal electrodes (REM bout >= 10 min, 19 subjects, 44 REM bouts); but
(5) we did not find a steep NREM-to-REM transition positive shift (15 min NREM followed by 5 min REM, 14 subjects, 23 bouts).

Conclusions: Our study reaffirms the technical feasibility of recording direct current EEG during sleep in humans and provide evidence for systematic dynamic alterations in DC EEG during sleep in young healthy individuals.

Simultaneous brain biomechanical, vascular and neurovascular characterization of REM sleep using multiparametric functional ultrasound

N. Zucker[1], M. Matei[1], A. Bergel[1], S. Pezet[1], M. Tanter[1,2]
[1]Institute Physics for Medicine Paris (ESPCI PSL Paris, INSERM, CNRS), Paris, France, [2]Iconeus, Paris, France

Introduction: Rapid-eye-movement sleep is characterized by strong neuronal activity, changes in autonomic regulation and widespread cerebral hyperemia. Recent advances in ultrasound neuroimaging demonstrated massive vascular surges during REM sleep with local cerebral blood volume increase of more than 100% (Bergel *et al* 2021). This huge metabolic demand during REM sleep remains today a mystery. Although the fundamental understanding of the main role of REM sleep remains a major scientific question, there is a lack of multiparametric functional imaging modalities able to characterize this sleep phase at the whole brain scale. Here we propose such a multiparametric functional imaging modality able to record simultaneously brain biomechanical properties, neurovascular activity and electrographic activity during sleep in rodents.

Materials and Methods: Multiparametric functional ultrasound imaging is performed concurrently with extracellular recordings of local field potentials (LFP) and is leveraged during long acquisitions to obtain both structural and functional accurate images of the whole rat brain during sleep. By performing ultrasound imaging with a linear array (128 elements, 110 μm spatial pitch, 15 MHz central frequency, N=11 compounded plane waves) at 5500 frames per second, the proposed technology is able to record spontaneous REM episodes along with a set of physiological features including cerebral blood volume changes linked to the neurovascular coupling, blood pulsatility and vascular parameters, tissue pulsatility, local brain stiffness and slow varying strain rates. By imaging the fast transient propagation of tissue pulsatility waves into the brain at each single cardiac cycle, we were able to map the dynamic changes of brain stiffness (Young's Modulus in kPa) during sleep phases. Such passive Shear Wave Elastography is performed simultaneously with functional Ultrasound imaging based on ultrafast Doppler and gives access to the simultaneous changes of vascular and brain mechanical properties during the rat sleep.

Results: Our results demonstrate that REM sleep is associated with a fast, massive and systematic fourfold softening of specific brain regions (respectively 0.45 kPa +/- 0.5 kPa for non-REM sleep and 0.12 kPa +/- 0.01 kPa). The local brain softening is very stable during the whole REM phase and comes back fast to baseline brain stiffness values in some seconds (8 +/- 1 seconds). This to date unreported variation of the mechanical stiffness of the brain during REM sleep is correlated with the massive hyperemia and vascular surges detected during this state. Its potential implication regarding the cerebrospinal fluid transport into ventricles during REM is proposed and validated in a large number of REM sleep episodes (N=20 REM episodes).

Conclusions: Brain neurovascular and mechanical imaging provides new insight into the physiological orchestra that takes place during REMs. This study shows that functional ultrasound imaging of the brain of rats during sleep is a promising technique to understand brain wide physiological mechanisms occurring during REM sleep and paves the way for a deeper understanding of the purpose and origin of the REM sleep.

SIRT1-mediated NAMPT acetylation leads to obesity-induced muscle dysfunction via NAD+/NADH imbalance

L. Zhang[1], Y. Yan[1], S. Li[1], Y. Wang[1], F. Lu[1], L. Zhang[1], Q.Y. Li[1]
[1]Ruijin Hospital, Shanghai Jiao Tong University School of Medicine, Department of Respiratory and Critical Care Medicine, Shanghai, China

Introduction: Obstructive sleep apnea (OSA) is an independent risk factor for cardiovascular diseases, diabetes, and arrhythmias, and its prevalence continues to rise worldwide. Obesity is a major risk factor for OSA, which may be involved in OSA pathogenesis by upper airway muscles abnormalities. This study aimed to analyze the mechanism by which fat affects upper airway muscles.
Materials and methods: To determine the role of SIRT1-mediated NAMPT acetylation in obesity, we measured the acetylation level and enzymatic activity of NAMPT under high fat, and performed a comprehensive characterization of gastrocnemius, including MRI imaging, electromyography, whole-body plethysmography and immunofluorescence.
Results: We demonstrated that high-fat levels decreased sirtuin (SIRT)1-mediated nicotinamide phosphoribose transferase (NAMPT) deacetylation, which inhibited NAMPT activity. SIRT1-mediated inhibition of NAMPT activity decreased the nicotinamide adenine dinucleotide (NAD+) rescue pathway, causing NAD+/NAD+ hydrogen (H) (NADH) imbalance, and consequently inducing structural and functional abnormalities of the upper airway muscle. On this basis, we also found estradiol can improve this process by ameliorating SIRT1-mediated NAMPT deacetylation.
Conclusions: The study first demonstrated the role of NAMPT acetylation in obesity via NAD+/NADH imbalance, suggesting a novel drug target of OSA and providing insights into sex-related differences in obesity-associated OSA pathogenesis.

Sleep and sociality: the influence of acute sleep loss on social motivation in female and male rats

J. Raymond[1], T. Doolan[1], E. Lynch[1], M. James[2], N. Everett[1], M. Bowen[1]
[1]The University of Sydney, School of Psychology/Brain and Mind Centre, Sydney, Australia, [2]Rutgers University, Robert Wood Johnson, Medical School Department of Psychiatry & Brain Health Institute, Piscataway, United States

Introduction: Inadequate sleep is highly prevalent in modern society and detrimental to physiological and psychological processes, including those critical for social interaction (e.g., attention, memory, and response inhibition). Sleep deprivation (SDe) also modulates motivation for drug- and food-based rewards, and clinical evidence suggests that sleep loss reduces social motivation. However, no objective preclinical research has yet assessed the impact of sleep loss on motivation to engage in social interaction.

Materials and Methods: The current study investigated the effects of acute SDe on motivation for social and sucrose rewards using operant self-administration models in female and male Wistar rats. Rats learnt to press a lever to obtain a social reward (30-s access to a same-sex conspecific via a retractable door) or a 45-mg sucrose pellet, to determine if SDe effects were social-specific. SDe was conducted via gentle handling (GH), a minimally stressful but complete-SDe involving manually keeping rats awake, for 6-hour periods starting at either light onset (0600-1200) or the mid-light (1200-1800) phase prior to operant testing (at 1800). Partial-SDe was conducted via caffeine administration at 0600 (i.p.; 10 mg/kg) and 1200 (i.p.; 10 and 30 mg/kg), prior to operant testing. Additionally, to investigate whether caffeine protects against sleep loss-induced asociality, caffeine (i.p.; 10 mg/kg) was administered 30-min prior to operant testing (1730) alongside 6-h GH total SDe (from 1200-1800).

Results: GH-induced total SDe acutely reduced lever pressing for both social and sucrose rewards in males and females regardless of SDe timing. While total SDe decreased motivation for social interaction for a protracted peiord following SDe, a rebound elevation in sucrose motivation was observed during the recovery sessions. When administered 6 hours prior to testing, 10 mg/kg caffeine increased responding for social and sucrose reward, whereas 30 mg/kg caffeine reduced motivation akin to GH total SDe. Acute caffeine administration protected against the diminishing effect of sleep loss on motivation but this was only temporary for social motivation, which was reduced during the subsequent recovery session following SDe.

Conclusions: These findings align with previous human studies demonstrating that acute sleep loss can reduce motivation for social interaction. The differential effects of GH and caffeine-induced SDe at different doses suggest that the magnitude of sleep loss, method and timing of SDe, reward type, and biological sex modulate whether a loss of motivation occurs following SDe. Given the key role that social support plays in resilience against stress, these findings highlight the importance of promoting adequate sleep for healthy individuals and transdiagnostic clinical populations with mental health disorders characterised by social dysfunction.

Acknowledgements: N/A

Sleep Disparity and Mood

G.A. Bruening[1], E. Davis[1], J. Jones[1], K. Duraccio[1], D.B. Kay[1]
[1]Brigham Young University, Provo, United States

Introduction: Total sleep time is related to mood, and we have shown that people who have higher sleep desire show worse mood. Evidence is unclear if the discrepancy between the two has an impact on a daily level. In this study we sought to explore this relationship with the hypothesis that sleep want being greater than total sleep time will lead to lower mood and the greater the discrepancy when sleep time is greater than desire, the lower the mood.

Materials and Methods: As part of an archival data set within the Consortium of Sleep Psychology at BYU, 74 participants were recruited to represent a wide range of insomnia symptom severity. Participants completed morning and evening sleep diaries for 9 to 22 nights except for a handful of the 74 participants who left the study early (avg=13.01, st dev=4.35). The evening diary asked the participant how much sleep they wanted that night. The morning diary was used to calculate total sleep time and waking mood (0=very tense, 10=very calm).

Morning total sleep time was subtracted from evening report of sleep desire to compute a sleep desire discrepancy for each day. Intraclass correlation coefficient was calculated to justify use of a multilevel model (ICC=.051). A multilevel regression analysis was run in STATA that used nightly sleep desire discrepancy to predict daily morning mood, controlling for day, with participants as the cluster. A second multilevel regression was conducted that took into account variance in slopes. A third regression was also conducted to examine the relationship between mood and the interaction between total sleep time and sleep desire.

Results: For the first multilevel regression analysis, a significant negative relationship was found for sleep desire discrepancy predicting mood (β=-.34, $p<.001$). For the second multilevel regression analysis the variance between slopes was relatively small (.057) and less than twice the standard error (.031) indicating the variance between slopes was insignificant. Another multilevel regression was run using the components of sleep desire discrepancy, which found total sleep time was significantly predictive of morning mood (β=.38, $p<.001$) while sleep desire was not (β=.0028, p=.97). A third regression was run for the interaction between total sleep time and sleep desire. The interaction effect did not significantly predict mood (β=.024, p=.40).

Conclusions: Discrepancy between desired and obtained sleep significantly predicted morning mood, such that greater discrepancy was related to lower mood. However, only total sleep time was significantly predictive when breaking sleep desire discrepancy into its components and the interaction between sleep time and sleep desire was nonsignificant. This indicates that sleep desire discrepancy is predictive of mood because total sleep time is predictive of mood. This suggests focusing on total sleep time for mood treatment could potentially be more effective than a focus on sleep desire.

Sleep duration, timing & quality in healthy adolescents: association with anxiety, depression and chronotype; a pilot study

S. Magnusdottir[1], I. Magnusdottir[2], A.K. Gunnlaugsdottir[2], H. Hilmisson[1], L. Hrolfsdottir[3], A.E. Eiriksdottir[4]

[1]MyCardio, SleepImage, Denver, United States, [2]University Akureyri, Akureyri, Iceland, [3]Institution of Health Science Research, University of Akureyri and Akureyri Hospital, Akureyri, Iceland, [4]Akureyri College, Akureyri, Iceland

Introduction: Sleep plays fundamental role in mental- and physical-health, with good sleep-health including adequate duration and quality, appropriate timing, regularity, and absence of sleep disorders. To date, most studies examining sleep in adolescents have utilized subjective questionnaires and/or actigraphy. This pilot-study was conducted as a part of Erasmus+ project *"Supporting Students' and Educators" mental and Physical Well-being in Challenging Times"* with the aim to objectively measuring sleep duration (SD), sleep efficiency (SE), sleep quality (SQI), sleep timing (sleep onset (SO), sleep conclusion (SC), sleep midpoint (SM) to calculate social jet lag (SJL)) in healthy adolescents for accuracy and to evaluate if there is a relationship between sleep metrics and anxiety, depression or chronotype.

Materials and methods: After ethics-approval (VSN-22-174) and study-registration (NCT05748496), participants were recruited from one junior college in northern Europe, were gender distribution is 2/3 female and 1/3 male. During regular school schedule, participants were asked to record their sleep for 3-school- and 2-free-nights with FDA-cleared/CE-marked home sleep test, SleepImageÒ, record sleep diary and respond to subjective questionnaires; Epworth sleepiness scale and insomnia severity index to evaluate daytime sleepiness and insomnia symptoms, general anxiety disorder-7 to evaluate anxiety, patient-health-questionnaire-9 and Becks-depression-inventory-II to evaluate depression symptoms and Morningness-Eveningness questionnaire (MEQ) to evaluate chronotype. Data was collected during the last week of February thorough the second week of March 2023.

Results: Of 68 adolescents-(72% females) participating, 65-(72% females) successfully finished all requirements of the study.

Only 15% sleep >8-hours on average with SD on school-nights is 7-hours/08-minutes and free-nights 7-hours/25-minutes (p=0.001) not significantly differing between genders. Male participants have higher apnea hypopnea index (AHI) 3.4 (p<0.001), wake after sleep onset (WASO) 14-minutes (p=0.002) and lower SE -3.6% (p=0.002), but less symptoms of depression measured with PHQ-9 and BDI-II or (3.4, p<0.0001; 8.2, p<0.0001, respectively) and anxiety evaluated with GAD-7 (4.7, p<0.0001) compared to female participants.

Participants sleeping £7-hours on school-nights (30%), fall-asleep 50-minutes later (p=0.002), wake-up 62-minutes earlier (p=0.001), with 80 minutes shorter (p<0.0001) total sleep time (TST) and are sleepier (p=0.014).

Moderate-(40%) and severe-(31%) SJL is prevalent and significantly correlated with depressive symptoms (BDI-II and PHQ-9); p=0.022/p=0.006, respectively and suicidal thoughts (p=0.033), with stronger correlation in females (p=0.018) than males.

The prevalence of being late-chronotype (MEQ£41) is 15.4%. MEQ-score is positively correlated with SD (p=0.017) and TST (p=0.029) and negatively with SJL (p=0.035). When evaluating the groups based on chronotype (morning-, intermediary- and late-), late-chronotypes fall asleep later (63-minutes; p=0.019) on school-nights compared to morning-chronotypes and have significantly worse SJL than morning- and intermediary-chronotypes, 61-minutes (p=0.033) and 70-minutes (p=0.0001). Late-chronotypes also have significantly more insomnia complaints (p=0.006/p=0.001) and depression symptoms (p<0.0001; p<0.0001) compared to morning- and intermediary-chronotypes.

Conclusions: Adolescents are sleep-deprived with high prevalence of moderate/sever-SJL correlating with depression and suicidal thoughts. late-chronotypes have shorter SD, more severe SJL, are sleepier and are more likely to have clinical depression. The results from this study can support design of school-based programs both to improve sleep duration and to target depressive symptoms through improving sleep habits in adolescents.

Sleep stages dependency of distinct distribution of oscillatory activity across frontal and central cortical areas studied by Frequency-Domain functional Near-Infrared Spectroscopy

S. Perrig[1], A. Lintas[2], M. Jaquerod[2], A. Villa[2]
[1]Center of Sleep Medicine / Geneva University Hospital, Department of Clinical Neuroscience, Chêne-Bourg, Switzerland, [2]Neuroheuristic Research Group / University of Lausanne, Faculty of Business and Economics, Lausanne, Switzerland

Introduction: Neurovascular coupling plays a key role in all brain states, although very different mechanisms regulate the relationship between blood flow and neuronal activity during sleep and wakefulness. It is known that sleep follows an alternation of states of arousal with specific electroencephalographic (EEG) and cardiovascular characteristics. However, it is not yet clear how hemodynamic signals vary during sleep phases across central cortical areas associated with sensorimotor brain activities and frontal areas associated with mental activities. This study evaluates hemodynamic correlates measured by Frequency-Domain functional Near-Infrared Spectroscopy (FD-fNIRS) during wakefulness (W) and brain states during sleep (N2 light sleep, N3 deep sleep, and rapid eye movement REM sleep). Our hypothesis is that these signals may differentiate frontocentral and autonomic cortical neurogenic activity from vascular signals associated with sleep depth.
Materials and Methods: Optical signals recorded by FD-fNIRS at wavelengths of 690 nm and 830 nm are characteristic of de-oxygenated (HbR) and oxygenated (HbO2) hemoglobin. We analyzed the brain activity of 10 healthy volunteers during a day-time sleep cycle, simultaneously monitored with polysomnography (PSG). Our montage included 32 optic channels that were aggregated in order to obtain virtual regions of interest (ROIs) corresponding to the electrophysiological recording sites Cz, FCz and Fz (international 10-20 EEG system). The continuous FD-fNIRS optical signals were segmented into epochs of 30 seconds each. Same sleep phase segments identified using the PSG scoring procedure were pooled and used for power spectra analysis.
Results: During wakefulness, central and frontal ROIs were characterized by differences in the frequency band 0.8-5.0 Hz. A similar pattern was observed during REM sleep (frequency range 1.1-5.0 Hz). It is interesting to notice during stage N2 the difference was limited to the range 2.9-4.1 Hz. In general and specifically in W and N2 sleep stage, we observed a power in central ROI larger than in frontal ROI. However, during REM and only during low frequency oscillations (<1 Hz) we observed that the power tended to be higher in frontal ROI. No fronto-central differences were observed during deep sleep stage N3.
Conclusions: During sleep, our findings show that FD-fNIRS signals show frequency-domain patterns of activity in fronto-central cortical areas that are similar to the observations made with EEG. Furthermore, FD-fNIRS suggests that during non-REM sleep, neurogenic activity associated with the autonomic nervous system tends to outnumber other sources.

Stimulation of glutamatergic neurons in the medial-lateral preoptic region of the hypothalamus disrupts sleep homeostasis

V. Hambrecht-Wiedbusch[1], A. Mondino[1], A. Jadidian[1], L. Floran-Garduno[1], D. Li[1], P. Torterolo[2], D. Pal[1], G. Mashour[1], G. Vanini[1]
[1]University of Michigan, Department of Anesthesiology, Ann Arbor, United States, [2]Universidad de la República, Departamento de Fisiología, Facultad de Medicina, Montevideo, Uruguay

Introduction: The preoptic area of the hypothalamus has been historically considered a critical brain site for sleep generation. However, recent research has identified different subsets of preoptic neurons that causally contribute to the promotion of wakefulness. Specifically, chemogenetic stimulation of glutamatergic neurons within the medial and lateral preoptic area (Vglut2_MLPOA) increases wakefulness, fragments NREM sleep, and suppresses REM sleep. While the wake-promoting role of these preoptic neurons is well established, their role in sleep homeostasis and the mechanisms by which these neurons generate arousal remain unknown.

Materials and Methods: Vglut2-IRES-Cre (Slc17a6tm2(cre)Lowl/J) mice were bilaterally injected with AAV-hSyn-DIO-hM3D(Gq)-mCherry (n=11) or AAV-hSyn-DIO-hM4D(Gi)-mCherry (n=5) for selective expression of excitatory or inhibitory DREADD in Vglut2_MLPOA, and subsequently implanted with electrodes to record the electroencephalogram (EEG) and electromyogram (EMG). After recovery from surgery and habituation, mice were kept awake for 6 hours (ZT0=7am) by gentle stimulation. Thirty minutes prior to the end of sleep deprivation (SD), mice received randomized intraperitoneal injections of vehicle or the designer receptor agonist Clozapine-N-oxide (CNO; 1 mg/kg). After sleep deprivation, EEG and EMG were recorded for 6 hours (ZT06 to ZT12). In separate experiments, mice expressing the inhibitory DREADD in Vglut2_MLPOA (n=5) were recorded for 6 hours (ZT06 to ZT12) after CNO administration. Total time spent in wakefulness, NREM and REM sleep, average number and duration of bouts for each vigilance state, as well as REM sleep latency were analyzed over the 6 hours recording period. For identification of Vglut2_MLPOA projection targets Vglut2-IRES-Cre mice (n=5) were injected with AAV-EF1a-double floxed-hChR2(H134R)-mCherry-WPRE-HGHpA into the MLPOA for conditional expression of channelrhodopsin-2 conjugated with mCherry. Rostro-caudal series of brain sections (+3.0 to -7.5 mm relative to bregma) were systematically examined using fluorescence microscopy.

Results: Stimulation of Vglut2_MLPOA impaired the homeostatic response to 6 hours of SD. This was produced by an increase in wakefulness during hour 1 post-SD (p=0.0005) that delayed NREM sleep rebound (during hours 2 (p=0.0269), 3 (p=0.0405), 4 (p<0.0001), 5 (p<0.0001) and 6 (p<0.0001)), which was highly fragmented. Despite an increased sleep drive, REM sleep was powerfully suppressed; REM latency was increased (p=0.0005) and time in REM was substantially reduced (p<0.0001 for each hour bin). Inhibition of Vglut2_MLPOA in non-SD mice increased REM sleep duration during the light (p=0.0005) and dark (p=0.0429) phase. Ongoing experiments suggest that Vglut2_MLPOA inhibition does not influence the homeostatic response to SD. Anterograde tracing analysis revealed that Vglut2_MLPOA project to several brain regions that control wakefulness and REM sleep generation.

Conclusions: Chemogenetic Vglut2_MLPOA activation impairs sleep homeostasis and powerfully inhibits REM sleep generation via downstream projections to key brain regions that control arousal and REM sleep onset. Vglut2_MLPOA are necessary and sufficient for normal sleep-wake control, but do not appear to be necessary for sleep homeostasis.

The effects of noise stress on sleep quality

C.M. Goanta[1,2], F. Florea[2], D. Cirpaciu[1,2]
[1]University of Medicine and Pharmacy Carol Davila, Physiology, Bucharest, Romania, [2]Spitalul Clinic Colentina, ORL, Bucharest, Romania

Introduction: Noise stress is considered a major occupational hazard worldwide and hypertension is a well-known risk factor for cardiovascular disease, which is currently the leading cause of ill health retirement. The association between noise exposure and hearing effects is well documented in the biomedical literature, but the same is not true for exposure to different noise levels and extra-auditory effects.

Berglung demonstrated the association between noise exposure and the non-auditory effect and conducted studies on subjects starting exposure at a level of 55 dB.

The hypothesis that excessive noise exposure might be associated with hypertension was described by Babisch who showed that the association could be explained by biochemical changes triggered by stress mechanisms in general. In short, an increase in levels of chemicals such as cortisol, adrenaline and noradrenaline in response to noise stress could lead to peripheral vasoconstriction, increased heart rate and increased blood pressure.

Materials and methods: The concept behind this product is the practical use of a correspondence model between the level of noise a human subject is subjected to during sleep and the evolution of certain biological parameters of the subject. The objective is to monitor the health impact of environmental noise on a human subject during sleep. In addition to this monitoring, the concept behind integrates a component to alert the subject if a risk to his/her health is expected from prolonged exposure to noise during sleep.

For this study we performed a home sleep study and a blood presure holter study on 50 healthy subjects that lived in Bucharest Romania during 2 nights- first night without noise stress and the second night with a white noise stress of 50 db.

We recorded the following parameters during the night:

1. using a polygraph we analysed: - Oxygen saturation,
- sleep quality,
- pulse,
- apnea episodes.

2. using an actigraph we monitored sleep duration and quality - duration to onset of sleep phases and their quality,
- temperature.

3. using a holter machine:
- we monitored blood pressure variations.

Results: During the study we observed changes in blood pressure values, decreased sleep quality and completed questionnaires showed increased fatigue during the following day.

Conclusions: The concept behind this study is the practical use of a model of the correspondence between the level of noise to which a human subject is subjected during sleep and the evolution of certain biological parameters of the subject. The objective is to monitor the health impact of environmental noise on a human subject during sleep.

The effects of REM sleep fragmentation on emotional memory and reactivity through a new methodological approach: preliminary data

L. Viselli[1], F. Salfi[1], A. D'Atri[1], B. Arnone[1], G. Amicucci[2], D. Corigliano[2], F. Naccarato[1], F. Festucci[1], A. Zilli[1], A. Procaccioli[1], C. Colombo[3], N. Cellini[3], D. Tempesta[1], M. Ferrara[1]
[1]University of L'Aquila, Department of Biotechnological and Applied Clinical Sciences, L'Aquila, Italy, [2]Sapienza University of Rome, Department of Psychology, Roma, Italy, [3]University of Padova, Department of General Psychology, Padova, Italy

Introduction: Rapid Eye Movement (REM) sleep is supposed to be the key sleep stage for proper emotional processing and emotional memory consolidation. The duration of REM sleep is considered the main REM feature for an appropriate psychophysiological response to emotional events. However, recent literature on insomnia patients suggested that restless REM sleep (manifested in cortical arousals and stage transitions that disrupts the continuity of REM periods) could be associated with maladaptive emotional reactions. To date, the role of REM sleep continuity in emotional processing among the healthy population is still to be addressed. In this study involving healthy young subjects, we exploited a new sleep manipulation technology based on vibrotactile stimulations to experimentally induce REM sleep fragmentation to evaluate its effects on emotional memory and reactivity.

Materials and Methods: Nine participants (mean age±standard deviation, 25.00±4.42, 8 females) underwent two experimental conditions (Fragmentation/Control) in a counterbalanced order. In each condition, subjects took part in

(i) a stimulus encoding phase and a baseline assessment of emotional Memory/Reactivity (eMR) before sleep (at 18:00, $Time_0$),

(ii) a nocturnal polysomnographic recording with/without REM fragmentation,

(iii) a post-sleep eMR assessment one hour after the final awakening ($Time_1$),

(iv) and a follow-up assessment after 48 hours ($Time_2$).

In the Fragmentation condition, REM sleep continuity was disrupted using a wristband delivering vibrotactile stimulations to induce cortical arousal (without awakenings). The effects of the experimental manipulation on eMR for negative/neutral stimuli were evaluated by collecting behavioural (Old/New paradigm), self-report (Self-Assessment Manikin scale), and physiological (Skin Conductance Responses-SCR, Heart Rate Deceleration-HRD) measures.

Results: During the Fragmentation night, REM sleep fragmentation index (number of transitions from REM to N1/Wake stage) and N1 duration significantly increased (both $p<0.001$) while the average and maximum value of REM continuity (number of consecutive 30-second REM epochs) decreased (both $p<0.001$). Analyses highlighted significant effects of REM sleep fragmentation on physiological measures (Condition x Time interaction: both $p\leq0.028$) but not on behavioural and self-reported ones (all $p\geq0.417$). Holm post hoc comparisons indicated that phasic SCR activity decreased at $Time_1$ in each condition (both $p<0.001$), although it was significantly lower at $Time_1$ after the Fragmentation night than in the Control condition ($p=0.013$). At $Time_2$, phasic SCR activity did not change in the Control condition ($p=0.170$), whereas it significantly increased in the Fragmentation one ($p=0.002$), becoming higher than the Control condition ($p=0.050$). HRD showed a significant reduction at $Time_1$ ($p=0.026$) and then remained stable at $Time_2$ in the Control condition ($p=1.00$), while no variations in the Fragmentation condition were obtained (all $p=1.00$).

Conclusions: Preliminary results indicated that REM sleep fragmentation may lead to a maladaptive HRD response, indicating a physiological weakening of the parasympathetic reaction to emotional events, which persisted after two recovery nights. At the same time, REM sleep fragmentation flattened sympathetic autonomic response, as shown by a brief-term reduction in SCR that did not persist after 48 hours. REM sleep discontinuity seems to differently affect the sympathetic and parasympathetic branches of the autonomic nervous system, leading to different effects on SCR and HRD.

The nucleus of solitary tract synchronizes cortical activity through the parabrachial nucleus in sleep-wake cycle in rat

F. Zhai[1,2], S. He[3], J. Chen[1], J. Lu[4]
[1]Shanghai Children's Medical Center, Shanghai Jiaotong University School of Medicine, Department of Otolaryngology, Shanghai, China, [2]Guizhou Branch of Shanghai Children's Medical Center, Shanghai Jiaotong University School of Medicine, Department of Otolaryngology, Guizhou, China, [3]Shanghai Children's Medical Center, Shanghai Jiaotong University School of Medicine, Department of Otolaryngology, Guizhou, China, [4]The First Hospital of Jilin University, Department of Neurology, Changchun, China

Introduction: The medullary nucleus of solitary tract (NTS) and its afferents of vagus nerve have long been investigated in regulation of cortical activity and sleep promotion. However, the underlying neural circuit and how and whether the NTS regulates electroencephalogram (EEG) in a sleep-wake dependent manner remain unclear. Hypothesis: We proposed the NTS via the pontine parabrachial nucleus (PB) regulates cortical activity and sleep.
Materials and methods: In this study, we bilaterally and directly stimulated the NTS neurons by chemogenetic approach and bilateral NTS terminals in the PB by optogenetic approach in rats.
Results: Neither stimulation altered sleep amounts nor patterns; however, both stimulations consistently increased EEG delta (0.5-4.0 Hz) power in non-rapid-eye-movement (NREM) sleep and high frequency EEG (alpha and beta, 10-30 Hz) power in wake and REM sleep.
Conclusions: Our results indicate that the NTS via its projections to the PB synchronizes low frequency EEG during NREM sleep and fast frequency EEG during wake and REM sleep. This pathway may serve the neural foundation for the vagus nerve stimulation (VNS) treating clinical cortical disorders such as epilepsy.
Acknowledgements: We truly thank Daqing Wang for his advice in the optogenetical study.

Two different methodologies for sleep deprivation during the postpartum in rats: gentle handling vs deep brain electrical stimulation

F. Peña[1], M. Rivas[1], D. Serantes[1], A. Ferreira[2], P. Torterolo[1], L. Benedetto[1]
[1]Universidad de la República, Department of Physiology, School of Medicine, Montevideo, Uruguay,
[2]Universidad de la República, Department of Physiology and Nutrition, School of Science, Montevideo, Uruguay

Introduction: Though sleep deprivation is a stressful situation itself, most common methods used in laboratory animals to prevent sleep usually involve stressful stimuli or conditions. Therefore, some of the consequences of sleep deprivation may arise from the methodology rather than from sleep loss itself. Likewise, sleep has been claimed as essential for milk ejection in mother rats, where sleep deprivation using gentle handling (GH) prevents milk ejection and pup weight gain. The stimulation of the brainstem reticular formation through deep brain electrical stimulation (DBES) is a less common technique and an alternative procedure to sleep deprive. While this methodology may also have unwanted side effects, it avoids aversive situations that would be critical for females under the constant care of their pups during the postpartum period. Thus, we wonder how different sleep deprivation methodologies impact maternal behavior and lactation.

Materials and Methods: On postpartum day 9 (PPD9), lactating rats were implanted for polysomnographic recordings and for DBES targeted to the peduncle-pontine tegmentum. Between PPD12-15 mother rats were submitted to a four-day-session protocol in a counterbalanced design: control session with pups (CWP), control session without pups (CWOP), sleep deprivation with GH, and sleep deprivation with DBES (we used the minimal energy of stimulation necessary to wake up the animal). All sessions consist of three hours of sleep deprivation (or a correspondent control period) followed by an hour of sleep recovery (or a control recovery period). The amount of milk ejected and the number of milk ejections were indirectly measured through the litter weight gain (LWG) and the stretching behavior of the pups, respectively.

Results: Our main results showed that active maternal behaviors were fragmented when mother rats were sleep deprived using both methods in comparison to CWP (3.21 ± 0.52 episodes/hour; $p\leq0.001$), but they were substantially more disrupted with GH (9.67 ± 0.76; $p\leq0.001$) than with DBES (6.13 ± 0.71; $p=0.006$). Nursing behavior was also fragmented, but the increase in frequency (episodes/hour) was greater with GH (8.38 ± 1.01) compared to CWP (2.75 ± 0.27; $p=0.005$) and to DBES (5.17 ± 0.57; $p=0.030$). Furthermore, lactating dams were capable of ejecting milk despite of being sleep deprived using both techniques, but this parameter was significantly reduced with GH (1.04 ± 0.44 ejections/hour) compared to CWP (3.63 ± 0.43; $p=0.019$), while DBES (2.79 ± 0.39; $p=0.494$) did not differ from CWP. Additionally, LWG significantly decreased during GH (-0.77 ± 0.44 %) compared to CWP (1.30 ± 0.20; $p=0.016$), while DBES (0.89 ± 0.23; $p=0.672$) did not differ from CWP.

Conclusions: These results suggest that sleep is not necessary for milk ejection and DBES seems to be a better option to sleep deprive during the postpartum period.

Two slow-wave sub-types with distinctive morphological features are associated with specific thalamic activation patterns: an EEG-fMRI investigation

D. Bergamo[1], G. Handjaras[1], D. Picchioni[2], E. Ricciardi[1], P.S. Özbay[2,3], J.A. de Zwart[2], J.H. Duyn[2], G. Bernardi[1], M. Betta[1]
[1]IMT School for Advanced Studies Lucca, MoMiLab, Lucca, Italy, [2]National Institutes of Health, Advanced Magnetic Resonance Imaging Section, National Institute of Neurological Disorders and Stroke, Bethesda, United States, [3]Boğaziçi University, Institute of Biomedical Engineering, Istanbul, Turkey

Introduction: Previous evidence indicates that slow waves (0.5-4Hz) of NREM sleep might include different subtypes with distinct generation mechanisms and functional roles. It has been suggested that large, widespread slow waves could result from the synchronizing action of subcortical structures with diffuse projections toward the cortex, while smaller, local slow waves primarily reflect a less efficient cortico-cortical synchronization mechanism. Among subcortical structures, an involvement of the thalamus in the regulation of slow-wave expression is supported by experimental evidence in both animal and human models. Here we used simultaneous EEG and fMRI recordings during sleep to investigate whether the thalamus might have a different involvement in the regulation and expression of distinct slow-wave subtypes

Materials and methods: Twelve healthy adults (8F, age 20-32y) completed two consecutive overnight sessions during which EEG (63 electrodes), fMRI (3T), and photoplethysmographic (PPG) signals were simultaneously recorded. Automated algorithms were used to detect slow waves and spindles in EEG recordings, while pulse wave amplitude drops (PWA-D) were detected in PPG recordings. PWA-Ds reflect peripheral vasoconstriction and can be used as an index for autonomic activity changes. Voxel-wise regression analysis, including spindles as a regressor of no-interest, was performed in each subject to identify brain hemodynamic changes associated with slow waves. Group-level analysis was conducted using a linear mixed-effect model (FDR correction; $q<0.001$). Then, average BOLD-signal profiles (0-12s following slow-wave onset) were extracted from thalamic voxels displaying significant group-level effects. A k-means algorithm based on cosine similarity was used to identify potential clusters of slow waves associated with distinct patterns of thalamic fMRI activity. The Silhouette criterion was used to determine the expected number of clusters. Paired t-tests and non-parametric signed-rank tests were employed to compare the properties of identified slow-wave clusters.

Results: Slow waves were associated with negative BOLD-signal changes in frontal, parieto-occipital, temporal, and somatomotor areas, and with positive changes in the brainstem, cerebellum, and anterior thalamus. Two clusters of slow waves were identified based on thalamic BOLD-signal profiles (218 voxels; x=+14, y=+12, z=-8). Cluster 1 (C1) exhibited an early positive thalamic response peaking ~3 seconds after slow-wave onset, whereas cluster 2 (C2) displayed a delayed thalamic response peaking after ~9 seconds. C1 slow waves occurred more frequently in isolation (i.e., no other slow waves detected within ±5 seconds around slow-wave onset; $p<0.05$), had larger amplitude ($p<0.001$) and synchronization efficiency (i.e., steeper slopes and/or involvement of more scalp electrodes; $p<0.01$), and were more frequently associated with PWA-Ds ($p<0.01$) compared to C2 waves. Furthermore, C1 waves were more prevalent during N2 sleep, whereas C2 slow waves predominated during N3 sleep ($p<0.01$).

Conclusions: Present results provide novel support for the existence of two distinct slow-wave synchronization mechanisms: a subcortico-cortical synchronization leading to large and widespread slow waves associated with changes in autonomic activity, and a cortico-cortical synchronization mechanism resulting in small, local slow waves. These functional mechanisms may undergo distinct regulation, have different functions, and show distinct alterations in pathological conditions.

Wake oscillation amplitudes and quantities change independently with time awake

S. Snipes[1], R. Huber[1,2]

[1]University Children's Hospital of Zurich, Child Development Center, Zurich, Switzerland, [2]Psychiatric Hospital, University of Zurich, Department of Child and Adolescent Psychiatry and Psychotherapy, Zurich, Switzerland

Introduction: Homeostatic changes in sleep need are most evidently reflected in slow wave activity (SWA) during NREM sleep. The increase in SWA following extended wake is believed to be due to a net increase in synaptic strength between neurons following a day of learning and forming new memories. Such a process should similarly affect the wake EEG. Previous studies found increases in theta power (4-8 Hz) that approximately reflect this process but found decreases in alpha power (8-12 Hz) which do not. We believed this could actually be due to a limitation of power analysis itself. In theory, increased synaptic strength between neurons should result in increased synchronicity and therefore increased *amplitudes* of oscillations, with no bearing on their quantity, although changes to either will affect spectral power. We therefore hypothesized that oscillation amplitudes would reflect sleep homeostasis, and quantities of bursts would change independently.

Materials and Methods: 18 young healthy adults (18-26, 9 female) were recruited for a 4/24 extended wake paradigm (asleep 4 h, awake 24 h). We recorded high-density EEG during eyes-open fixation, eyes-open auditory oddball, and eyes-closed conditions, every 3 h. Instead of measuring spectral power, we identified oscillatory bursts using cycle-by-cycle analysis, which identifies oscillations independently of their amplitude, based only on their waveform.

Results: We found that for both theta and alpha oscillations, in all conditions, amplitudes increased with time spent awake (max Hedge's g = 2.51, min p-value < .001). For both eyes-open conditions, these amplitudes followed an increasing saturating exponential curve, reflecting sleep homeostasis as expected by the two-process model of sleep. Instead, the number of theta bursts increased linearly with time awake (max g = 2.52, min p-value < .001), and alpha bursts decreased (max abs g-value = -1.73, min p-value < .001).

Conclusions: These results support the interpretation that sleep need is directly related to increasing synaptic strength, reflected as increased amplitudes with time awake. More broadly, it encourages re-analysis of prior results that used spectral power, especially when related to sleep and sleep homeostasis.

Wearable devices may reduce the risk of injury during sleep episodes

V. Correa[1]
[1]Semmelweis, Mental Health, Budapest, Hungary

Introduction: Sleep episodes can be detected by wearable devices, and the use of this technology can prevent lesions caused by aggressive behavior during sleep.

Materials and methods: We analyzed video recordings of sleep-related behaviors that may represent parasomnias and seizures at different ages and biological sex groups. The keywords sleepwalking, sleep eating, sleep sex, seizure, and aggressive behavior in sleep were searched in public video databases. We classified the videos into biological sex and age groups (children, adults, elderly), and the keywords. The odds ratio (OR) association between nocturnal events versus wearable device injury prevention groups was discussed.

Results: In 170 videos (98 men), we found an association between adults and sleepwalking (OR:2.29, 0.98-5.36, p:0.055), and seizure phenotype in adults and children. However, the higher association between middle age/elderly and aggressive behavior in bed (punching and/or kicking) (OR:73.6, 8.1-667, p:0.001) may give us a clue as to how the wearables devices can prevent accidents, and how parents could monitor children's episodes through alarm devices.

Conclusions: Aggressive behavior during sleep, such as epilepsy or sexsomnia attacks, has shown us the importance of the identification of the groups at risk, and the development of wearable devices to prevent not just injuries, but even death/murder.

Behavior, Cognition and Dreaming

Changes in brain activity upon stimulus-induced awakening predict subsequent dream recall

<u>D. Marzoli</u>[1], A. Michalak[1], D. Bergamo[1], F. Pietrogiacomi[1], V. Elce[1], P. Bianca[1], I. De Cuntis[1], G. Avvenuti[1], E. Ricciardi[1], G. Bernardi[1]
[1]IMT School for Advanced Studies, MoMiLab, Lucca, Italy

Introduction: Upon waking up from sleep, we may recall having had some particular conscious experiences (CE) - ranging from simple thoughts or perceptual snapshots to movie-like narratives -, or no experience at all (NE). Previous work showed that EEG activity patterns in the few seconds before an alarm-induced awakening might predict whether the sleeper will report a conscious experience. Given that the response of the sleeping brain to sensory stimuli is known to vary according to its ongoing functional state and activity pattern, here we investigated whether the alarm sound used to induce the awakenings could lead to distinct EEG changes depending on whether the sleeper was having a subjective experience or not.

Materials and Methods: In the present study, 17 healthy adult volunteers (10 females, mean age 28.3 + 3.9 y) underwent four overnight high-density EEG recordings in combination with a serial awakening protocol. Participants were awoken during stable N2 sleep by an alarm sound played 4-6s after an auditory, visual, tactile, or sham stimulation. Upon awakening, a pre-recorded questionnaire was administered to assess the content (if any) of the mental activity preceding the alarm sound. Our present analyses were focused on a subset of 191 awakenings performed in the sham (no stimulus) condition. Semi-automatic procedures were applied for bad channel detection, removal of artifactual activity through independent component analysis, and identification of bad data segments. We analysed the signal in the 2s preceding and the 2s following the alarm. The IRASA method was used to decompose the power spectrum into its periodic and aperiodic components, and the fractal part was subtracted from the original signal to determine the oscillatory power in the six canonical frequency bands. Moreover, microstate analyses were carried out to calculate sequence metrics and complexity (Hurst exponent).

Results: CE reports were associated with stronger high-frequency activity (beta power) than NE reports in the 2s preceding the alarm sound ($p < 0.05$, cluster-mass correction). However, in the 2s following the alarm sound, we observed the opposite pattern, with NE reports showing higher levels of alpha and gamma power compared to CE trials ($p < 0.05$, cluster-mass correction). Finally, microstate analyses revealed that NE trials, relative to CE, had lower signal temporal predictability (higher complexity) in the 2s following the alarm, as indicated by a lower Hurst exponent.

Conclusions: Consistent with previous findings, CEs were associated with increased high-frequency power during pre-awakening sleep relative to NEs. Furthermore, our observations demonstrated that differences in subjective experience before the awakening are associated with specific changes in brain activity following an abrupt, stimulus-induced awakening. These differences may reflect distinct modalities of interaction between arousal-related structures and the cortex depending on whether the sleeper was (or was not) in a state associated with an ongoing subjective conscious experience.

Circadian regularity moderates the impact of stress on cognitive processes

G. Gilmore[1], L. Whitehurst[1]
[1]University of Kentucky, Psychology, Lexington, United States

Introduction: Cognitive ability is intricately related to sleep and circadian processes. Evidence suggests that poor sleep as well as circadian misalignment – a mismatch between our sleep-wake cycle and our outside environment – leads to significant impairments in executive functioning and emotional processing. In addition, stress can interfere with our sleep processes by increasing sleep onset latency, decreasing sleep quality, and disrupting circadian regulation. Stress can also directly enhance and disrupt certain cognitive functions. With reported rates of stress skyrocketing in recent years, it has become increasingly important to understand how daily stress exposures moderate psychosocial functioning. The current project used daily assessments of sleep, stress, and cognitive performance in an international sample to examine the unique and combined impacts of stress, sleep, and circadian factors on markers of cognitive ability.

Materials and Methods: 228 participants (Female = 64; M_{Age} = 52.51 ± 11.50; non-US based = 74) completed 21-days of assessments using a mobile app on their phone that prompted them to complete psychological evaluations three times throughout the day which included sleep surveys, stress assessments, cognitive tasks, and mood questionnaires. Cognitive tasks included assessments of working memory, emotional inhibition, and cognitive flexibility. Emotional inhibition was evaluated via a modified Stroop task, where three different word types (neutral, negative, and emotionally rejecting words) were presented in various colors and participants were tasked with reporting the color of the words. The Trail Making Test (TMT) was used to measure cognitive flexibility and a backwards digit span task assessed working memory. To assess circadian entrainment, we calculated the mid-point of participants' sleep periods for each of the 21 days. We then calculated the sum of the difference scores between the 21 mid-points and took the root mean square to create an entrainment score, which was representative of consistency or inconsistency in sleep/wake schedule. Daily surveys were used to collect reports of sleep quality and stress. Linear mixed effect models were used to assess data given their longitudinal and repeated structure.

Results: Participants with a more consistent sleep/wake schedule – more entrained – responded faster on the Stroop task regardless of word type (b=43.09, p=.02). Participants who reported experiencing more stress events during the study were more reactive to rejecting words (b=57.59, p = .03). However, more consistent circadian entrainment served as a protective factor against the impact of stress on reactivity to negative (b = -2.33, p = .05) and rejecting words (b = -2.80, p = .03). Participants reporting better sleep quality were also more accurate on the Stroop task (b = .08, p = .03). Lastly, participants reporting less total sleep time (b = 4798.50, p = .003) and better sleep quality (b = -7651.6, p = .05) displayed better attentional performance on the TMT.

Conclusions: We found evidence for individual and combined effects of sleep, circadian entrainment, and stress on emotional inhibition and attention. Our results indicate that sleep and circadian processes serve as important protective factors against the impact of stress on affective cognition.

Comparative analysis of methods of evaluating human fatigue

M.T. Mello[1], R. Guerreiro[1], R. Santarelli[1], V.M. Brant[1], A.T. Barreto[1], F.R. Silva[2], A. Silva[1]
[1]Universidade Federal de Minas Gerais (UFMG), Departamento de Esportes, Belo Horizonte, Brazil,
[2]Multidisciplinary Center in Somnolence and Accidents (CEMSA), Belo Horizonte, Brazil

Introduction: Work fatigue was defined as tiredness, which reduces functional capacity and is experienced during or after the workday. Considered as a multifactorial process, 3 different fatigue conditions were identified: (1) the physical fatigue representing reduction of ability to carry out physical efforts, (2) mental fatigue which is a condition of low alertness and reduced ability to solve problems and (3) emotional fatigue represents a reduced ability to engage in emotional activities. Thus, the objective of this study is to present comparative results of 4 different methods used to estimate fatigue, as well as to present the benefits and limitations of each method.

Materials and methods: The present study used 4 different methods to estimate fatigue. 47 volunteers (45 men and 2 women), 41.3 ± 7.5 years old, truck operators for 11.5 ± 6.0 years. Actigraphy and core temperature was evaluated. The 5-minute psychomotor vigilance test, the Karolinksa Sleepiness Scale, and the postural assessment using the Light® Sonometer were performed. Fatigue prediction was performed using the FAST program.

Results: In response to the PSQI, 51.06% had good sleep quality and 48.94% had poor sleep quality with an average efficiency of 81.6%. In response to the actigraphy workers slept an average of 7.2 hours a day with 93.5% efficiency. The workers' CBT cosinor analysis showed a preserved circadian curve. Core body temperature showed differences between the 6 hours worked in each shift. Similarly, the light sound level meter showed lower risk scores for fatigue in day shifts. Only the variable of the fastest 10% of the PVT showed worse results, while no significant differences were observed by KSS. The risk analysis by FAST showed strong influence of the circadian factor.

Conclusions: In conclusion, each method has positive and negative points, and it is up to the evaluator/manager to identify the method that best suits the purpose of the evaluation, as well as the local culture and conditions. We recommend to use different methods of risk assessment and management in combination fatigue and carrying out assessments, which allow estimating performance and fatigue throughout the working day, since performance and fatigue may change over time of the working day.

COVID-19 pandemic changes in lucid dreaming: an online survey

G. Herminia Ferreira[1], M. Jatahy[2], J. Vidal[3], R. Lucena[4], M. Medeiros[5], S. Mota-Rolim[6]
[1]Federal University of Pernambuco, Philosophy, Recife, Brazil, [2]Federal University of Paraná, Philosophy, Curitiba, Brazil, [3]Federal University of Rio Grande do Norte, Medicine, Natal, Brazil, [4]Federal university of Rio Grande do Norte, Pharmacy, Natal, Brazil, [5]Federal University of Rio Grande do Norte, Psychology, Natal, Brazil, [6]Federal University of Rio Grande do Norte / Brain Institute / Onofre Lopes University Hospital, Natal, Brazil

Introduction: Pandemic-induced anxiety negatively affected sleep quality for many individuals, but an increase in total sleep time was also observed. Dream recall frequency also increased, especially for nightmares. However, to date, there are no consistent reports focusing on pandemic-related changes in lucid dreaming (LD), a physiological state of consciousness during which dreamers know they are in a dream.

Materials and Methods: We used the International COVID Sleep Study Questionnaire (ICOSS), an online questionnaire that aimed to understand the possible effects of COVID-19 on sleep, dream, and wakefulness parameters. We included an additional question about LD in the Brazilian version of the questionnaire. In this work, we investigated LD recall frequency and other sleep variables in 1,857 subjects. For the analysis of the factors influencing an increase in the frequency of LD during the pandemic, we fitted a logistic regression model to predict LD frequency enhancement in terms of other characteristics and events related to sleep, dream, and nightmare.

Results: Firstly, we found that most participants (64.78%) maintained their LD recall frequency during the pandemic, but a considerable fraction (22.62%) informed that LD became more frequent, whereas a smaller subset (12.60%) reported a decrease in LD during the pandemic. Secondly, we observed that the number of participants reporting LD at least once per week increased during the pandemic. Using the mixed logistic regression model, we confirmed a significant increase in the recall frequency of LD during the pandemic ($p = 0.002$). This increase in LD during the pandemic was associated with an enhancement in both dream and nightmare recall frequencies, as well as with sleep quality and symptoms of REM sleep behavior disorder.

Conclusions: LD recall frequency significantly enhanced during the pandemic. This increase in LD was significantly associated with an enhancement in both dream and nightmare recall frequencies, as well as with sleep quality and sleep singing. Pandemic-related factors such as anxiety, sleep fragmentation and extended duration, which enhance REM sleep awakening, may explain this pandemic LD increase.

Dreaming and memory consolidation - a registered report

S. Schoch[1], S. Ataei[1,2], L. Salvesen[3], M. Schredl[4], J. Windt[5], G. Bernardi[3], B. Rasch[6], N. Axmacher[2], M. Dresler[1]

[1]Donders Institute, Nijmegen, Netherlands, [2]Ruhr University Bochum, Bochum, Germany, [3]IMT School for Advanced Studies, Lucca, Italy, [4]Central Institute of Mental Health, Mannheim, Germany, [5]Monash University, Department of Philosophy, Melbourne, Australia, [6]University of Fribourg, Fribourg, Switzerland

Introduction: Sleep is crucial for memory consolidation, but whether dreams reflect ongoing memory consolidation during sleep remains uncertain. A recent meta-analysis has found a significant effect of incorporating a memory task into dreams on subsequent memory performance. However, previous studies only had 20% power to detect the estimated effect size, highlighting the need for larger sample size studies. Furthermore, only NREM dreams were reliably associated with improved memory performance. While the role of incorporations into REM dreams is currently less clear, previous studies have suggested that REM sleep and dreams are involved in emotional processing. To empirically test these assumptions, our Registered Report uses a large sample size to investigate whether incorporating a memory task into a dream enhances memory strength and emotional processing, focusing on sleep-stage-dependent effects.

Materials and methods: Ninety-two participants are being recruited to spend three nights in a sleep laboratory. After an adaptation night to get used to the sleep laboratory and the 64-channel EEG, two experimental nights are completed. During these, participants learn a word-picture association task before sleep, with a memory recall and valence and arousal ratings before sleep, after sleep, and four days later. Up to 8 dream reports are collected from NREM and REM sleep. In one of the experimental nights, we use targeted memory reactivation (auditory word cues) in the minutes preceding the awakenings.

Results: Data collection started in February 2023, and currently, 14 participants have completed the study, with another 6 participants enrolled.

Conclusions: This study is the first registered report in dream research and will provide insight into two potential functions of dreaming; memory and emotional processing. Furthermore, it will generate a large data set of dream reports and concurrent brain activity.

Effect of sleep deprivation on facial emotion recognition – an experimental eye -tracking study

I.T.K. Hui[1,2], X. Yang[1], J.H. Hsiao[1,3], S.X. Li[1,3]
[1]The University of Hong Kong, Psychology, Hong Kong, Hong Kong, SAR of China, [2]King's College London, Institute of Psychiatry, Psychology & Neuroscience, London, United Kingdom, [3]The University of Hong Kong, The State Key Laboratory of Brain and Cognitive Sciences, Hong Kong, Hong Kong, SAR of China

Introduction: Previous research has suggested that sleep disruption worsens cognitive functioning such as emotional processing. However, the findings on the effect of sleep deprivation on emotion recognition remained mixed, and whether perceived emotional intensity of the stimuli affects emotion recognition under sleep deprivation is yet to be explored. Besides, most previous studies measured emotional intensity by experimentally manipulated morphed pictures, which might inadvertently induce task difficulty, thereby confounding the behavioral outcomes. In the current study, we aimed to examine the effect of sleep deprivation on facial emotion recognition by taking subjectively rated emotional intensity of facial expressions into consideration. In addition, we explored whether a particular eye-movement strategy would be superior in well-rested vs. sleep deprived conditions.
Materials and Methods: A total of 40 young adults (age = 20.35 ± 1.73, % female = 65) with normal or corrected-to-normal vision and no clinical diagnoses of psychiatric and sleep disorders were recruited. All the participants underwent two experimental conditions in a counterbalanced order (well-rested sleep at home vs. 1-night sleep deprivation in the laboratory). An emotional recognition task was administered in the morning at a fixed time frame (9:00 - 10:00am) following both conditions, which required participants to identify and rate the intensity of happy, sad, fearful, and angry facial expressions. Eye-movement patterns were recorded using the EyeLink 1000 eye-tracker.
Results: A two-way repeated measure ANCOVA found a significant main effect of sleep condition, $F(1, 38) = 5.592$, $p = .023$, and a significant sleep x emotion interaction effect, $F(3, 114) = 3.861$, $p = .011$, after adjusting for emotional intensity, on emotion recognition speed. However, further Bonferroni-adjusted post-hoc tests revealed no significant difference in emotional recognition between sleep conditions, $p > .05$. Multiple linear regression showed that higher general emotional intensity was significantly associated with faster emotion recognition speed for all facial expressions, $B = -205.934$, $p = .019$, and especially for happy faces, $B = -333.384$, $p = .030$, under well-rested sleep condition but not sleep deprived condition. The Eye Movement analysis with Hidden Markov Models (EMHMM) revealed two distinct eye-movement patterns (focusing more on noses and mouths vs. eyes and mouths). Mixed ANCOVA found a significant emotion x eye-movement pattern interaction under well-rested condition after adjusting for emotional intensity, $F(3,111) = 4.343$, $p = .006$. Specifically, compared with those focused more on eyes and mouths, participants focused more on noses and mouths responded significantly faster to fearful emotions under well-rested condition, $p = .021$. This superior effect was not found under sleep deprived condition.
Conclusions: Our findings showed that emotional intensity affected the effects of sleep deprivation on emotion recognition. Whilst higher general emotion intensity led to faster emotion recognition under well-rested sleep, this association was not observed under sleep deprivation. Future research is needed to further examine the underlying mechanism linking emotional intensity and emotion recognition in the context of sleep deprivation.

Effects of haloperidol on low gamma oscillations of the EEG

D. Gallo[1], S. Castro[1], M. Cavelli[2], J. Gonzalez[1], P. Torterolo[1]
[1]Universidad de la Republica del Uruguay, Montevideo, Uruguay, [2]University of Wisconsin, Madison, United States

During cognitive processes, different cortical areas interact intensely with each other and with other subcortical regions such as the thalamus. It has been postulated that oscillations in the gamma band frequency (30 to 45 Hz) of the electroencephalogram (EEG) are the product of these interactions, and therefore they are involved in cognitive functions. Both cognitive processes and the cortical gamma activity, as well as its coupling between cortical areas, are radically different between wakefulness and the different stages of sleep. Numerous neuronal groups and neurotransmitters are involved in both the regulation of wakefulness, as well as in the cognitive processes associated with it. The dopaminergic system is one of them. Dopamine agonists have a promoting effect on motivated wakefulness, while dopamine antagonists produce the opposite effect. However, it is not yet known if the dopaminergic system participates in the regulation of the gamma band. For this reason, the goal of the project focuses on characterizing the role of the dopaminergic system in the modulation of the gamma band EEG frequency range. To carry out this purpose, the effect of high doses (4 mg/kg, i/m) of haloperidol (dopamine receptor antagonist) was studied in 4 cats chronically implanted for polysomnography. Subsequently, we analyzed the power spectral density and intercortical connectivity through the "phase lag index" (PLI) of the gamma band during wakefulness and sleep under the control situation and the effects of haloperidol. We evidenced a displacement of the maximum value of gamma power towards lower frequency values, generating increases in power even in the beta band of EEG frequencies. Similarly, the maximum value of gamma band PLI was evidenced in lower frequency values after administration of haloperidol. It is concluded that the dopaminergic system has a modulating role of the gamma band of the EEG.

Efficacy of non-invasive NESA neuromodulation and therapeutic exercise on sleep disorders and cognitive function in people diagnosed with dementia. Randomized multicenter trial

E. Teruel-Hernández[1], R. Medina-Ramírez[1], B. Machío-Castello[1]
[1]University of Las Palmas de Gran Canaria, Las Palmas, Spain

Introduction: Dementia is a progressive decline in cognitive functions due to an alteration in the pattern of neural network connections. There is an inability to create new neural connections, resulting, among others, in sleep-wake disturbances. To date, there are not many treatment options. In addition to the adverse effects of drugs, it has been shown that they do not remove the amyloid deposits that form, nor do they prevent their formation. Therefore, the need arises to look for other treatment options to improve the functioning of neural plasticity. In this study we propose to evaluate the effect of non-invasive neuromodulation with the NESA device and therapeutic exercise on sleep disorders and cognitive function in the dementia population.

Materials and Methods: A randomized, multicenter clinical trial is conducted with 30 patients diagnosed with dementia from two Alzheimer associations. Participants were assigned to three treatment groups (CG: control group; EETG: experimental group of 52 sessions of therapeutic exercise; GENM: experimental group of 20 sessions of non-invasive neuromodulation with the Nesa device). Sleep and cognitive function variables were measured at 4 different times during the study using various rating scales.

Results: The results obtained in the sleep quality variable reveal favorable and significant data for both experimental treatments after two months of follow-up, obtaining a higher score and effectiveness for sleep disorders with the neuromodulation treatment. Similar results were obtained with the cognitive function variable, obtaining a significantly higher score in the neuromodulation group.

Conclusions: Non-invasive stimulation with the Nesa device and therapeutic exercise are two effective non-pharmacological treatments that provide benefits in sleep disturbance and cognitive functions in patients with dementia.

Estimating vigilance from the pre-shift sleep using under-mattress sleep sensors

J. Manners[1,2], E. Kemps[2], A. Guyett[1,3], N. Stuart[1,2], B. Lechat[1], P. Catcheside[1], H. Scott[1]
[1]Flinders Health and Medical Research Institute, Sleep Health, Adelaide, Australia, [2]Flinders University, College of Education, Psychology and Social Work, Adelaide, Australia, [3]Flinders University, College of Medicine and Public Health, Adelaide, Australia

Introduction: There are well-established adverse effects of shift-work schedules on sleep, fatigue and vigilance, largely due to misalignment between circadian rhythms and the work-rest schedule. Predicting when performance is most impaired in high-risk shift work occupations is critical to reduce the incidence of workplace errors and accidents. However, current methods routinely rely on subjective or manual markers of sleep timing and quality with little consideration towards detailed sleep markers prior to each work shift. This study aimed to develop and test the accuracy of a novel, data-driven machine learning model for predicting vigilance errors on an 8hr night shift-work schedule using prior sleep data measured by a non-intrusive, under-mattress sensor.

Materials and methods: 24 healthy volunteers attended the laboratory on two separate occasions, one month apart, to compare wake performance and sleep with two different shift work lighting conditions. Each condition occurred over an 8-day protocol that included 4 nights of simulated night shift work. Following a baseline sleep opportunity from 10PM-7AM, participants remained awake for 27hrs and then slept from 10AM-7PM on days 3-7. From midnight on each of days 4-7, participants completed eight-hour simulated night shifts, which included six 10-minute psychomotor vigilance task (PVT) trials per shift. Sleep was measured using an under-mattress sensor. Using extra-trees machine learning models, PVT performance (lapses, reaction speed) during each night shift was predicted based on the preceding daytime sleep. Data were split using k-fold cross-validation to train the model and subsequently confirm model performance across multiple iterations of data splits. Leave one group out cross-validation was used to evaluate performance with new subjects.

Results: The final extra-trees regression model demonstrated moderate accuracy for predicting next-shift PVT performance, with a standard error (RMSE) of 22.9ms for reaction times under 500ms, 0.47ms^{-1} for reaction speed, and 7.8 for the number of lapses. The extra-trees classifier was effective at predicting trials containing ≥5 lapses, with a Matthews correlation coefficient of 0.59 and an F1 score of 0.83.

Conclusions: Preliminary model performance is comparable to current fatigue prediction models which rely on self-report or manually entered data. This approach provides a more streamlined and efficient way to monitor and manage fatigue in non-standard work schedules, and these findings support the potential utility of unobtrusively collected sleep data to help improve work shift safety and risk management.

Exercise as a strategy to mitigate the cognitive effects of partial sleep deprivation

C.H. Le Roux[1], D.E. Rae[2], G. Lipinska[1]
[1]University of Cape Town, Psychology, Cape Town, South Africa, [2]University of Cape Town, Human Biology, Cape Town, South Africa

Introduction: A substantial portion of the population is likely to experience intermittent bouts of partial sleep deprivation (PSD) as academic, work and even social demands often displace sleep time or compromise healthy sleeping habits. Despite the known negative effects of sleep deprivation on cognitive functioning, which has implications for health, safety and productivity, PSD is not always avoidable. Thus, short-term strategies to minimise the effects of occasional PSD to enable safe and effective functioning are warranted. Exercise may be one such cost-effective and safe strategy. The limited existing literature on sleep deprivation and exercise focuses on total sleep deprivation rather than PSD which is a more common experience. Thus, this study aimed to investigate the effects of a morning bout of moderate intensity aerobic exercise following three consecutive nights of PSD on cognitive functioning and mood the next day.

Materials and Methods: In this randomised, counterbalanced, cross-over, intervention study, 25 healthy adults, who were also recreational runners (age: 18-39y, 40% female, habitual sleep duration: 7.3±0.7 h), completed i) one week of habitual sleep, ii) a set of baseline (T_0) measures, iii) three consecutive nights of PSD (operationalised as 70%, 60% and 50% of habitual time-in-bed respectively) and iv) three sets of follow-up measures the day after the third PSD night at habitual wake-up time (T_1), midday (±5h after habitual wake-up time, T_2) and afternoon (±10h after habitual wake-up time, T_3). Participants repeated this protocol under two randomised conditions. In the Exercise condition (EX), participants completed a 40-minute submaximal treadmill run (at 80% of maximum heart rate, HR max) with five one-minute intermittent high-intensity efforts (90% HR max) immediately after T_1 measures following PSD. Under the Control condition (CON), participants rested in place of the exercise session. We present preliminary data on measures of sustained attention measured using the Psychomotor Vigilance Task (PVT).

Results: Number of attentional lapses increased significantly across timepoints for both conditions (CON: $c^2(4)=15.31$, $p<0.05$; EX: $c^2(4)=13.67$, $p<0.05$). Post-hoc analyses indicated more lapses at T_1, T_2 and T_3 compared to T_0 for the CON condition but only at T_1 and T_2 compared to T_0 in the EX condition, showing that participants in this condition were protected from attentional lapses later in the afternoon.

Conclusions: This study found that the PSD appears to result in diminished attention. Furthermore, it provides preliminary evidence that morning aerobic exercise appears to rescue sustained attention towards the end of the day following three nights of PSD. Attention is known as the "gateway" function necessary for other high-order cognitive processes and the observed improvement with exercise may have a positive influence on other domains effected by sleep deprivation.

How does closing one's 'dream' eyes affect alpha power and visual content in lucid REM sleep?

S. Al-Youssef[1,2], K. Konkoly[3], I. Arnulf[1,2], K. Paller[3], D. Oudiette[1,2]
[1]Sorbonne Université, Institut du Cerveau - Paris Brain Institute - ICM, Inserm, CNRS, Paris, France, [2]AP-HP, Hôpital Pitié-Salpêtrière, Service des Pathologies du Sommeil, National Reference Centre for Narcolepsy, Paris, France, [3]Department of Psychology, Northwestern University, Evanston, IL, United States

Introduction: When asleep, we experience strong visual imagery (a.k.a. dreams) in the absence of external stimuli and although our physical eyes are closed. During wake, closing one's eyes is robustly accompanied by the appearance of EEG alpha oscillations. We aim to test whether this fundamental property of the waking visual system is maintained during REM sleep and whether it is associated with dream visual content.

To do so, we took advantage of the unique peculiarities of lucid dreamers, who are aware of dreaming during REM sleep, can perform a predefined task while dreaming and even signal it via muscular codes, allowing to timestamp the EEG segment corresponding to a dream of interest.

Materials and Methods: We recruited 4 lucid dreamers with narcolepsy, based on their ability to easily reach lucid REM sleep in a laboratory setting. Each participant had five 40-min naps monitored by polysomnography. We instructed participants to: i) successively close and open their eyes in their dreams and sniff twice for 'close' and once for 'open' (measured by a nasal cannula); ii) report whether they had a visual content or not in both conditions by smiling ('yes', zygomatic EMG) or frowning ('no', corrugator EMG). We woke participants up when they transitioned from REM sleep to NREM sleep stage 2 and immediately collected a dream report.

We used spectral power analysis in the 5 s window after a response code (sniff or facial EMG) to determine whether occipital alpha power during (lucid) REM sleep varies when the dreamer's eyes are open or closed and in function of the presence or absence of visual content.

Results: Lucid dreamers with narcolepsy reached REM sleep in 21/26 naps and were lucid in 8 of these naps. In total, they were able to perform a closed eyes signal 29 times and an open eyes signal 19 times. Surprisingly, eyes' closure during dreams was not always accompanied with a loss of visual content (6/16 cases without visual content vs. 10/16 cases with visual content; no visual code for the remaining 13 closed eyes signals). Conversely, participants always reported visual content when their eyes were open (8/8; no visual code for the remaining 11 eyes closed signal). All isolated closed/open signals without information on the visual content were excluded from the spectral power analysis.

In our preliminary results, we found no main effect of eyes condition (closed vs. open), of the visual content condition (no visual vs. visual content), or their interaction on the occipital alpha band power.

Conclusions: Closing our eyes in dreams does not seem to prevent the occurrence of visual content or to reliably increase occipital alpha power as it is the case during wakefulness. However, our results have to be confirmed with a larger sample size.

Investigating the role of sleep onset in semantic memory restructuring and creativity

N. Decat[1], J. Sénéchal[1], H. De Verville[1], T. Bieth[1], I. Arnulf[1,2], E. Volle[1], D. Oudiette[1,2]
[1]Sorbonne Université, Institut du Cerveau - Paris Brain Institute - ICM, Inserm, CNRS, Paris, France,
[2]AP-HP, Hôpital Pitié-Salpêtrière, Service des Pathologies du Sommeil, National Reference Centre for Narcolepsy, Paris, France

Introduction: Sleep is suggested to reorganize associative memories in a way that fosters creativity. Recent studies highlight the specific benefit of N1 sleep (sleep onset) and its associated mental experiences in creativity, but the underlying mechanisms are unclear.

Materials and Methods: In the present study, we aim to determine whether creative insight gained after a short nap stems from a reorganization of semantic associations during N1 sleep. Participants (N=77) attempted to solve a riddle before and after a 20-minute incubation period, including either N1 sleep (N1 group) or only wakefulness (Wake group). After each solving phase, they completed a relatedness judgment task (RJT). We used the RJT ratings to build individual semantic networks and computed the change in network metrics before and after incubation to assess restructuring. Additionally, we explored phenomenological dimensions of conscious experience collected during incubation.

Results: Preliminary results show:
i) no significant correlation between memory restructuring and solving in either group;
ii) that mental content seems to become more perceptual and spontaneous when early signs of drowsiness are present (i.e., slow eye movements).

Conclusions: Our findings may clarify the role of N1 sleep and its associated mental experiences in creative problem-solving and provide additional insights into the cognitive and experiential aspects of the wake-to-sleep transition.

Investigation of the cognitive functions of sleep and dreams through electroencephalography, verbal reports and electronic games

D. Brandão[1], R. Scott[1], V. Cerqueira[1], L. Gila[1], G. Oliveira[1], J. Souza[1], G. Silva[1], S. Ribeiro[1]
[1]Federal University of Rio Grande do Norte (UFRN), Brain Institute, Natal, Brazil

Introduction: Sleep is an important mental and bodily state for the consolidation of memories. It is very conserved across animal species, and likely had an early and sustained influence on the evolution of prey and predator behaviors. The Threat Simulation Theory states that dreaming was also important along evolution, due to the capacity of alerting about possible future threats. Methodological limitations complicate comparisons of sleep and dreams between preys and predators in non-human animals, but this can be addressed by inviting humans to play videogames.

Materials and methods: We set out to address the link between sleep, dreaming, and the prey vs. predator dichotomy in 13 pairs of adult volunteers that came to the laboratory and had their brain activity simultaneously recorded through electroencephalography (EEG), while they played a videogame against each other for 45 minutes, then slept for 2 hours, had their dream reports collected, and then played again for another 45 minutes. In the videogame, one participant was hunted by the other in a predator-versus-prey simulated confrontation.

Results: The results indicate that preys reported more dreams than predators, and that dreams related to the game contributed to prey score. Preys also benefited from having a deeper sleep than predators, which was also positively correlated with prey score. Furthermore, preys showed greater EEG power in the delta frequency band (slow wave oscillations between 1 and 3Hz), which also favored their score. No effect was found for sleep spindles. The prey's performance was impaired by the number of occurrences of microstate C, a task-negative pattern of electrical activity.

Conclusions: These results suggest that slow waves during sleep and game-related dream contents improve the post-sleep performance of individuals in the role of prey, while no benefits were detected for those in the role of predator. Altogether, the results show that both sleep and dreams are important for adapting to the very difficult situation of being preyed upon, but not so relevant in the context of being a predator, which does not represent a very stressful challenge.

Is sleep apnea related to increasing dream and nightmare frequency?

K.J. Hwang[1], J. Kim[2], S.J. Han[3]
[1]KyungHee University Medical Center, Neurology, Seoul, Korea, Republic of, [2]Pusan Medical Center, Neurology, Pusan, Korea, Republic of, [3]Wonkwang University Sanbon Hospital, Neurology, Sanbon, Korea, Republic of

Introduction: This study evaluate dream and nightmare frequency in patients with obstructive sleep apnea syndrome and its relationship to respiratory parameters.

Materials and methods: This study included 2346 patients (789 women, mean age 52.37 years) who underwent polysomnography because of suspected sleep apnea. Each patient completed questionnaires evaluating nightmare (Disturbing Dream and Nightmare Severity Index, DDNSI and Nightmare Effect survey, NES) Reported dream frequency was classified as none, infrequent (1/week), sometimes (2-3/week), frequent (3>week).

Results: Both AHI ($p<0.001$) and ODI ($P=0.021$) were significantly lower for the frequent dreaming group. BDI ($p<0.001$) and BAI ($p<0.001$) were significantly higher for the frequent dreaming group. As the DDNSI and NES score increased, the BDI ($r=0.420$ $p<0.001$ VS $r=0.379$ $p<0.001$) and BAI ($r=0.458$, $p<0.001$ VS $r=0.371$, $p<0.001$) increased linearly. However, DDNSI and NES score were not related AHI and ODI.

Conclusions: Despite traditional examples of a correlation between oxygen desaturation and dream content, the respiratory parameters as measures of sleep apnea syndrome severity showed negative correlate with dream frequency. Psychiatric comorbidity was associated with increasing dream and nightmare frequency.

It's the sentiment that counts: a comparison of sentiment analysis models for detecting dream valence

G. Baber[1], M. Gratton[1], J. Girard[1], N. Hamilton[1], S. Ellis[1], E. Hemmer[1]
[1]University of Kansas, Psychology, Lawrence, United States

Introduction: Measuring emotion in dreams is crucial for the advancement of dream research. However, collecting self-reported dream emotions or annotated dream reports is costly. Sentiment analysis offers a cost-effective computational method for labeling emotions and quantifying affective valence in text. Few sentiment analysis models have been tested for their validity in dream reports, and none have been compared against dreamers' own emotion ratings. In this study, we evaluated various sentiment analysis models in their ability to accurately capture dreamers' affective valence in dream reports.

Materials and Methods: We collected dream reports ($n = 47$) from university psychology students ($N = 30$) and obtained self-reported dream emotions using a short-form Profile of Mood States Scale, using 8 positive and 8 negative valence emotions with Likert scale rating 1-4. We also collected emotion annotations from six external raters, using the same emotions and rating scale as the dreamers. Dreamers' own emotion ratings served as the standard for comparison. The six raters demonstrated a moderate agreement (generalized Kappa interrater reliability = 0.626, 95% CI [0.549, 0.713]) for the 16 emotions. Mean values were calculated across raters for each emotion. We compared the performance of a RoBERTa twitter-based multilabel emotion classification deep learning model, a BERT multiclass deep learning model trained on product reviews, VADER (a lexicon-based valence model), and LIWC (a lexicon-based sentiment analysis tool). To reduce dimensionality of the emotion variables and model outputs, we conducted a principal component analysis (PCA) on dreamers' and raters' emotion ratings, and on all model outputs excluding VADER and BERT, which already modeled valence. The first component (PC1) from each PCA was used as a measure of valence, given that positive and negative emotions loaded appropriately onto the factor.

Results: Pearson correlations (Holm-Bonferroni corrected) revealed significant relationships (p < .001) between raters' PC1 and the PC1 of all models in relation to dreamers' PC1. We performed separate standardized linear regressions to predict dreamers' PC1, using raters PC1 and each model PC1 as predictors, while controlling for dream report word count. External raters performed best in predicting dreamers' valence (= .83, 95% CI [0.65, 1.01], $p < .001$, = 0.65), followed by RoBERTa (= .76, 95% CI [0.56, 0.96], $p < .001$, = 0.55), BERT (= .62, 95% CI [0.39, 0.86], $p < .001$, = 0.36), LIWC (= .57, 95% CI [0.39, 0.86], $p < .001$, = 0.30), and VADER (= .55, 95% CI [0.30, 0.81], $p < .001$, = 0.27). Dream report word count did not significantly affect dreamers' PC1 in any model.

Conclusions: Our study demonstrates for the first time how different sentiment analysis models correspond to dreamers' own dimensional dream valence. External raters and the RoBERTa model were the most effective in explaining the variance in dreamers' valence. However, all models exhibited some predictive validity. These findings provide a template for dream researchers in selecting a sentiment analysis tool for analyzing dream valence.

Learning during sleep – a historical review

S. Ataei[1,2], E. Simo[2], M. Bergers[3], S. Schoch[2,4], N. Axmacher[1], M. Dresler[2]
[1]Ruhr University Bochum, Neuropsychology, Bochum, Germany, [2]Donders Institute for Brain, Cognition and Behaviour, Radboud University Medical Center, Nijmegen, Netherlands, [3]Department of Psychiatry, Amsterdam UMC location Vrije Universiteit Amsterdam, Amsterdam, Netherlands, [4]Center of Competence Sleep & Health Zurich, University of Zurich, Zurich, Switzerland

Introduction: Sleep helps to consolidate previously acquired memories. In contrast, whether new information such as new languages can also be learned during sleep has been debated for over a century. However, the sporadic nature of empirical studies testing this question and their varied objectives and methodologies make it difficult to draw definitive conclusions.

Materials and Methods: We comprehensively reviewed the history of sleep learning research, from its empirical beginnings in the 1940s to the present day. Synthesizing the findings from 46 research papers, we critically examine the limitations and assumptions that have contributed to the discrepancies in the literature and highlight promising new directions in the field.

Results: Among the twenty-two studies that examined non-verbal learning during sleep, including habituation, conditioning, perceptual, and procedural learning, a significant majority of twenty studies suggest that these simpler forms of learning can indeed take place during sleep. Conditioning, in particular, has shown promise for practical application. In contrast, the results for more complex applied learning (for example, learning a new language while sleeping) show greater divergence. In particular, only thirteen of the twenty-two studies exploring verbal learning during sleep reported positive results. Several studies have reported implicit retrieval of verbal material when awake by adjusting the timing of stimulus presentation during sleep. Additionally, a study has shown that explicit retrieval of materials presented during lucid REM sleep is also possible during wakefulness.

Conclusions: There is compelling behavioral and neurophysiological evidence indicating that implicit retrieval of both non-verbal and verbal information can be accomplished in wakefulness. Explicit retrieval of information learned during sleep may not be easily accessible while awake in most cases, with the notable exception of information incorporated into lucid dreams in REM sleep.

Further research is needed to compare learning during sleep and wakefulness using consistent methods while optimizing factors such as the timing of presentation and the characteristics of the stimuli used in the study. In addition, exploring the potential of lucid dreaming in relation to sleep learning could provide valuable insights into this intriguing field.

Lucid dream induction with sleep EEG wearables: a multi-center study

L. Salvesen[1,2], M.J. Esfahani[2], M. Carr[3], C. Picard-Deland[4], E. Demsar[5], A.H. Daraie[6], Y. Keuren[2], M. McKenna[2,7], K. Konkoly[8], F.D. Weber[2,9], S.F. Schoch[2], G. Bernardi[1], M. Dresler[2]
[1]IMT School for Advanced Studies Lucca, MoMiLab, Lucca, Italy, [2]Donders Institute, Sleep & Memory Lab, Nijmegen, Netherlands, [3]University of Rochester, Sleep and Neurophysiology Laboratory, Rochester, United States, [4]Université de Montréal, Center for Advanced Research in Sleep Medicine, Montreal, Canada, [5]Monash University, Centre for Consciousness and Contemplative Studies, Melbourne, Australia, [6]Johns Hopkins University, Department of Biomedical Engineering, Baltimore, United States, [7]Max Planck Institute for the History of Science, Berlin, Germany, [8]Northwestern University, Evanston, United States, [9]University of Tübingen, Institute of Medical Psychology and Behavioral Neurobiology, Tübingen, Germany

Introduction: Lucid dreaming refers to a state in which individuals become aware that they are dreaming while remaining asleep. Although only about 20% of the general population experiences lucid dreaming on a regular basis (Erlacher et al., 2022), it is a skill that can be learned. A variety of lucid dream induction techniques have been proposed over the years (Stumbrys et al., 2012; Tan and Fan, 2022); however, previous investigations often lacked physiological measures or restricted participation to experienced lucid dreamers. Moreover, most relied on small sample sizes and lacked reliable replication. To address these limitations, we designed an innovative multi-center preregistered study across three laboratories in Italy, Canada, and the Netherlands, including 60 participants overall. We hereby present results for the data collected in Italy (SPACE lab, IMT School for Advanced Studies Lucca, Italy).

Materials and methods: We aim to evaluate the effectiveness of combining two lucid dreaming induction methods: targeted lucidity reactivation (TLR; Carr et al., 2020) and sense-initiated lucid dreaming (SSILD; Aspy, 2020). Our protocol includes a pre-nap cognitive training phase that directs participants' attention towards sensory perceptions while sensory stimuli are synchronously presented. These sensory stimuli can subsequently be used to cue lucidity during sleep. Participants undergo two morning-nap sessions, each starting with cognitive training. In one session, sensory cues are presented again during REM sleep (stimulation condition), while in the other, they are not (sham condition). Neurophysiological activity is measured using a portable EEG headband (ZMax, Hypnodyne) and sensory cues are administered through an open-source dream engineering toolbox (Dreamento; Esfahani et al., 2022).

Results: We present data from 10 participants (7 males; mean age 33 ± 7.38 years) who successfully completed at least one experimental nap session. A total of 15 experimental sessions (7 stimulation, 8 sham) were analysed: an average of two REM dream reports were obtained per session (1.88 ± 1.16 sham, 1.86 ± 0.90 stimulation), and 43.33% of reported dreams were categorised as lucid (43.75% sham, 42.86% stimulation). Almost half of the lucid dreams were signal-verified by a predefined eye movement sequence (42.75% sham, 52.43% stimulation). Regarding subjective ratings, the average dream awareness scores were equivalent for the two conditions and did not appear to be related to the participant's previous lucidity experience. *Of note, data collection is still in progress, and results may be further updated accordingly.*

Conclusions: The goal of this research is to validate an effective, scalable lucid dream induction method using wearable EEG headbands together with an open-source dream engineering toolbox. The evaluated method combines two induction techniques: SSILD and TLR. Overall, our preliminary descriptive results indicate a high incidence of lucidity in morning naps after cognitive training, which does not seem to be driven by TLR during REM.

Lucid dreaming and creative writing

L. Roklicer[1]
[1]Swansea University, Psychology, Swansea, United Kingdom

Introduction: Bringing awareness to our nightlife has many potential benefits, from overcoming nightmares to improving creativity. This study focused on using lucid dreaming to enhance creativity in writers. However, the findings indicate broader applications and deeper benefits for overall well-being and creativity. Participants reported experiencing creative inspiration and gaining insights into their writing practice, specific projects, and their waking life. They also reported shifts in consciousness, a heightened sense of agency and confidence, improved sleep, and a positive attitude towards sleeping.

Materials and Methods: The experimental study involved 28 writers who underwent lucid dreaming induction training. Over the 8-week intervention, they wrote new short stories while incorporating insights from their dreams. The study employed a mixed approach to induce lucid dreams, along with a newly developed model that required participants to set intentions and actively engage with their dream environment to develop a work of fiction. Qualitative thematic analysis was conducted to analyze subjective reports and weekly group discussions.

Results: The intervention produced both direct and indirect creative benefits, influencing both the writing pieces and the writers themselves. It yielded changes in the content and nature of dreams, enhanced one's sense of agency and control in both dreams and daily life, and had real-life implications for several participants. Participants reported overcoming recurring nightmares and anxiety dreams due to the increased sense of agency. They also experienced transformative insights into their daily lives, emotional states, and major life events. The intervention led to improved memory and sleep quality. For example, one participant who previously relied on audiobooks to fall asleep was now able to do so without them. Dreams became more vivid, unusual, and emotionally impactful, with the content and insights from dreams spilling over into participants' waking lives. Some participants reported feeling excited and relaxed about going to sleep, whereas previously they struggled with sleep or had reservations about going to sleep.

Conclusions: By raising awareness and shifting focus to night dreams, participants experienced a heightened sense of agency in both their dreaming and waking life, and their dreams became more connected, insightful, and interesting. This impacted their creativity, sleep quality, and confidence, giving them a transformed outlook on life, themselves, and the people around them. In some cases, the influence was direct, e.g. a dream gave an answer to a puzzle one participant had been looking for all her life, while in other cases it was the whole process that shifted their view and gave them a new way of looking at things. A number of participants thus experienced a stronger connection with their subconscious, a calmer demeanour in their waking life, more empathy for others, a more relaxed state (that in some cases led to falling asleep easier), and a different perspective on creativity, helping them to open up to new ways of writing and challenge themselves in creative ways, pushing boundaries - both creative and mental/emotional.

Multidisciplinary management of sleep disorders in young age male patients after craniocerebral injuries

N. Syrmos[1]
[1]Aristotle University of Thessaloniki, Thessaloniki, Greece

Introduction: Sleep disorders are serious post traumatic conditions. The signs and symptoms of sleep may include excessive daytime sleepiness, irregular breathing, increased movement during sleep, irregular sleep, abnormal wake cycle , difficulty falling asleep and also others situations.

Material and methods: 10 cases of sleep disorders in young age male (25 to 45 years old) patients after craniocerebral injuries are presented and discussed .6 cases (60%) of excessive daytime sleepiness ,1 case of increased sleep need (10%) ,1 case of insomnia, (10%),2 cases of sleep fragmentation (20%).

Results: We perform appropriate neurosurgical , neurological, pscychiatric and radiological evaluation with ct and mri studies in all 10 patients. In 3 cases (30%) we observe amelioration through six months period.

Conclusions: Disordered sleep is a common phenomenon after craniocerebral injuries . Sleep disruption contributes to morbidity, development of neurocognitive - neurobehavioral deficits, and prolongs the recovery phase after the initial traumatic situation . Appropriate recognition and correction of these problems may limit the secondary effects of craniocerebral injuries and improve neuro recovery/patient outcomes. Collaboration with other medical disciplines is necessary in order to achieve optimal results in order to ameliorate the quality of life.

Physiological sleep correlates are associated with positive and negative affect in younger and older adults

A. Subramoniam[1], P.C. Chen[2], S. Mednick[3], L. Whitehurst[4]
[1]University of Kentucky, Biology, Lexington, United States, [2]University of Pennsylvania, Pennsylvania, United States, [3]University of California, Irwine, United States, [4]University of Kentucky, Psychology, Lexington, United States

Introduction: A growing body of literature has linked sleep to affective states. However, the bulk of this research has focused on disrupted, delayed, or dysfunctional sleep patterns. Additionally, most studies utilize subjective or self-report indicators of sleep, with few studies examining how physiological sleep indices are related to emotion processing in healthy adults across the lifespan. Here, we examine how sleep dependent neural and cardiac activity during a midday nap are linked to pre and post sleep affect in younger and older adults.

Materials and Methods: 58 young (aged 18-35) and 49 older (aged 60-85) participants completed a 90-minute nap in a university sleep lab. Before and after sleep, participants completed the Affect Adjective Checklist (AAC; Zuckerman & Lubin, 1990) to measure positive and negative emotions and the Karolinska Sleepiness Scale to assess subjective sleepiness. Each participant slept with polysomnography, including electroencephalography (EEG) and electrocardiography (ECG). We determined sleep architecture and conducted spectral analyses of EEG and ECG to extract slow oscillation (0.5-1Hz) and sigma (12-16Hz) power, as well as high frequency heart rate variability (HF-HRV; 0.15-0.45 Hz)-an indicator of parasympathetic cardiac tone. Independent t-tests compared sleep (subjective and objective) and cardiac variables between the young and older group. Repeated measures ANOVA was used to assess positive and negative emotional states before and after sleep for both older and younger adults. Regression analysis was used to predict pre- and post-sleep emotional states from sleep variables.

Results: Older and younger adults had significant differences in subjective sleepiness before ($p<0.05$) and after sleep ($p<0.05$), with younger adults reporting higher levels of sleepiness compared to older adults. Younger adults' naps also had longer total sleep times ($p<0.001$), more minutes in Stage 1 ($p<0.001$), more minutes in Stage 3 ($p<0.001$), longer REM durations ($p<0.001$), higher sleep efficiency ($p<0.001$) and higher sigma activity ($p<0.05$) compared to older adults. All participants reported more positive than negative emotions ($p<0.001$) Additionally, older adults reported more positive emotions than younger adults ($p=0.001$). Lastly, for younger adults only, less autonomic activity in stage 2 was associated with higher positive emotions after sleep ($p< 0.001$)

Conclusions: We found evidence that physiological indicators during sleep are associated with emotional states after sleep in younger and not older adults.

Recovery from sleep loss and infections: sleep restriction induces adaptive motivational changes similar to sickness behaviour but via other mechanisms

J. Axelsson[1,2], L. Balter[1,2]
[1]Stockholm University, Stockholm, Sweden, [2]Karolinska Institute, Stockholm, Sweden

Introduction: In the same manner as sickness induces adaptive behavioural changes support recovery from a disease, sleep loss should induce behavioural changes assuring sufficient sleep. This is supported by recent findings that also support that the sleep loss induces motivational changes are driven by subjective sleepiness. The aims are to test to what degree these motivational changes overlap with sickness induced motivational changes and to explore involved mechanisms.

Materials and Methods: 56 subjects went through a study protocol with sleep restriction (two days with 4 hours in bed/night vs two days with 9 hours in bed) and experimentally induced low-grade inflammation (COVID-19 vaccination). We assessed C-reactive protein (CRP) as a marker of inflammation, sleepiness (Karolinska Sleepiness Scale, KSS) and motivation to engage in everyday behaviour (Motivation scale of Sleepiness, MOSS).

Results: Sleep restriction and vaccination caused a number of motivational changes (including an increased drive for rest, sleep, to be alone and avoidance of exercise or being socially active), that largely overlapped. Both sleep restriction and vaccination resulted in increased sleepiness, while only vaccination increased CRP levels. Both subjective sleepiness and CRP were strong predictors of motivational changes, including a strong drive for sleep preparatory behaviour, and resting, but also an avoidance of physical and social behaviour.

Conclusions: Our findings support that
1) sleep loss leads to behavioural changes causing the organism to organize behaviours that assure sufficient sleep and recovery in an adequate environment,
2) that these behaviours are adaptive and to a large extent overlap with sickness behaviour, and
3) that both subjective sleepiness and low-grade inflammation are likely mechanisms driving behavioural changes to assure recovery.

Our findings also support that the sleep loss and low-grade inflammation induces similar motivational changes but via different mechanisms. Consequently, insufficient sleep and sleepiness are likely to drive behaviours and symptoms, such as loneliness and a worse lifestyle, problems central in many disorders as well as increasing the risk for developing ill-health. On a positive note, improvements of sleep and manipulations of sleepiness could be successful interventions improving motivation aiding a healthy lifestyle and compliance to treatments.

REM sleep and emotion dysregulation in the elderly: a TMR study

C. Leitner[1,2], V. Greco[3], F. Casoni[2], P.A. Lewis[3], L. Ferini-Strambi[1,2], A. Galbiati[1,2]
[1]Vita-Salute San Raffaele University, Milan, Italy, [2]IRCCS San Raffaele Scientific Institute, Department of Clinical Neurosciences, Neurology – Sleep Disorders Center, Milano, Italy, [3]Cardiff University Brain Research Imaging Centre (CUBRIC), School of Psychology, Cardiff, United Kingdom

Introduction: Sleep provides a time window for reactivation and reorganization of the neuronal circuits that are activated during the diurnal emotional experience. Rapid Eye Movement (REM) sleep plays an important role in this emotional processing, specifically on the overnight emotional modulation. However, when REM sleep is disrupted, as with phasic events and frequent awakenings, its role in emotion regulation is hindered. The aim of this project is to assess the role of REM sleep in the emotion regulation process and to evaluate the overnight modulation of emotional reactivity and the impact of Targeted Memory Reactivation (TMR) in the elderly.

Materials and methods: The experiment design consists of a single overnight session. Participants perform an arousal rating task before and after sleep, in which participants rate emotionally neutral and negative IAPS pictures, each associated with a semantically associated auditory tone. Sleep is recorded using polysomnography, and half of the sample receive auditory TMR during REM.

Results: 19 subjects have been enrolled. 10 participants were included in TMR protocol, blinded to their condition (mean age 62.4 ± 6.91, 3M). The remaining 9 participants did not receive TMR (mean age 60 ± 6.33, 4M). Results revealed that overnight habituation decreased with increases in arousals and awakenings during REM ($r = -0.71$; $p < 0.05$). Moreover, REM latency negatively correlated with the overnight habituation ($r = -0.93$; $p < 0.01$). Of note, the positive correlation between REM duration and overnight habituation ($r = 0.67$; $p = 0.07$) and the negative correlation between REM density and overnight habituation ($r = -0.67$; $p = 0.07$) were close to significance. Our results support a main role of REM sleep in emotional processing. Instead, no significant effect of TMR on the overnight modulation of emotional reactivity was observed.

Conclusions: This study shed light on the role of REM sleep in modulating daytime response to emotional stimuli and it may provide an insight regarding the insurgence of daytime mood impairment during aging.

Repetitive content and clinical reproducibility of anesathesia dreams reported in breast cancer surgical patients

M. Shull[1], S. Strowd[2], P. Sikka[3], B. Heifets[2], H. Chow[2]
[1]Stanford Health Care, Department of Anesthesiology, Stanford, United States, [2]Stanford Medical School, Department of Anesthesiology, Stanford, United States, [3]Stanford University, Department of Psychology, Stanford, United States

Introduction: The phenomenon of dreaming with surgical anesthesia is frequently observed but poorly understood. We systematically studied patients undergoing surgical procedures related to breast cancer, a population who often reports dreaming at our institution, seeking to characterize the type of dream content reported with surgical anesthesia.

Materials and methods: We investigated 350 breast cancer surgical patients at Stanford Medical Center with selected surgeons and anesthesia providers from August 2022 through June 2023. Patients ranged from 19 to 89 years of age, mean age was 54.5 years old (SD 13.7 years).
A common anesthetic (**T**otal **I**ntra**V**enous **A**nesthesia or **TIVA**) template was followed using a medication protocol primarily based on intra-operative infusion of propofol and remifentanil anesthesia employing EEG-guidance (Massimo Sedline EEG) to closely monitor depth of anesthesia. This medication and monitoring template was used to minimize intra-operative movement and post-operative side effects to surgical anesthesia such as post-operative nausea (PONV) and prolonged post-operative sedation.
A pre-emergent anesthetic state was attempted to be maintained by TIVA anesthetic titration for at least 5 minutes under EEG guidance. Patients were awoken from anesthesia either by spontaneously opening their eyes or when their frontal EEG indicated a particular state of arousal: a sudden reduction in alpha power followed by a sudden increase in higher beta power.
A Stanford Hospital IRB-approved awareness and dream interview survey was administered by anesthesia providers immediately (within 5 minutes) upon anesthesia emergence in the operating room and/or in the post-anesthesia care unit. Patients were excluded if unable to immediately respond to survey (i.e. excessive sedation). The survey contained questions about the presence and emotional content of dreaming during anesthesia.

Results: Of the 350 patient surveys, 237 (67.7%) reported experiencing dreams after anesthesia, of whom 192 patients (54.8%) reported recall of dream content. Recalled dreams were categorized into *only* 4 general groups of content : 116 dreams were primarily focused on *loved ones* (people or pets); 38 reported *work/project-based* dreams; 30 reported being *alone and/or in a safe space*; and 8 reported interacting *with medical providers* involved with their care. Of the 192 recalled dreams, only 2 dreams were reported as "*negative*" dreams with the remaining dreams characterized as "*positive or neutral dreams*" and were in general, clinically perceived to reduce patient anxiety. There were *no* cases of intra-operative surgical awareness reported by any patient.

Conclusions: Our findings suggest that dreaming related to surgical anesthesia in breast cancer patients is a clinically reproducible anesthetic process that results in repetitive dream content. These dreams may reflect a common response to psychological stress experienced by these patients related to breast cancer diagnosis, prognosis and therapy. Reproduction of an anesthetic dream state in surgical patients appears to provide an anxiolytic effect. These findings suggest that anesthesia dreams may serve an emotional regulation function and contribute to post-surgical adaptive emotional functioning.

Sleep and cognition: multidomain analysis

I. Filchenko[1,2], A.K. Eberhard-Moscicka[3], S. Duss[1], M. Aktan Süzgün[1], C. Bernasconi[1], M.H. Schmidt[1], C.L.A. Bassetti[1]

[1]Inselspital, University Hospital Bern, Department of Neurology, Bern, Switzerland, [2]University of Bern, Graduate School for Health Sciences, Bern, Switzerland, [3]University of Bern, Department of Psychology, Bern, Switzerland

Introduction: Sleep plays a pivotal role in cognition: good sleep is important for normal cognitive performance, whereas sleep-wake disorders are linked to cognitive dysfunction [Kong, 2023]. While multiple studies investigated associations between sleep and cognition, most of them focused on self-reported sleep characteristics and global cognitive functioning [Qin, 2023]. To date, little is known about the association of the novel measures of sleep microarchitecture and nocturnal heart rate variability with different cognitive domains. We aimed to explore the associations of sleep characteristics with multiple cognitive domains.

Materials and Methods: The "Sleep and cognitive functioning" study included volunteers in good or excellent health condition (Eastern Cooperative Oncology Group grade of 0-1). Known pre-existing brain damage (e.g., previous stroke, neuroinfection, tumors), progressive neurological diseases, known psychiatric diseases, concomitant benzodiazepine medication, drug abuse and pregnancy were exclusion criteria. Demographics, medical history, subjective sleep parameters (Pittsburg Sleep Quality Index, Epworth Sleepiness Scale, Fatigue Severity Scale, Insomnia Severity Index, Morningness-Eveningness Questionnaire), sleep architecture by actigraphy and polysomnography (PSG electroencephalography was recorded either with 256 electrodes or 6 electrodes in 50% of participants), nocturnal heart rate variability and cognition were assessed at study inclusion. Cognitive assessment included tests of verbal memory (Digit Span Test, DST forward; Hopkins Verbal Learning Test, HVLT), visual memory (Corsi Block Tapping Test, CBT; Brief Visuo-spatial Memory Test, BVMT), executive functioning (DST backward, Victoria Stroop Test, Go/no-Go task) and attention (Bells Test; Alertness Task, Psychomotor Vigilance Test, PVT). Associations between cognitive parameters as dependent variables and sleep parameters as independent variables were explored using multiple linear regression with adjustment for age and sex.

Results: 56 participants were included showing a median age of 53.9 years old (interquartile range ,IQR [35.7, 65.1]); 57% men; median actigraphic total sleep time of 8.0 hours (IQR [7.4, 8.5]); median polysomnographic sleep efficiency of 75.2% (IQR [62.1, 83.7]); median apnea-hypopnea index of 7.3/h (IQR [1.8, 16.7]).

Visual memory was associated with interdaily stability (BVMT total recall: -17.51 points, p=0.027), sleep spindle (SS) density (CBT span: 0.16 points, p=0.033), slow wave (SW) amplitude (BVMT total recall: 0.24 points, p=0.008) and NREM3 central beta power (BVMT delayed recall: 102.86 points, p=0.047).

Verbal memory was associated with morning preference (HVLT immediate recall: -0.18 points, p=0.035), standard deviation (SD) 1/SD2 of Poincare plot of nocturnal HRV (DST span forward: 1.28 points, p=0.016), SS density (DST span forward: 0.20 points, p=0.008), SW amplitude (HVLT immediate recall: 0.28 points, p=0.031) and NREM3 central alpha power (HVLT delayed recall: 3.21 points, p=0.037).

Executive functioning was associated with SS density (DST span forward: 0.32 points, p=0.008) and REM frontal gamma (Go/no-Go task reaction time: -1624.44 ms, p=0.034).

Attention was associated with high SW amplitude (PVT: -0.18 lapses, p=0.001).

Conclusions: Objective sleep parameters were associated with all investigated cognitive domains, whereas subjective sleep parameters had limited associations with cognition. These results confirm previous findings about the importance of sleep for cognition and expand our understanding of the link between cognition and electroencephalographic spectral power, nocturnal heart rate variability and NREM oscillations.

Sleep disrupts complex spiking dynamics in the neocortex and hippocampus

J. Gonzalez[1], M. Cavelli[1], A. Tort[2], P. Torterolo[1], N. Rubido[3]
[1]Universidad de la Republica, Facultad de Medicina, Departamento de Fisiologia, Montevideo, Uruguay, [2]Brain Institute, Federal University of Rio Grande do Norte, Natal, Brazil, [3]University of Aberdeen, King's College, Institute for Complex Systems and Mathematical Biology, Aberdeen, United Kingdom

Introduction: The complexity of electroencephalographic signals decreases during slow-wave sleep; however, the underlying neural mechanisms remain elusive.

Materials and Methods: Here, we analyse *in-vivo* publically available recordings from neocortical and hippocampal neuronal populations during wakefulness and sleep.

Results: We show that the complexity decrease is due to the emergence of synchronous neuronal DOWN states. Namely, we find that DOWN states during SWS force the population activity to be more recurrent, deterministic, and less chaotic than during REM sleep or wakefulness, which, in turn, leads to less complex field recordings. Importantly, when we exclude DOWN states from the analysis, the recordings during wakefulness and sleep become indistinguishable: the spiking activity in all the states has a universal scaling, collapsing to a power law compatible with critical phenomena. We complement these results by implementing a critical branching model of the cortex, which shows that inducing DOWN states to only a percentage of neurons is enough to generate a decrease in complexity that replicates SWS.

Conclusions: We conclude that DOWN states fully account for the complexity decrease during SWS, while a common underlying spiking regime describes all sleep-wake states in the neocortex and hippocampus.

Sleep Problems and Emotional/Behavioral problems in Gifted School-aged Children

J. Sun[1], G. Wang[2,3,4], F. Jiang[2,3,4]
[1]Shanghai Jiao Tong Univeristy, Shanghai Mental Health Center, Shanghai, China, [2]Department of Developmental and Behavioral Pediatrics, Pediatric Translational Medicine Institute, National Children's Medical Center, Shanghai Children's Medical Center, School of Medicine, Shanghai Jiao Tong University, Shanghai, China, [3]MOE-Shanghai Key Laboratory of Children's Environmental Health, Xinhua Hospital, School of Medicine, Shanghai, China, [4]Shanghai Center for Brain Science and Brain-Inspired Technology, Shanghai, China

Introduction: Previous research had explored the differences in daytime functioning and nighttime sleep problems between gifted children and typically developing children. However, there had been no research that further divided gifted children into different levels of giftedness. This study hypothesized that children with different levels of giftedness would have different sleep needs and behavioral characteristics.

Materials and Methods: The study's participants were 80 children aged 6 to 11 (50% boys) from Shanghai Experimental School. Giftedness was assessed by the Wechsler Intelligence Scale for Children – Fourth EditionWISC-IV. Participants with scores below 130 were classified as the typical development (TD) groupN=16), those with scores ranging from 130 to 145 were classified as the gifted(G) group (N=38), and those with IQ scores above 145 were classified as the highly gifted (HG) group (N=26). Sleep was evaluated subjectively with the Children's Sleep Habit Questionnaire (CSHQ) and objectively using Actiwatch. The Strengths and Difficulties Questionnaire (SDQ) measured emotional and behavioral functioning.

Results: Results indicated that as the IQ level increased, the proportion of sleep problems and total scores of CSHQ decreased. Compared with the HG group (46%), the proportion of sleep problems is higher (p=0.044) in the gifted (G) group (68.4%) and TD group (81.3%). HG group scored the lowest on the CSHQ, they had less sleep duration (p=0.015) and daytime sleepiness (p=0.028) problems. But no significant differences were found in objective sleep parameters and SDQ scores.

Conclusions: The results showed that children with higher levels of giftedness had fewer sleep problems, particularly regarding sleep duration and daytime sleepiness. However, objective sleep recordings did not reveal any differences in sleep parameters among the groups, which suggests that differences in sleep needs may exist among children with different levels of giftedness. Surprisingly, there were no differences among the three groups in terms of daytime emotional and behavioral problems. Our findings suggest the need for personalized sleep recommendations for highly gifted children.

Subjective sleepiness better predicts effort-related cardiovascular response than sleep duration per se

L.N. Wuest[1,2], C. Cajochen[1,2], R. Lasauskaite[1,2]
[1]Psychiatric Hospital of the University of Basel, Centre for Chronobiology, Basel, Switzerland,
[2]University of Basel, Reseach Platform Molecular and Cognitive Neurosciences, Basel, Switzerland

Introduction: In two experimental studies, we investigated the impact of sleep duration and light intensity on effort-related cardiovascular response. As suggested by Brehm`s motivation intensity theory, invested effort should be proportional to the experienced task demand as long as the required effort is justified, and effort investment should cease when the level of justified effort is exceeded. Effort should manifest as sympathetic impact on the heart and can be assessed non-invasively through the cardiac pre-ejection period (PEP). Systolic blood pressure (SBP) is also a main indicator of sympathetic reactivity. We hypothesized that sleep restriction as well as lower light intensity should lead to higher effort-related cardiovascular response.

Materials and Methods: All participants were healthy and aged between 18 and 35 years. Thirty-six participants (22 women) were included in Study 1 and 24 participants (16 women) in Study 2. We manipulated sleep duration during the night (5h vs. 8h, within subjects) and light intensity during an experimental session (Study 1: 1 lux vs. 100 lux, between subjects; Study 2: 100 lux vs. 500 lux, within subjects). All experimental sessions were scheduled 2h after habitual wake time. In Study 1, experimental sessions comprised an 8-min baseline period, a 15-min light exposure period, and a 5-min auditory 2-back task, while being exposed to one of the light conditions. In Study 2, participants performed a modified auditory Sternberg task and there were two blocks of light exposure and cognitive task per session, one for each light intensity. Additionally, we assessed subjective sleepiness using the Karolinska Sleepiness Scale.

Results: Subjective sleepiness was higher in the sleep restriction condition in both studies (Study 1: β=2.138, SE=0.470, t(26.364)=4.553, $p < .001$; Study 2: β=1.708, SE=0.435, t(69)=3.924, $p<.001$), but was not influenced by light intensity (both $ps>.135$). In Study 1, there were no significant effects of sleep duration or light intensity on effort-related cardiovascular response (cardiac PEP and SBP). In a post-hoc analysis, we categorized participants into a low and a high sleepiness group according to the median of sleepiness rating. We found a significant difference in PEP change score during the first minute of task performance (β=-2.556, SE=1.244, t(53.632)=-2.055, p=.045, R^2=.064), indicating that less sleepy participants invest effort during task performance while more sleepy participants disengage. In Study 2, sleep restriction led to stronger SBP reactivity during task performance (β=1.639, SE=0.705, t(59.186)=2.324, p=.023, R^2=.042). There were no significant effects of light. Subjective sleepiness was significantly associated with SBP reactivity (β=0.422, SE=0.148, t(73.686)=2.845, p=.006, R^2=.084). These results indicate that sleepier participants exert higher effort during task performance in Study 2.

Conclusions: Overall, subjective sleepiness appears to be a better predictor of effort-related cardiovascular response during cognitive task performance than sleep duration, as indicated by higher explained variance. A priori determination of the magnitude of effort manipulation is impossible, sleepiness lead to higher effort mobilization in Study 2 and disengangement in Study 1. Subjective sleepiness reflects, among other factors, individual coping with lack of sleep and as such should be more informative for the implicit evaluation of task demand.

Thalamus: hub for autonomic regulation, sleep and cognition

I. Filchenko[1,2], A.K. Eberhard-Moscicka[3], C. Gutierrez Herrera[1,4], M. Aktan Süzgün[1,5], J.L. Picard[1], C. Bernasconi[1], M.H. Schmidt[1], C.L.A. Bassetti[1]

[1]Inselspital, University Hospital Bern, Department of Neurology, Bern, Switzerland, [2]University of Bern, Graduate School for Health Sciences, Bern, Switzerland, [3]University of Bern, Department of Psychology, Bern, Switzerland, [4]Inselspital, University Hospital Bern, Department of Biomedical Research (DBMR), Bern, Switzerland, [5]Istanbul University-Cerrahpasa, Department of Neurology, Istanbul, Turkey

Introduction: Recent evidence points to the involvement of the thalamus in the regulation of sleep oscillations and cognition [Scharf, 2022; Jaramillo, 2021; Mensen, 2018]. However, the involvement of the thalamus in autonomic regulation that may contribute to its role in sleep and cognition remains unclear. We aimed to investigate the differences in sleep, cognition and nocturnal heart rate variability (HRV) as a marker of autonomic functioning in patients with isolated thalamic stroke (TS) versus non-stroke control group.

Materials and Methods: We included 16 patients (1832 screened) with acute TS (age 68.07 [58.19, 70.56] years, 11 (68.8%) men, apnea-hypopnea index (AHI) 9.40 [5.00, 23.15] events/h, modified Rankin Scale at discharge 0 [0, 1] points) and 32 control volunteers (845 screened; age 60.52 [52.05, 67.80] years, 21 (65.6%) men, AHI 14.12 [3.39, 21.55] events/h) matched at the population level by age, sex and AHI. Demographics, medical history, sleep architecture assessed by actigraphy and polysomnography (electroencephalography was recorded with 256 electrodes in TS and either with 256 (n=17) or 6 electrodes (n=15) in control group), nocturnal HRV and cognition (tests of object naming, selective attention, working, visual and verbal memory) were assessed at study inclusion. In a subset of TS patients (n=5) sleep, cognition and HRV were reassessed at subacute/chronic stroke (91-450 days).

Results: Compared to control group, TS patients exhibited deficits in selective attention (Bells test completion time: 2.81 [2.33, 3.40] vs. 1.65 [1.33, 2.01] minutes, $p<0.001$), working memory (Digit Span Test backward, span, 3.00 [2.50, 4.00] vs 4.00 [4.00, 5.00] points, $p=0.004$) and verbal memory (Hopkins Verbal Learning Test, immediate recall: 17.00 [13.00, 19.25] vs. 23.50 [20.75, 28.00] points, $p<0.001$).

Moreover, compared to control group, TS patients had longer actigraphic sleep duration (9.49 [8.40, 10.15] vs. 7.90 [7.37, 8.53] hours, $p=0.001$) and higher HRV (standard deviation of NN intervals: 216.72 [122.75, 257.49] vs. 75.68 [67.18, 89.87] ms, $p<0.001$).

The analysis of sleep microarchitecture indicated a lower cyclic alternating pattern index (15.17 [13.12, 15.79] vs. 21.26 [18.14, 23.46] events/hour, $p<0.001$), lower slow wave density (7.59 [6.39, 8.41] vs. 9.17 [7.45, 10.47] events/min, $p=0.016$) and lower spindle density (2.21 [1.52, 3.28] vs. 3.13 [2.24, 4.26] events/min, $p=0.044$) in TS patients compared to control group. Additionally, compared to control group, electroencephalographic spectral power was bilaterally decreased in TS patients, with ipsilateral side being largely affected: NREM2 alpha (0.77 [0.31, 1.27] vs. 1.52 [1.03, 2.32] uV^2/Hz, $p=0.011$), REM beta (0.09 [0.05, 0.13] vs. 0.15 [0.10, 0.19] uV^2/Hz, $p=0.034$).

Correlation analysis demonstrated distinct patterns of the associations between autonomic, sleep-wake and cognitive parameters in TS versus control group. Specifically, in TS, sleep microarchitecture was associated with cognitive functioning ($p<0.05$), while such associations were not significant in control group ($p>0.05$).

In the assessed subacute/chronic TS patients (n=5), the recovery from acute to subacute/chronic phase seemed poor.

Conclusions: These findings support previous knowledge about the regulatory role of the thalamus in NREM sleep and cognition and extend our understanding on its involvement in autonomic regulation and REM sleep.

The Budapest Sleep, Experiences, and Traits Study: an accessible resource for understanding associations between daily experiences, individual differences, and objectively measured sleep

P. Ujma[1]
[1]Semmelweis University, Institute of Behavioural Sciences, Budapest, Hungary

Introduction: Despite high interest in studying and improving sleep, relatively little is known about which daily experiences influence sleep and how, or how poor sleep affects next day's affect or behaviors. The difficulty of understanding these relationships arises from the fact that such relationships are bidirectional in nature, may be differently associated with subjectively and objectively assessed sleep, and may also be modulated by individual differences.

Materials and Methods: To address these challenges, we designed the Budapest Sleep, Experiences, and Traits Study (BSETS), a multidisciplinary observational sleep study also utilizing novel remote EEG devices for an objective assessment of sleep. BSETS is a sample of over 250 healthy participants who are studied in a naturalistic setting using a large questionnaire assessing psychological, demographic, and anthropometric information, as well as evening/morning diaries of sleep and daily experiences, and mobile EEG recordings over a period of 7 days.

Results: To demonstrate the capabilities of BSETS and as a proof of concept, we demonstrate that 1) self-reported sleep timing correlates highly with both diaries and EEG assessments, 2) self-reported sleep quality in the morning is affected by EEG-assessed sleep latency, WASO and sleep efficiency, 3) alcohol consumption reduces sleep latency, but sexual activity doesn't change objectively measured sleep characteristics, 4) quantitative EEG in BSETS is of adequate quality, as delta and spindle spectral peaks and the negative correlations between these and age are clearly present.

Conclusions: BSETS is a powerful dataset to study bidirectional associations between sleep and daily experiences, as well as correlations between normal and pathological traits and sleep characteristics. Upon its completion, this dataset will be accessible to the wider scientific community and can be utilized to investigate the complex multidirectional relationships between objectively and subjectively measured sleep, daily experiences, and individual differences, bestowing it with significant value for sleep researchers as well as practitioners working in clinical settings with patients suffering from disordered sleep.

The effect of sleep deprivation on food choice certainty: a pilot study

A. Bazzani[1], P. Frumento[2], P. Nguyen[1], S. Ravaioli[3], G. Turchetti[1], U. Faraguna[4,5]
[1]Sant'Anna School of Advanced Studies - Pisa, Institute of Management, Pisa, Italy, [2]University of Pisa, Department of Political Sciences, Pisa, Italy, [3]Columbia University, Department of Economics, New York, United States, [4]University of Pisa, Department of Translational Research and New Technologies in Medicine and Surgery, Pisa, Italy, [5]Istituto di Ricovero e Cura a Carattere Scientifico (IRCCS) Fondazione Stella Maris, Department of Developmental Neuroscience, Pisaita, Italy

Introduction: Sleep is vital for decision-making, including food choices. Sleep deprivation harms cognitive function, emotions, and well-being, leading to unhealthy habits like overeating. Our study explores how sleep influences food decisions, examining the effect of sleep deprivation on snack consumption.

Materials and Methods: Building upon Rangel et al.'s (2011) study, our experiment examines food decision-making under different conditions, including time given to decide, the number of alternatives presented, and sleep condition. We enrolled 47 participants (23.46 ± 2.8 years old, 17 females), of which 38 experienced regular sleep, and 9 were assigned to four conditions: before and after a night of regular sleep (pre-RS and post-RS), and before and after a night of total sleep deprivation (pre-SD and post-SD). Sleep was monitored using wrist actigraphy for seven nights prior to the experiment. Participants completed a questionnaire and engaged in two activities: rating 70 Italian snacks on a scale between -5 and +5, presented as randomized visual stimuli (60 trials) with snack matrices of varying sizes (4, 9, or 16 items). The time available for each trial was indicated by coloured frames: blue (5 seconds), red (3 seconds), or yellow (1 second). After each trial, participants rated their certainty regarding their choice on a scale from 1 to 5.

Results: A linear mixed-effects regression model revealed that sleep condition significantly influenced choice certainty. Participants in all sleep conditions, compared to post-RS, exhibited significantly lower certainty when making decisions ($\beta = -0.22$, $p = 0.003$ for pre-RS; $\beta = -0.22$, $p = 0.006$ for pre-SD; $\beta = -0.32$, $p = 0.0005$ for post-SD). Additionally, longer decision time and fewer alternatives were associated with higher certainty ($\beta = 0.46$, $p < 0.0001$; $\beta = -0.035$, $p < 0.0001$, respectively). Regarding the between-individuals variance in the coefficients associated to certainty, the post-SD condition showed the highest variance (0.04 for post-SD vs. 0.03 for pre-SD vs. 0.02 for pre-RS), compared to the reference value of pre-RS. Furthermore, increasing certainty was negatively associated with the likelihood of changing taste preference from salty to sweet or vice versa compared to a baseline preference ($\beta = -0.54$, $p < 0.0001$). All sleep conditions, compared to pre-RS, were negatively associated with a change in taste preference, with post-SD reaching statistical significance ($\beta = -0.15$, $p = 0.02$). The probability of switching from salty to sweet was 46%. These results were confirmed when including all participants (i.e., also using those with the pre-RS condition only). Gender and age did not significantly predict choice certainty or change in taste preference in the whole sample.

Conclusions: This study offers valuable insights into how sleep conditions, as an internal state, impact food choice. While the ongoing nature of the study limits its generalisability, these findings hold promise for future research addressing intra-individual and inter-individual physiological differences in unhealthy behaviours from a public health perspective.

The effects of partial sleep deprivation on adaptive cognitive control

M. Calderan[1], A. Visalli[2], R. Sellaro[1], N. Cellini[3]
[1]University of Padova, Department of Developmental Psychology and Socialisation, Padova, Italy, [2]IRCCS San Camillo Hospital, Venice, Italy, [3]University of Padova, Department of General Psychology, Padova, Italy

Introduction: Lack of sleep can have a significant impact on daily life, particularly on the cognitive functions that govern goal-oriented behaviors. When regularities are detected in the environment, it is possible to predict the demands for control, as they now become expected. Remarkably, the adaptation of control, facilitated by the repetition of stimuli and responses, seems to be unaffected by sleep deprivation. Here we present preliminary data from an ongoing study where we assess how partially sleep-deprived individuals learn regularities in a predictable yet uncertain environment, and to what extent their behavior is supported and/or hindered by their build-up expectations.
Materials and Methods: Participants were randomly assigned to undergo either an 8-hour (well-rested, WR, n=18) or a 4-hour (sleep-restriction, SR, n=17) sleep period before performing a Go/No-Go task at 10.30-11.30 a.m.. Participants' sleep was monitored via actigraphy and subjective measures. The task consisted of 12 blocks in which, unbeknownst to participants, the proportion of Go vs. NoGo trials was systematically varied (i.e., 20%-80%, 80%-20%, or 50%-50%). Reaction times (RT) data from Go-trials were analyzed with a generalized-multilevel-model including Condition (WR vs. SR), Go-Probability (20%-50%-80%), TaskTime (first or second half of the task), and their interaction as predictors. A binomial-logistic regression was used to model accuracy (ACC) data from No-Go trials, with the same predictors as those for the RT analysis.
Results: The analysis of RT revealed that the probability of a Go response had an effect on both groups, with participants responding faster as the probability of Go increased. This effect was less pronounced in the first half of the task compared to the second half for the WR group, suggesting the presence of meta-learning. No evidence of meta-learning was instead observed in the SD group. Regardless of the Go-Probability, the SD group experienced a slowdown in RTs from the first to the second half of the task. As for WR participants, this effect was evident in low-Go-Probability but not high-Go-Probability trials. In terms of ACC, results showed only an effect of Go-Probability, with lower accuracy as the probability of Go increased. That is, in both groups inhibitory deficit arose only when the prepotent response was "Go".
Conclusions: Preliminary results suggest that acute sleep deprivation could potentially alter the learning mechanism responsible for behavioral adaptation. Although the task structure is initially unknown to participants, as blocks with varying Go-Probabilities are repeated, participants can learn and adaptively update their expectations. This is evident in the case of the WR group, where the effect of Go-Probability increased in the second half of the task compared to the first half. In contrast, for the SD group, the Go-Probability effect did not substantially vary, potentially indicating a different learning style. This possibility will be further explored with a Hierarchical Bayesian model for individual learning under uncertainty. Noteworthy, our sleep restriction did not impair inhibitory control.

The impact of daytime sleep on emotional memory consolidation and reactivity

C. Colombo[1], J. Ongaro[1], V. Venturi[1], B. Dal Grande[1], L. Viselli[2], A. D'Atri[2], M. Ferrara[2], N. Cellini[1]
[1]University of Padova, Department of General Psychology, Padova, Italy, [2]University of L'Aquila, Department of Biotechnological and Applied Clinical Sciences, L'Aquila, Italy

Introduction: Several studies have suggested that sleep plays a role in emotional memory processing, facilitating the consolidation of emotional memories and modulating emotional reactivity to these stimuli. However, recent studies on sleep and emotional memory processing are yielding conflicting results. In particular, so far there is no consensus in the literature on whether physiological changes can be appreciated even after short periods of sleep.

Materials and Methods: In this study, we investigated the effects of a daytime nap on the consolidation of pictures with different emotional content. We also investigated changes in emotional reactivity both on a subjective and psychophysiological level. Thirty-two healthy subjects (F=22, 23.4±2.8 years) were assigned to a SLEEP (n=14) or a WAKE (n=14) group. Participants were shown 28 images with different emotional content (14 neutral and 14 negatives), before (T0), either after a nap of a maximum of 90 minutes or after an equivalent period of wakefulness (T1), and 48 hours after the first test (T2). Heart rate and skin conductance were also measured in each session. For each image, the participant had to give an evaluation in terms of valence and arousal. The memory task consisted in a learning phase, in which 80 images (40 neutral and 40 negatives) were presented, and in three test phases (T0, T1, T2) in which the participants were exposed to 120 pictures (60 neutral and 60 negatives), half of them novel and the other half already presented during the encoding, and they had to indicate whether the image was new or old.

Results: The results showed a reduction in mean skin conductance responses in the stimulus presentation window (0-6 seconds) between sessions T0 and T1 for the SLEEP group. The cardiac deceleration response was more pronounced for the negative than neutral pictures for both experimental groups. At the subjective level, negative stimuli were rated as less pleasant and more arousing than neutral ones, but these ratings did not differ between groups and did not change across testing sessions. The results obtained from the memory test suggest that participants who had taken a nap had a greater memory consolidation, in particular for negative pictures, compared to the WAKE group. All these differences were no longer present after 48 hours from the first session.

Conclusions: The present preliminary data seems to confirm the active role of sleep in the consolidation of pictures with emotional content, even after a daytime nap. This data also suggest that sleep may be implicated in reducing physiological activation (i.e., sympathetic-mediated arousal) related to stimuli with negative content.

The impact of sleep deprivation on sustained attention, mind wandering and sleep-like activity in wakefulness

M. Degrave[1], J. Manousakis[2], C. Anderson[2], T. Andrillon[1]
[1]Institut du Cerveau - Paris Brain Institute - ICM, Mov'it team, Paris, France, [2]Turner Institute for Brain and Mental Health and School of Psychological Sciences, Monash University, Monash, Australia

Introduction: When focusing on everyday tasks, our attention can sometimes wander off, leading to attentional lapses. These fluctuations of attention can be divided into mind-wandering, in which the subject's attention is focused on internally generated thoughts unrelated to the ongoing task, or mind-blanking, where nothing is going on in our mind. Previous studies have shown that mind-wandering and mind-blanking are associated with the occurrence of spatially and temporally localized sleep-like slow waves in healthy non-sleep deprived individuals. In this study, we wanted to determine how sleep deprivation impacts cognitive performance in a sustained attention task, as well as the occurrence of mind wandering and mind blanking. Finally, we sought to examine the link between the attentional consequences of sleep deprivation and the presence of sleep-like slow waves in awake but sleep-deprived individuals.

Materials and methods: Fifteen participants underwent a 24h sleep deprivation procedure, while being continuously recorded with high-density electroencephalography (hd-EEG). Every 2h, they performed a Sustained Attention to Response Task (SART), during which they were regularly interrupted and asked to report the focus of their attention (on-task, mind wandering and mind blanking), and their vigilance level. From the EEG recordings we detected the occurrence of sleep-like Slow Waves during the task.

Results: Without sleep deprivation, participants spent 65% of the time focusing on the task, 17% thinking about something else (Mind Wandering) and 18% thinking about nothing (Mind Blanking). After 24h sleep deprivation, the proportion of on-task and mind-wandering reports fell to 15% and 12% respectively, while mind-blanking increased to 60%. As predicted, MW was associated with impulsivity (faster responses, more commission errors) and MB with sluggish responses (slower responses, more omission errors). EEG analysis showed that the occurrence of sleep-like slow waves increased with time spent awake, paralleling the increase in subjective fatigue. Furthermore, slow waves predicted impulsive behaviours (mind wandering, commission errors) when detected over frontal electrodes and predicted sluggish behaviour (mind blanking, omission errors) when detected over occipital electrodes.

Conclusions: Our results show how sleep deprivation can affect both sustained attention and the stream of conscious thoughts. The distinct location of sleep-like slow waves preceding mind-wandering and mind-blanking in sleep-deprived individuals suggests that these potential markers of sleep intrusions represent a putative mechanism for the cognitive consequences of sleepiness. This work could thus lead to the online detection of attentional lapses associated in real-life settings.

The relationship between sleep EEG and cognitive performance in a diverse sample of older adults: the DISCO Study

T. Taporoski[1], K. Harrington[1], S. Alexandria[1], A. Milstead[1], F. Sorond[1], M. Carnethon[1], K. Knutson[1]
[1]Northwestern University, Feinberg School of Medicine, Chicago, United States

Introduction: Quantitative power spectral analysis of electroencephalographic (EEG) frequency band parameters are potential markers of cognitive function. Most studies investigating the association between sleep and cognition are conducted in laboratory settings, and there is a lack of data from the general population outside of clinical environments. This study aimed to examine the association between several cognitive domains and spectral power derived from at-home sleep EEG.

Materials and Methods: The sample comprised 140 older adults (mean age = 69.3 years, range = 56-82 years; 57% women) residing in Chicago or neighboring areas. Cognitive performance was assessed using four NIH Toolbox measures: List Sorting, Pattern Comparison, Picture Processing, and Flanker Task. Additionally, the time to complete the Trails Making Test A and B was recorded. At-home sleep EEG data were collected using Sleep Profiler device (Advanced Brain Monitoring). Spectral power within the slow oscillation (0.5 to <1 Hz), delta (1 – 4 Hz), theta (4 – 8 Hz), alpha (8 – 12 Hz), sigma (12 – 15 Hz), beta (15 – 30 Hz) and gamma (30+ Hz) frequency bands were measured in microvolts (µV) and obtained using LunaR. Quantification of the spectral power is the average of the N2+N3 epoch-level estimates. Linear regression models were fit for the NIH Toolbox measures, while Negative Binomial regression models (with a log link) were used to model the Trails test time outcomes. All models adjusted for age (continuous), gender (men/women), and education level (years of schooling).

Results: Higher sigma power and lower theta power were associated with more efficient alternate attention as measured by the Trails B test. A one-SD increase in theta power (SD = 5.7 µV) was associated with an 18.6% increase in Trails B completion time (p < 0.01) while a one-SD increase in sigma spectral power (SD = 1.8 µV) was associated with an 11.8% decrease in Trails B completion time (p = 0.02). Trails B completion time ranged from 22 to 713 seconds in the sample. Lower power in the gamma band was associated with better performance on the List Sorting Task; a one-SD increase in gamma power (SD = 0.04) was associated with a 0.27-point lower score on the task (p < 0.01). List Sorting Task scores ranged from 59 to 136 in the sample. Slow oscillation, alpha, beta, and delta spectral band power showed no associations with any cognitive domains.

Conclusions: The study found that increased sigma power, decreased theta power, and decreased gamma power in sleep EEG were each associated with better performance in tasks measuring working memory and mental flexibility. Therefore, sleep microarchitecture may serve as an important therapeutic target to preserve cognitive function, particularly in the executive domain, in older adults. Longitudinal studies are needed to validate our findings and investigate the mechanistic underpinning relating sleep microarchitecture to cognitive performance in the executive domain.

The relationship between university students' academic discipline and dysfunctional sleep attitudes on sleep quality and quantity

T. Kuhn[1], S. Karsan[2], J. Heisz[2], L. Middleton[1]
[1]University of Waterloo, Kinesiology and Health Sciences, Waterloo, Canada, [2]McMaster University, Kinesiology, Hamilton, Canada

Introduction: Sleep is critical for university students, as it is associated with academic performance and well-being. Many students report having poor sleep and it is important to understand what factors are contributing to that. Dysfunctional attitudes towards sleep and sleep hygiene may be modifiable factors associated with poorer sleep quality and quantity. Academic discipline may play a role in forming dysfunctional attitudes toward sleep, but this observation is based on limited research looking at medical versus non-medical students. The objectives of this study were to a) examine how sleep attitudes and habits vary between academic disciplines; b) Understand how academic discipline, sleep attitudes, and sleep hygiene are associated with sleep quality and quantity.

Materials and methods: A 20-minute survey was administered across all departments and faculties across two Canadian universities. Measures included the Dysfunctional Beliefs and Attitudes about Sleep (DBAS) scale, the Pittsburgh Sleep Quality Index (PSQI), the Insomnia Severity Index (ISI), and the Sleep Hygiene Index (SHI). Stress, anxiety, and depression severity were also recorded. Participants were asked to report their department and faculty, which were classified into four academic disciplines: 1) Health-related (including medicine), 2) Engineering (including computer science), 3) Arts (including fine arts, social sciences, and the humanities), and 4) Science (including Math). One-way ANOVA was used to compare descriptive characteristics. Multiple linear regression models were used to examine the independent effects of study discipline, sleep attitudes, and sleep hygiene on sleep, while controlling for demographic variables (age, sex, and university) and mental health.

Results: 1566 undergraduate and graduate students completed the survey. ANOVAs revealed students studying Arts –and to a lesser extent those studying Science – reported worse sleep quality and mental health than students studying Health. However, Engineering students had similar sleep quality and mental health compared to Health students. With respect to sleep attitudes, students studying non-health-related academic disciplines had significantly more severe dysfunctional attitudes towards sleep than students studying Health, only when controlling for demographic covariates and not mental health. Academic discipline did not significantly predict sleep quality and insomnia severity when considering sleep attitudes and sleep hygiene practices but did predict sleep duration in Engineers ($b = -0.21$, $p = 0.02$) and Art students ($b = 0.28$, $p < .01$). However, sleep attitudes significantly predicted sleep quality ($b = 0.46$, $p < .001$) and insomnia severity ($b = 1.14$, $p < .001$), while sleep hygiene predicted sleep quality ($b = 0.08$, $p < .001$), sleep duration ($b = -0.01$, $p < .001$), and insomnia severity ($b = 0.15$, $p < .001$).

Conclusions: This is one of the first studies to directly examine how sleep differs across academic disciplines. These results suggest that study discipline may influence sleep quality –but not sleep duration– through mental health, attitudes about sleep, and sleep hygiene practices. In general, the results confer with prior reports suggesting that students studying health-related disciplines may have an advantage over some of their non-health-related peers, suggesting the need for health-related education geared towards non-health-related disciplines.

The role of sleep and wakefulness in the consolidation of factual information

A. Gasparello[1], A. Baldassarri[1], G. Degasperi[1], N. Cellini[1]
[1]University of Padova, Department of General Psychology, Padova, Italy

Introduction: Among the various functions attributed to sleep, memory consolidation is one of the least questioned. However, the ideal time window between encoding and night sleep needed to consolidate – especially when declarative memory is assessed – is still a matter of debate. To further contribute to this topic, we compared the effect of both sleep and wakefulness on the consolidation of factual information, to highlight potential differences between these two conditions. Moreover, we tested whether a positive effect of sleep on memory consolidation remains stable after a subsequent period of wakefulness or whether a delayed sleep period could protect information from further decay. Lastly, we explored the relationship between sleep macrostructure and memory performance.
Materials and Methods: Fifty-two participants (24.27±4, 19 M) underwent both a SleepFirst (SF) and a WakeFirst (WF) conditions in a counterbalanced order. They were presented with a fact learning task, consisting of 60 facts from 20 locations across the world, at 9±1 PM (SF) or at 9±1 AM (WF), and three following recall tests (T0, T1, and T2, -immediately after the encoding, 12hr, and 24hr later, respectively), in which they had to recall a fact from each of the 20 locations presented before. In each condition, participants were presented with a different set of locations and questions, and accuracy was computed as the number of facts correctly recalled in each session. Memory performance was also calculated as the accuracy in each testing session relative to the previous one. Sleep parameters were recorded in the night following the encoding at participants' homes with a wearable device (Dreem Headband).
Results: No significant differences were found at the immediate test between the two conditions. After 12 hours, the SF group, who slept between T0 and T1, showed a significantly less detrimental memory performance than the WF group, suggesting a possible consolidation effect of the night sleep. Moreover, in the following 12 hours, the WF group, who slept between T1 and T2, showed a reduced detriment than SF, with the two groups reaching a comparable performance level at the end of the experiment (T2). Taken together, these two results might indicate a possible beneficial effect of sleep on memory, regardless of the time delay from the encoding phase to sleep. No associations were found between sleep parameters on the two experimental nights and the behavioural performance.
Conclusions: Our study showed a beneficial effect of sleep on declarative memory consolidation, either when it occurs just after the encoding of factual information or after a longer delay (i.e., more than 12hr). At the same time, wakefulness was always associated with a marked forgetting of the encoded materials. Our data seem to suggest that sleep may perform a protective action on information that has not been compromised by wakefulness interference.

The spectrum of conscious experiences during NREM sleep: there is more than what meets the eye

A. Michalak[1], D. Marzoli[1], D. Bergamo[1], F. Pietrogiacomi[1], V. Elce[1], B. Pedreschi[1], I. De Cuntis[1], G. Avvenuti[1], E. Ricciardi[1], G. Bernardi[1]
[1]IMT School for Advanced Studies Lucca, MoMiLab Research Unit, Lucca, Italy

Introduction: Upon awakening from sleep, individuals may report having had a conscious experience (CE) or indicate a lack of any subjective experience (NE) during their sleep. In some instances, they may report that they had an experience but are unable to recall its content (CEWR). It was suggested that this three-level classification may fail to capture the full spectrum of conscious experiences that one may have during sleep. For instance, CEWR could result either from forgetting a rich and complex dream (rCEWR) or from an unsuccessful encoding of a simple dream lacking in saliency (sCEWR). Moreover, NE instances may not necessarily indicate unconsciousness (UNC), as states similar to *mind blanking* during wakefulness (consciousness without content; CWC) might also occur during sleep. Given these premises, we investigated the relative frequency of CE, rCEWR, sCEWR, CWC and UNC instances during N2 sleep and explored their relationship with subjective sleep depth.

Materials and methods: Twenty-four healthy adults (12F, age 28 ± 5y) underwent four overnight high-density EEG (256 electrodes) recordings in combination with a serial awakening protocol. Awakenings were performed during stable N2 sleep using a loud alarm sound played 4-6s after auditory, tactile, visual, or sham stimulation. Here we focused on data obtained from the sham (no stimulus) condition. Upon awakening, participants were asked a series of pre-recorded questions related to their oneiric experience and subjective sleep depth. All participants received detailed, standardized instructions regarding the meaning of each question and were asked to practice answering them for at least one week.

Results: A total of 227 reports (9.58 ± 1.71 per subject) were collected. On average, $44 \pm 25\%$ of the reports were CE, $32 \pm 23\%$ were CEWR, and $25 \pm 20\%$ were NE. Among CEWR instances, sCEWR (71%) were more common than rCEWR (signed-rank test; FDR-p=0.05). Of all NE reports, 58% were confirmed to represent UNC instances, while the remaining cases were classified as CWC. Subjective sleep depth appeared to vary across the five experience categories following a V-shape relationship (rmANOVA; F=4.46, p=0.02). Indeed, self-reported sleep depth tended to decrease along CE, rCEWR, sCEWR, and CWC, while it was higher for UNC relative to both CWC (FDR-p=0.03) and sCEWR (FDR-p=0.03). This effect was not observed when the classical three-level categorisation of conscious experiences was used (rmANOVA; F=0.18, p=0.80). Further, in CE instances, higher vividness of dream experiences was associated with higher subjective sleep depth (rank-sum test; p=0.03).

Conclusions: Present results indicate that: i) conscious experiences during (NREM) sleep vary along a spectrum that may not be adequately captured by classical three-level classifications; ii) lack of a reported experience does not necessarily equate lack of consciousness; iii) white dreams are often associated with the impression of having had simple experiences that may have failed to be encoded; iv) subjective sleep depth increases when conscious experiences are more immersive or when consciousness completely fades out. These findings highlight the complexity and variability of conscious processes during NREM sleep.

Vigilance during recurrent variable and stable short sleep schedules in young adults

T. Koa[1], J. Gooley[1,2], M. Chee[1], J. Lo[1]
[1]National University of Singapore, Centre for Sleep and Cognition, Singapore, Singapore, [2]Duke-NUS Medical School, Neuroscience and Behavioural Disorders Programme, Singapore, Singapore

Introduction: Many individuals curtail their sleep on weekdays but attempt to compensate by extending their sleep on weekends. Previous partial sleep deprivation experiments have revealed cumulative vigilance decrement induced by having the same curtailed time-in-bed (TIB), i.e., a stable short sleep schedule, across nights. Importantly, even with an intervening period of recovery sleep that simulates weekend catch-up sleep, vigilance deficits are compounded upon re-exposure to sleep curtailment. However, intra-individual variability in TIB is common even in the context of sleep restriction. Here, we determined whether relative to a stable short sleep schedule, a variable short sleep schedule will result in similar or different levels of vigilance impairment.

Materials and methods: 53 young adults (age: 21-28; 26 males) participated in this 16-day, laboratory-based, between-group study. After 2 baseline nights of 8-h TIB, the stable short sleep group had a nightly 6-h TIB in the following 5 'weeknights' (66666). The variable short sleep group (84846) had the same total TIB of 30 h during the 'weeknights', although TIB alternated between 8 and 4 h in the first 4 'weeknights', and TIB on the last 'weeknight' was 6 h – same as the stable short sleep group – thereby, ruling out its contribution to any group difference in vigilance at the end of the 'work week'. The control group had a nightly 8-h TIB (88888). After 2 'weekend' recovery nights of 8-h TIB, the TIB manipulation repeated for another 5 'weeknights'. Vigilance was assessed using a 10-min Psychomotor Vigilance Task 5 times each day. Mixed models were used to determine the effects of group and day on the daily average number of lapses (responses exceeding 500 msec).

Results: The group × day interaction was statistically significant ($p<.001$). Vigilance of the control group remained at baseline level throughout the protocol ($p>.41$). For the stable short sleep group, the number of lapses was elevated from baseline after 2 nights of 6-h TIB, continued to increase in the first 'work week', showed no sign of recovery over the 'weekend' ($p>.28$), and was worse in the second than the first 'work week' on each corresponding 'weekday' ($p<.001$). In contrast, for the variable short sleep group, during the 'weekdays' in the first manipulation week, the number of lapses fluctuated and was tightly coupled with the TIB in the previous night, and vigilance impairment in the first and the second week was comparable ($p=.09$). Vigilance deficits were similar in the first 'work week' for both short sleep groups, but were less prominent in the variable than the stable short sleep group in the second 'work week' ($p=.03$).

Conclusions: When TIBs are limited on weekdays, a variable sleep schedule which allows for prophylactic and / or recovery sleep on some nights may mitigate vigilance decrement as compared with a schedule with no recovery opportunity. Nevertheless, optimal vigilance performance can only be achieved when nightly TIB is within the age-specific recommended range.

Chronobiology/Circadian Disorders

A case of misaligned clocks and an irregular sleep-wake cycle of an insomniac 9-year old patient with Wolf-Hirschorn syndrome. The rationale for a plausible role of mitochondrial LETM1

F. Dubourg[1,2], M. Meira e Cruz[3,4]
[1]Hospital Universitário Professor Edgard Santos, Salvador, Brazil, [2]Universidade Federal da Bahia, Salvador, Brazil, [3]Centro Cardiovascular da Universidade de Lisboa, Sleep Unit, Lisbon, Portugal, [4]Centro Europeu do Sono, Lisbon, Portugal

Wolf-Hirschorn Syndrome (WHS) is a rare deletion disorder caused by loss of material from the distal aspect of the short arm of chromosome 4. WHS affects at least 1/50,000 newborns, and presents a broad range of clinical manifestations. The high degree of variation in the clinical presentation of WHS is thought to be related with the size of the 4p deletion. While disturbed sleep, meaning insomnia, was described in some cases of WHS, patophysiological features linking such sleep difficulties to the typical chromosomal deletion are unknown. The mitochondrial cation exchanger LETM1 sparks interest because of its role on the seizures of WHS patients and Diurnal rhythms of LETM1 protein levels where documented in animal models in which mitochondrial nucleotide metabolism became deregulated in the absence of LETM1 with significant changes on the expression amplitude of circadian core clock genes. We report a case of a 9 year-old girl with WHS presenting with insomnia and a circadian disruptive pattern characterized by an irregular sleep-wake cycle. We rather discuss the link between the 4p deletion, and the plausible role of LETM1 deficieny in sleep dificulties of patients with WHS.

A comparative study of US-based melatonin assay companies - Solidphase vs Salimetrics

J. Love[1], M. Bright[1,2], C. Cano[1,2], L. Epstein[1,2], J. Lane[1,2,3]
[1]Brigham and Women's Hospital, Sleep and Circadian Disorders, Boston, United States, [2]Harvard Medical School, Boston, United States, [3]Massachusetts General Hospital, Boston, United States

Introduction: Solidphase and Salimetrics are two companies providing salivary melatonin analysis for researchers and clinicians. Both companies offer commercial services, with Salimetrics more consumer-based and Solidphase more research-based. Salimetrics provides a basic kit mailed directly to the participant and can be mailed directly back to the company. Solidphase assays samples collected by researchers or clinicians and requires the research or clinical team to provide any necessary collection supplies and materials and receive and package the samples for shipping to Solidphase. Despite the convenience of Salimetrics, past users have been concerned the technology is less accurate in measurement of melatonin levels, particularly in low concentration samples. Salimetrics has updated their technology, therefore we tested both companies' dim light melatonin onset (DLMO) assays head-to-head (N=4).

Materials and methods: Each participant collected saliva samples starting 6 hours before their self-reported habitual bedtime and 2 hours after, for a total of 9 samples over 8 hours. To ensure enough saliva for both assays, two sets of saliva were collected at each timepoint, approximately 10 minutes apart, with the Salimetrics taken first and then the Solidphase. The patients were provided a kit of comprehensive materials needed to create and verify a dim-light environment (<10 lux) and facilitate accurate saliva sample collection.

Results: Both Solidphase and Salimetrics were able to measure melatonin concentrations in all saliva samples (range <0.5 – 34 pg/ml). We calculated DLMO using a threshold approach (4pg/mL) to facilitate DLMO calculation in a clinical setting. The DLMOs measured by the two methods were within 30 minutes of one another, with an average difference of 18.5 minutes adjusting for the differences in collection times. Salimetrics provides a report with pre-calculated DLMO values, using a 4pg/mL threshold or 2 standard deviation metric in the event baseline melatonin values exceed 4pg/mL, as they did for one participant in our study. We generated our own patient reports using Solidphase data. Turnaround time for Solidphase was 7 days vs. 8 days with Salimetrics. The per sample cost with Solidphase was $20.63 (this includes the swab bought off the healthcare purchasing portal and the cost of analysis) and with Salimetrics was $21.00 (this included the package, shipping, etc.).

Conclusions: Overall we found no clinically significant differences in DLMO assayed by Solidphase vs. Salimetrics. A major difference is the direct-to-participant approach of Salimetrics, simplifying the procedure greatly. Both this direct mailing and the return of analyzed results in a report provided by Salimetrics may increase clinical use. However, the instructions provided with the collection kit by Salimetrics are sparse, and we suggest providing supplemental instructions when using the Salimetrics kit.

Analysis of the implementation of a sleep quality program in a public transport company in the metropolitan region of the city of Recife

L. Nascimento[1], G. Galdino[2]
[1]UFPE, Recife, Brazil, [2]Conorte, Recife, Brazil

Introduction: Poor sleep quality is responsible for impairment in concentration, learning, and memory lapses that occur due to poor brain oxygenation throughout the night's sleep, compromising the intellectual performance. As consequences of this pathology, there may be: low productivity and presenteeism, increased absenteeism, increased accident rates and rising disability retirement costs. Studies report that the highest incidence of accidents usually affect drivers, young, male; shift workers and travelers to business; in addition to people with circadian rhythm disorders or chronic sleep. On the other hand, sleep health programs that have already been implemented record a reduction in costs with employee health and claims. O early diagnosis and treatment are the key to resolution and prevention of sleep disorders. Among sleep pathologies, snoring, sleep apnea sleep and insomnia is of great importance. Their treatment involves multidisciplinary involvement by the correlation of the same with the individual's lifestyle and habits.

Materials and Methods: In April 2023, a project was started to improve the quality of sleep and life of drivers of three urban public transport companies in the city of Recife and the Metropolitan Region. The approach methodology was developed through a calendar with multiple presentation actions of the project proposal at the bus terminals. Next, a routine of educational actions was established, through face-to-face lectures and distribution of recorded classes by the multidisciplinary health team, for the WhatsApp group, created to support the project.

Then, in June of the same year, the validated questionnaire on excessive daytime sleepiness, the Epwhort questionnaire, was applied to the drivers and, after initial screening, the drivers who recorded a score equal to or greater than 9 points were submitted to a polysomnography examination. type IV. In August 2023, the project is in the final stage of carrying out tests on the entire population of drivers participating in the project and, subsequently, the assistance support phase for treatment will begin.

Results: Of the 220 drivers participating in the project, 100% are male, aged between 16 and 30 years. 44% of drivers submitted to the Epwhort questionnaire complained of poor sleep quality. Of these, 52% had an AHI below 5, without desaturation and will be advised to reinforce sleep hygiene and reorganize good health habits. 24% had an AHI between 12 and 63 with significant desaturation, below 87. 16% had mild apnea with major snoring events and desaturation reaching 90%. 4% had mild apnea without snoring or desaturation.

Conclusions: The study allowed the observation that a relevant part of the individuals accompanied, they were young men, who had problems with sleep. A significant amount of plaintiffs with indication for sleep monitoring and treatment later with re-education and sleep hygiene, to the other interviewees.

Thanks: Locmed and Conorte.

Association between chronotype and sleep quality among high school teenagers: a pilot study

J.F.d.O.L. Batista[1], L.G.D.L. Júnior[1], S.S. da Silva[1], M.C.P. do Nascimento[1], M.G.M.e Cruz[2], M.V. Heimer[1]
[1]University of Pernambuco, Faculty of Dentistry, Recife, Brazil, [2]Universidade de Lisboa, Centro Cardiovascular, Lisboa, Portugal

Introduction: Chronotype is the individual's predisposition to have morning or afternoon preferences, an individual's biological clock is determined by the preference of bedtime and activities experienced. Evidence demonstrates that an individual's chronotype influences the quality of sleep, which may have an impact on the individual's physical and psychological health. The present study proposes to analyze the relationship between chronotype and sleep quality in Brazilian high school students.
Materials and Methods: This study aimed to analyze the association between chronotype and sleep quality in adolescents. This is an observational, cross-sectional study carried out in public schools in the Brazilian city of Recife (PE). The sample consisted of 150 adolescents, aged 15-19 years, of both genders. The tools used for data collection were as follows: the Sociodemographic Questionnaire, the Circadian Rhythm Scale – Wake/Sleep Cycle and Pittsburgh Sleep Quality Index (PSQI).
Results: Most adolescents were aged between 17 and 19 years old (52.7%); were female (52%); in the 3st year of the Brazilian high school system (38%); studying full time (86%); had a family income of between 1 and 2 minimum wages (70%); slept less than 6 hours a night (73.3%); had poor sleep quality (85.3%); had excessive daytime sleepiness (54.7%) and were classified with a morning chronotype (67.3%). The results show an association between chronotype and sleep quality ($p < 0.05$).
Conclusions: Adolescents with the morning chronotype were 5.92 times more likely to have poor sleep quality.

Association between circadian rhythm disorders and falls in the robust older adults

C. Santana[1], C.M. Guimarães[1], C. Dias[1], E.B.C. Pinto[1], M. Meira e Cruz[2,3,4], C. Salles[1,5,6]
[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]European Sleep Center, Lisbon, Portugal, [3]University of Lisbon, Sleep Unit, Cardiovascular Center, Faculty of Medicine in Lisbon, Lisbon, Portugal, [4]College Sao Leopoldo Mandic, Campinas, Brazil, [5]Federal University of Bahia, University Hospital Professor Edgar Santos, Salvador, Brazil, [6]Jorge Amado University Center, Salvador, Brazil

Introduction: Falls are responsible for more than 70% of accidental deaths in the older adults. On the other hand, sleep-wake cycle disorders may be contributing to these episodes. Therefore, the present study has the objective of evaluating the association between the occurrence of falls in robust older adults and circadian rhythm disorders.

Methods: This study is part of a more extensive study entitled "Sleep disorders and metabolomic profile related to the occurrence of falls in older adults community-dwelling: a prospective longitudinal study".This is a cross-sectional study. Inclusion criteria: age$\geq$65 years, both sexes, physical robustness (Clinical Functional Vulnerability Index and Montreal Cognitive Assessment Basic). Exclusion criteria: pathologies such as stroke, balance disorders, Alzheimer's disease, osteoarticular disorders, difficulty understanding instructions. Sleep disorders were investigated with a subjective method using the Horne-Ostberg Questionnaire. A survey of falls in the previous twelve months was carried out.

Results: A total of 77 robust older adults were selected, with a mean age of 71.0 ± 5.0. Among the robust subjects, 53 were female (68%), and 21 individuals had a history of falling in the previous 12 months (27.3%). It was observed that: 57.1%(n=44) of patients reported that they would wake up between 05:00-06:30 a.m. if they were entirely free to plan their day; 70.1%(n=54) of the elderly considered waking up in the morning very easy when they were not woken up unexpectedly; 53.3%(n=41) did not feel awake during the first half hour after waking up in the morning; 74.0%(n=57) of patients reported that they would choose the time range of 08:00-10:00 a.m. to perform two hours of heavy physical activity; 54.5%(n=42) feel at their best moment between 08:00-10:00 a.m.; 57.1%(n=44) reported that they considered themselves a definitely morning type. Among the individuals who fell (n=21), it was observed that the group who recognized themselves as definitely morning type showed the highest percentage of falls, with 42.8%(n=9). Seven episodes of falling were observed (33.3%) among those predisposed to fall asleep between 9:00 and 10:15 p.m. There were also differences in the rates of falls among individuals with different predispositions regarding the time of falling asleep and waking up. Among those with a preferred time to fall asleep between 08:00 and 9:00 p.m., there were 03 episodes of falls (14.3%). Among those who fell asleep between 10:15 p.m. and 00:30 a.m., ten fall occurrences (48%) were identified, and twelve fall occurrences (57.1%) were observed among subjects predisposed to wake up between 05:00 and 06:30 a.m.

Conclusions: The present study observed the occurrence of a higher number of falls in definitely morning types of individuals, as well as 46.8% of the elderly who do not feel alert during the first half hour after waking up in the morning, a fact that alerts us as to preventive measures for falls in this population.

A translational investigation of the role of lipids in the sleep/circadian disruptions of neuroinflammatory and neurodegenerative disorders

B.A Prakash[1], H.R Sanghani[1], M. Boyle[2], K.C Dines[2], R.G Foster[3], A. Jagannath[3], S.R Vasudevan[1]
[1]University of Oxford, Pharmacology, Oxford, United Kingdom, [2]Bristol Myers Squibb, Neuroscience Thematic Research Center, San Diego, United States, [3]University of Oxford, Nuffield Department of Clinical Neurosciences, Oxford, United Kingdom

Introduction: Neurodegenerative disorders are characterised by the progressive loss of neurones in the brain, resulting in symptoms including dementia, cognitive impairment, and ultimately death. The development of therapeutics has been stymied, however, by a lack of suitable targets. Sleep and circadian rhythm disruptions (SCRDs) are some of the earliest presenting symptoms of neurodegenerative disorders and recent evidence suggests that targeting the pathways activated by SCRDs could offer a new treatment paradigm. Towards this effort, we have identified a class of molecules, lysolipids, whose levels are increased by SCRDs and which are capable of driving neuroinflammation/neurodegeneration. Thus we hypothesise that the increase in lysolipids following SCRDs plays a key role in driving inflammation and targeting these lipid pathways could provide new areas of treatment for neuroinflammatory and neurodegenerative disorders.

Materials and Methods: Using a multidisciplinary investigation involving the *in vitro* "sleep in a dish" model, organotypic suprachiasmatic nucleus (SCN) assays, cellular circadian reporter luciferase assays, and mining the publicly available human sleep metabolomics data, we have identified lysolipids as a hub capable of connecting sleep, circadian rhythms, and neuro-physiological and inflammatory processes.

Results: We show that lysolipids at physiologically relevant concentrations alter the expression of genes marking sleep/wake state in primary neurone culture. Furthermore, these lipids alter circadian rhythms in immortalised cell lines and organotypic SCN slices.

Conclusions: Lysolipids are capable of altering sleep and circadian processes and thus could present a new mechanism through which sleep/circadian disruptions and neuroinflammation are connected. Therefore targeting lysolipid pathways may represent a novel therapeutic paradigm for neutralising the negative effects of SCRD on neuronal physiology.

Acknowledgements: Bristol Myers Squibb and the Department of Pharmacology, University of Oxford.

Can treatment of delayed sleep-wake phase disorder improve juvenile myoclonic epilepsy? Report of one case

S.P. Li[1], E. Rehim[2], M. Vendrame[2]
[1]University of South Florida Health Morsani College of Medicine, Tampa, United States, [2]Lehigh Valley Fleming Neuroscience Institute, Allentown, United States

Introduction: Delayed Sleep-Wake Phase Disorder (DSWPD) is characterized by sleep initiation insomnia when attempting sleep at conventional times and difficulty waking at the required time. Juvenile Myoclonic Epilepsy (JME) is a primary generalized epilepsy associated with a characteristic sleep/wake rhythm, with the tendency to go to bed later at night, to get up later in the morning. In the pediatric population we have previously observed specific circadian and sleep/wake patterns of generalized seizures (6 am-12 pm) and myoclonic seizures (in wakefulness, 6 am to noon).

Materials and methods: We reviewed the case of a 20-year-old man with JME presenting with nocturnal seizures out of sleep, who was found to have comorbid DSWPD.

Results: The patient is a 20-year-old man with diagnosis of JME since age 17. His seizures were in the form of generalized tonic-clonic, and his electroencephalogram showed diffuse bilateral bursts of 4 Hz spike-and-wave complexes. He was on levetiracetam at the dose of 2000 mg/day in two divided AM and PM doses, with a seizure frequency to about 8 events per month. He reported an at least 6 months history of extreme difficulty waking up in the morning preventing him from pursuing regular academic work. He did not report snoring and reported waking up rested when allowed to wake up later in the morning. His BMI was 23 Kg/m2 and his Epworth Sleepiness Scale 10. His 2-week sleep diary showed a sleep schedule ranging from 3 to 5am bedtime and 10am-1 pm wake up time, consistent with DSWPD. Together with the close cooperation of his parents, we implemented an aggressive pharmacological and behavioral plan. Timed evening melatonin (10 mg taken at 9 pm), combined with a gradual shift in sleep-wake scheduling and morning light therapy (470 nm wavelength for 1 to 2 h in the morning after waking up) were administered over 5 months. Sleep diaries data showed a progressive shift in sleep schedule ranging from 11 pm to 12am bedtime and 7am-9am wake up time. At his 3-month follow up patient reported continuing rigorous sleep schedule with melatonin and light therapy, and one seizure in the context of missing one dose of levetiracetam.

Conclusions: Recognition and treatment of DSWPD in JME, together with assessment of circadian and diurnal seizure patterns, may offer therapeutic considerations for better control of seizures.

Cardiometabolic parameters in night workers during the menopausal transition period after melatonin intervention

C. V R D'Aurea[1], F. G Amaral[2], J. Cipolla-Neto[2], C. Rc Moreno[2], E. C Marqueze[1]
[1]Catholic University of Santos, Santos, Brazil, [2]University of São Paulo, Sao Paulo, Brazil

Introduction: In the menopausal transition period, the prevalence of sleep complaints increases considerably, with nocturnal awakenings being the most common report. Changes in sleep patterns can have negative impacts on general health and quality of life, such as the development of cardiovascular diseases – a very frequent change in shift workers and menopausal women. Another common consequence of this double relationship (shift workers and menopausal women) is the reduction in melatonin production which, among many actions, has an anti-inflammatory, antioxidant, and antihypertensive role. If performed correctly, melatonin therapy can prevent and intervene in the negative consequences of this scenario. The present study aims to evaluate the effects of melatonin supplementation in night and day workers who are in the menopausal transition on cardiometabolic parameters.

Materials and Methods: This is a phase II, randomized, controlled, double-blind clinical trial. To determine the sample to be researched, the repeated measures test (ANOVA) was used, considering an unknown effect size (50%), two measurements (before and after intervention), alpha error of 0.05, beta error 95%, six groups of four people each, totaling 24 people. 8-night workers, 8-morning workers, and 8-afternoon workers who are in the menopausal transition and work in the 12hx36h system, will be evaluated. The groups of workers will be divided into a control group and an intervention group so that each group comprises 4 workers. Workers who undergo hormone replacement therapy will be excluded. The intervention group will receive the melatonin dose that will be adjusted gradually and individually and should be taken 1 hour before the usual bedtime, only on days off (between shifts and free days). The control group will receive a placebo with the same instruction, for 90 days in both groups. As this is a double-blind study, neither the participants nor the investigators will know if they will be part of the intervention or control groups. Before and after the intervention, a blood sample will be collected to determine plasma concentrations of blood glucose, total cholesterol, HDL-cholesterol, LDL-cholesterol, VLDL-cholesterol, serum triglycerides, and glycosylated hemoglobin, after a 12-hour fast. Blood pressure and stiffness parameters (pulse wave velocity, augmentation index, systolic central blood pressure, and heart rate) will also be evaluated.

Expected results: Workers in the intervention group are expected to show improvement in cardiometabolic parameters compared to the control group. In addition, it is expected that the improvement of the evaluated parameters will be more remarkable in the night workers intervention group compared to the day workers intervention group.

Chronotype, sleep and mental health of International Medical Students in Georgia

I. Sakhelashvili[1]
[1]Georgian American University GAU, Medical School, Tbilisi, Georgia

Introduction: Chronotypes refer to individual preferences for daily productivity and sleep, specifically, the preferences for waking and sleeping times, which are referred to as "morningness" and "eveningness" ("larks" and "owls") types. The aim of this study was to investigate the likelihood of dual diagnosis, which refers to the co-occurrence of sleep and mental disorders, in a representative sample of participants.

Materials and Methods: The study was conducted at Georgian-American University from September 2022 to January 2023, with the participation of 160 international medical students. The participants completed the Morningness/Eveningness Questionnaire (MEQ), the Epworth Sleepiness Scale (ESS), the Pre-Sleep Arousal Scale (PSAS), and the Student-Life Stress Inventory (SLSI).

Results: The mean age of the participants was 21.13±2.33, with 64.4% (103) being female. Of the participants, 7 (4.4%) were classified as definitely evening types, 14 (8.75%) as moderately morning types, and 104 (65%) as intermediate chronotypes.

Comparison of definitely evening type and moderately morning type students showed that the later chronotype subjects presented significantly higher indicators in all the study variables. Although the ESS scores in both groups were below the cut-off, the evening type samples reported higher levels of excessive daytime sleepiness than morning type samples (7.86±1.79 and 4.64±3.24, respectively). Six out of 7 definitely evening type subjects reported high PSAS scores, including both Somatic (15.14±6.6) and Cognitive (27.71±8.86) PSAS, as well as Total PSAS (42.85±14.04). In addition, all evening type subjects reported a high level of stress (135.14±28.69) across all stress categories, with maximum scores (2.14±0.69) for overall stress level.

As expected, moderately morning type samples reported significantly lower scores for both somatic (14.28±6.7) and cognitive (18.64±8.35) PSAS, as well as Total PSAS (32.92±14.54). Although the moderately morning type subjects reported a high level of Total SLSI, the scores were significantly lower than those of the evening type sample (128.57±40.78 and 135.14±28.69, respectively). Furthermore, the overall stress level scores of morning-type subjects were significantly lower (1.71±0.72). The associations between Total PSAS, Total SLSI, and Total ESS were also significant ($p<0.01$ and $p<0.05$, respectively).

Among the moderately morning type study sample group, there was a strong correlation between somatic PSAS and both Total SLSI ($p<0.05$) and Total ESS ($p<0.05$). Cognitive PSAS also correlated with Total SLSI ($p<0.05$).

Conclusions: The study findings suggest that international students with a later chronotype have a higher prevalence of pre-sleep arousals (PSAS) and stress (SLSI) compared to students with an early chronotype. Further research is necessary to determine how chronotype affects the health and sleep patterns of students.

Circadian-based lighting substantially improves vigilance in simulated night shift work conditions compared to standard lighting

H. Scott[1], N. Stuart[1], J. Manners[1], A. Guyett[1], E. Kemps[2], B. Lechat[1], L. Lack[1], N. Lovato[1], A. Vakulin[1], S. Banks[3], J. Dorrian[4], R. Adams[1], D. Eckert[1], P. Catcheside[1]
[1]Flinders University, Flinders Health and Medical Research Institute: Sleep Health, Adelaide, Australia, [2]Flinders University, College of Education, Psychology and Social Work, Adelaide, Australia, [3]University of South Australia, Behaviour-Brain-Body Research Group, Adelaide, Australia, [4]University of South Australia, Adelaide, Australia

Introduction: Night shift work frequently results in circadian misalignment and poor sleep off-shift, reducing cognitive performance on-shift. This study developed a circadian-based lighting design and tested whether it could improve on-shift cognitive performance, via faster circadian adjustment and promoting more adequate sleep, compared to standard lighting.

Materials and Methods: Nineteen healthy sleepers (12 males/7 females, mean±SD aged 28.7±10.4 years) underwent two separate 8-day experimental conditions. Participants were exposed to standard lighting (current levels on submarines) or circadian-based lighting (designed to facilitate rapid phase delay) during each stay, in randomised counterbalanced order. After an adaptation sleep from 22:00 – 07:00 (Day 1), participants remained awake for 27 hours to transition to sleeping during the day (10:00 - 19:00) and undertook simulated night shift-work (00:00 - 08:00) at night on Days 3-7. Cognitive performance was assessed via cognitive test batteries administered during the night shift-work. The primary performance outcome was the number of lapses (>500ms responses) on the psychomotor vigilance task (PVT), administered six times across each simulated work shift.

Results: There was a significant day-by-condition interaction on PVT lapses, $p<0.05$. Circadian-based lighting intervention resulted in ~50% fewer lapses by the final day than standard lighting (mean±SD 7.4±5.0 vs. 15.6±6.1 lapses). Similar effects were observed on other PVT outcomes.

Conclusions: Circadian-based lighting significantly improved vigilance during night shift work compared to standard lighting. Automated lighting interventions should be considered as a cognitive enhancement strategy for shift-workers.

Circadian disruption among Brazilian airline pilots

I. Sampaio[1], F.M. Fischer[1]
[1]University of São Paulo, School of Public Health, São Paulo, Brazil

Introduction: Irregular working hours impact human sleep, both in timing and duration. Airline pilots are exposed to irregular work schedules due to their reporting times and duty duration. This study aims to inform some metrics regarding sleep and activity circadian rhythms in a sample of Brazilian airline pilots.

Materials and methods: Actigraphs (Condor[R]) were worn by fifty-one Brazilian airline pilots (7 female, mean age 40.2 $\pm$10.12), for 15 consecutive working and free days (two-pilot crew, not crossing 3 or more time zones). The nonparametrics variables related to the sleep-activity circadian rhythms were intradaily variability (IV) and interdaily stability (IS). The IV informs the average degree of activity variability within a day, quantifying diurnal sleep fragmentation (values range from 0 to 2, with 0 meaning more consolidated sleep). The IS expresses the regularity of activity times between days (values range from 0 to 1, with 1 meaning more stability).

Results: 753 days were monitored (Dec 2021-May 2022): 492 working days and 261 days-off. The reporting times were: 15% early-morning (06h01-07h59), 20% morning (08h00-11h59), 22% afternoon (12h00-17h59), 15% evening (18h00-23h59) and 28% night (00h00-06h00, half of them between 04h01-05h59). Duty duration averaged 7 ($\pm$6.44) hours. Intradaily variability (IV) averaged 0.892 ($\pm$0.234); interdaily stability (IS) averaged 0.252 ($\pm$0.096). We compared these results with those from the INZEIT study published by Mitchell et al. (2017), in which the IV and IS variables were calculated in men and women aged 21-60 who were not shift workers, did not have sleep disorders or any illness that required bed rest, did not have mobility impairments, and women were not pregnant or lactating (N=110). INZEIT´s IV mean was 0.93 ($\pm$0.23) and IS 0.46 ($\pm$0.12). IV was not different between the groups (t= 0.96, df 157, p=0.33), but IS was significantly different (t= 10.77, df 157, p<0.0001). Limitations of this study include not having the baseline data for intrasubject comparison when pilots were not on duty (i. e. on vacation).

Conclusions: It was possible to observe the pilots´ intradaily variability (IV) did not differ from the non-shiftworkers. It may be hypothesized that pilots tried and many times succeeded to organize sleep times according to their working times and personal life commitments within the 24-hour day. However, pilot´s intradaily stability (IS) showed sleep and activity times were not stable along the days and did differ from the non-shiftworkers. It reinforces the work schedules changed significantly along the working days. These results show the impact of working time in sleep and activity cycles and consequently a certain level of circadian disruption for shiftworkers, especially for those exposed to irregular working hours as civil aviation crews.

Circadian photoreception impacts thoughts of self

M. Burge[1], R. Lumapas[1], A. Lander[1], B. Thomas[1], A. Phillips[1], S. Cain[1]
[1]Monash University, Turner Institute for Brain and Mental Health, School of Psychological Sciences, Clayton, Australia

Introduction: Light exerts a direct influence on mood and cognition. While there is evidence that light therapy can be effective treatment for mood disorders, the specific impacts of light on the regulation of mood-related cognition are not well understood. In this study, we tested whether circadian photoreception impacts responses on a task designed to assess thoughts of self.

Materials and Methods: Participants completed the self-referential encoding task (SRET) under the same photopic lux (~200 lux) with different impact on circadian photoreception: blue-enriched (λp = 490 nm) and blue-depleted light (λp = 631 nm). Light conditions were counterbalanced for order of exposures across two sessions, two weeks apart. The SRET involved participants deciding whether positively (e.g., "good") or negatively (e.g., "terrible") valenced adjectives were self-descriptive. Twenty-eight participants (16 women, mean age = 20.36, SD = 2.26) were included in the final analysis.

Results: Utilising logistic mixed effects models to analyse trial-by-trial performance, we found that blue-depleted light significantly increased the log likelihood (Estimated Marginal Means; EMM Log Odds Ratio = 1.32, $p < .01$) of endorsement of negative words as self-describing. We found no evidence that light conditions affected participants' responding to positive words (EMM Log Odds Ratio = 0.96, $p = .57$). To examine how light conditions affected the latent decision making process underlying these responses, we fit a hierarchical drift diffusion model (HDDM). The HDDM describes choice and reaction time as the culmination of the following parameters: the rate at which we accumulate evidence (drift rate; v), an a priori bias towards certain responding (bias; z), the amount of information we require before making a decision (boundary separation; a) and time outside of the decision process such as time taken to execute a response (non-decision time; t). Bayesian posterior distribution comparisons indicated that under blue-depleted light, evidence accumulation (v) was slower when rejecting negative words as self-descriptive. No differences in parameter estimates for positive words were observed between the light conditions.

Conclusions: This is the first study to demonstrate that administration of light that differentially impacts circadian photoreception acutely and directly influences our thoughts of self. Our key finding was that, relative to blue-depleted light, blue-enriched light decreased negative self-thoughts. Computational modelling of the HDDM revealed that this was due to a slower evidence accumulation when rejecting negative words as self-descriptive under blue-depleted light. Given the link between speed of accumulation and decision preference, our results show rejection of negative self-descriptions was more challenging in the blue-depleted light condition. These findings suggest that the positive effects of bright light-based therapies on mood might be due to immediate decreases in negative self-thoughts, in addition to the recognised role of light in regulating circadian rhythms.

Comprehensive analysis of circadian protein expression patterns in healthy adults

A. Specht[1], G. Kolosov[1], F. Bueno[1], A. Arrona-Palacios[2], E. Pardilla-Delgado[2], N. Ruiz-Herrera[2], K.-M. Zitting[2], C. Czeisler[2], J. Duffy[2], E. Mignot[1]
[1]Stanford University, Psychiatry and Behavioral Sciences, Stanford, United States, [2]Division of Sleep and Circadian Disorders, Department of Medicine, Brigham and Women's Hospital and Division of Sleep Medicine, Harvard Medical School, Boston, United States

Introduction: The circadian clock governs essential physiological processes, including sleep-wake cycles and metabolism. Understanding the dynamics of circadian protein expression patterns in humans may provide new insight into how peripheral clocks are synchronized. We carried out a study to analyze circulating protein levels, focusing on those that showed both 24-hour expression patterns and the subset of them that showed endogenous circadian expression.

Materials and Methods: Two studies of healthy young adults were conducted at the Center for Clinical Investigation, Brigham, and Women's Hospital. Both employed a Constant Routine protocol (CR) during which the participant's behavior and environment were maintained constant for 38 hours so that 24-hour rhythmicity in the proteins could be attributed to endogenous circadian origin. Hourly blood samples were collected using an intravenous catheter, and plasma samples were frozen for subsequent proteomic analysis. In 8 of 17 participants, samples were also collected on a 24-hour baseline day prior to CR and during a recovery day after CR. Inspired by A. Pelikan et al. [_FEBS J. 2022; 289(21):6605-6621_], we used differential rhythmicity analysis based on a cosinor model with mixed effects to assess protein behaviors across four independent 24-hour conditions. This method not only enabled the identification of rhythmic proteins, but also characterized the rhythms with acrophases and amplitudes.

Results: Among 6,916 proteins examined, 1,063 exhibited significant 24-hour rhythmicity. Of these, 431 proteins, including pro-opiomelanocortin and parathyroid hormone, displayed consistent circadian rhythms between conditions and participants. The circadian proteins exhibited characteristic oscillatory profiles, and variations in amplitude and phase provided valuable insights into the strength and timing of circadian oscillations. When we applied a two-harmonic model, an additional set of 259 proteins displayed significant rhythmicity, highlighting complex circadian patterns extending beyond simple sinusoidal rhythms. Overall, we found that the largest number of proteins had their peak levels in the late afternoon/evening, with another smaller group peaking in the early morning.

Conclusions: This comprehensive analysis of circadian protein expression patterns in healthy adults unveils the complex nature of circadian regulation. Distinguishing between rhythmic and circadian proteins, assessing expression patterns beyond simple sinusoids, along with assessing amplitude and phase, enhances our understanding of the complexity, stability, and temporal characteristics of circadian rhythms. These findings contribute to our understanding of the ubiquity of circadian regulation and pave the way for a potential new biomarker for circadian medicine.

Daridorexant: a new treatment option for delayed sleep phase disorder (DSPD)?

V. van Ginneken[1], C. Sauter[1]
[1]Charité – Universitätsmedizin Berlin, Competence Center Sleep Medicine, Department of Psychiatry, Charité – Universitätsmedizin Berlin, Berlin, Germany

Introduction: The therapy of the circadian rhythm disorder DSPD to date consists mainly of strict sleep hygiene measures combined with the use of bright light (phototherapy) around the time-point of spontaneous awakening and administration of melatonin 12h after waking-up. However, this chronotherapeutic strategy does not lead to a stable phase advance and sufficient decrease in insomnia symptoms and daytime impairment in all patients. Is the dual orexin receptor antagonist (DORA) daridorexant a new therapeutic option for the treatment of DSPD?

Materials and Methods: Case report: Diagnostics and therapy of a 31-year-old patient with a history of DSPD since childhood. The diagnosis of a DSPD is based on actigraphy and digital sleep-wake-diary data, which includes the recording of daytime symptoms (mood, performance, fatigue) on visual analogue scales.

Results: Initially the patient shows a typical profile of DSPD. He then follows a chronotherapy with a gradual advance of the time-point of getting up in combination with phototherapy and physical exercise in the morning and 2mg of melatonin administration approx. 12h after getting up. He does not achieve a sufficient improvement of his nighttime and daytime symptoms, and complains about side effects such as holocephalic headaches. The chronotherapy is adjusted several times including the use of low-dose sedating antidepressants for sleep induction without sufficient success. He then starts taking 50mg daridorexant 60 min before bedtime which leads to a stable reduction of his subject sleep onset latency (<30min) while maintaining a stable phase advance. The patient furthermore reports a better overall sleep quality, daytime performance, and mood. The positive effects on the subjective sleep quality and phase advance stay constant at follow-up at 3 and 6 months while the patient reports a further subjective increase in daytime performance at work and in his social life.

Conclusions: The DORA daridorexant may be a new therapeutic option for the treatment of DSPD.

Design, development, and evaluation of a digital sleep and circadian management smartphone application for optimising shift work performance in Defence

P. Varma[1], S. Postnova[2], S. Knock[2], L. Shen[1], I. Xie[3], A. Senevirathe[3], M. Jaimangal[3], M. Howard[4], S. Rajaratnam[1], E. Aidman[5], T. Sletten[1]
[1]Monash University, Turner Institute for Brain and Mental Health, Clayton, Australia, [2]The University of Sydney, School of Physics, Camperdown, Australia, [3]Curve Tomorrow, Melbourne, Australia, [4]Institute for Breathing and Sleep, Austin Health, Heidelberg, Australia, [5]Defence Science and Technology Group, Edinburgh, Australia

Introduction: Defence personnel undertake shift work in complex and high-risk environments that demand sustained alertness and decision-making under pressure. Personalised, digital sleep-wake management tools that can provide them with support to improve their sleep and optimise performance are crucial but lacking. This project aimed to:

1. Co-design an app with Defence that utilises biomathematical modelling for sleep and alertness to provide personalised recommendations for sleep based on duty commitments.
2. Examine the app's preliminary efficacy in improving sleep and performance.

Methods and materials: Eight Air Traffic Controllers from the Australian Defence Force (three females, age range: 21-42 years, 1-12 years' shift work experience) completed an individual 60-90 minute co-design interview to understand their sleep and lifestyle management with shift work and needs for an app-based intervention.
An app (SleepSync) was developed from an existing prototype validated with healthcare shift workers, including lifestyle and individualised recommendations generated with the Model of Arousal Dynamics based on Defence personnel's rosters, daily sleep-wake habits, and personal commitments. A single-arm, six-week efficacy trial was conducted to examine pre-post changes in sleep, measured as changes in the average sleep duration, the Insomnia Severity Index, and the PROMIS – Sleep-Related Impairment. Pre- and post-shift performance was measured across multiple shift types using the Psychomotor Vigilance Task (PVT), N-Back and the Balloon Analogue Risk Task. Data were analysed using inductive thematic analyses (interviews), t-tests and linear mixed models.
Results: Co-design interviews identified the following themes:
(i) the impact of undertaking shift work on sleep, social and family life;
(ii) the need for a shift work-driven personalised technology that delivers notifications and recommendations for sleep and alertness instead of a one-size-fits-all solution;
(iii) Features supporting sustained engagement with the app, including an interactive user interface, personalised recommendations, clear instructions on the use of the app, a toolkit with educational content around sleep and fatigue management, a proprietary calendar system to manage their shifts and personal commitments; and
(iv) High level of data security and privacy.
Preliminary results from the efficacy trial of the SleepSync app (n = 13 [six females], age range 22-46 years, 2-12 years in shift work) showed significant improvements in sleep duration (6.9 ± 0.5h at baseline, to 7.5 ± 1.1h after App use, $p<.001$), with reduced insomnia symptoms noted for 61% of participants. Performance errors reduced on N-Back Incorrect responses (Baseline = 9.2 ± 0.9, App use = 5.5 ± 0.8, $p<.001$) and PVT lapses (Baseline = 8.1 ± 1.2, after App use = 6.6 ± 0.8, $p = 0.04$). Objectively measured risk-taking did not change from baseline to app use.
Conclusions: The implementation of the SleepSync app in Defence personnel demonstrated positive proof of concept, with preliminary results showing improvements in sleep and performance. User feedback suggested good acceptability for the app. Further testing of the technology is needed to examine its effectiveness. Ongoing development should engage more end users to enable long-term adoption, and maximise the app's benefits for sleep and other health outcomes.

Dim Light Melatonin Onset analysis in individuals diagnosed with Delayed Sleep-Wake Phase Disorder (DSWPD)

C. Johnson[1], J. Brzezynski[1], A. Goldberg[1], C. Miller[1], A. Kaden[1], S. Smieszek[1], C. Polymeropoulos[1], G. Birznieks[1], M. Polymeropoulos[1]
[1]Vanda Pharmaceuticals Inc., Washington, DC, United States

Introduction: We are conducting a double-blind, randomized, clinical study in Delayed Sleep-Wake Phase Disorder (DSWPD) participants with extensive clinical phenotyping. We evaluated screening Dim Light Melatonin Onset (DLMO) assessments in participants with a DSWPD diagnosis to determine the proportion of participants with and without a circadian delay.
Materials and Methods: Delayed DLMO is DLMO occurring after or within 30 minutes before desired bedtime, and after 21:30. Each DLMO assessment consisted of eight saliva collections performed at five, four, three, two, and one hour before bedtime, at planned bedtime, and one and three hours after bedtime. Salivary DLMO assessments were distributed to participants at Visit 1 (screening) and Visit 3 (treatment) with a questionnaire to record planned and actual collection times. Participants were instructed to wear blue-light blocking glasses during the assessment period. The Morningness-Eveningness Questionnaire (MEQ) was also completed by participants at V1 to evaluate circadian and sleep rhythm patterns. DLMO was calculated for each phase assessment and defined as the clock time when the melatonin concentration exceeded the mean of three low consecutive values, plus twice the standard deviation of these points.
Results: Thirty-four participants with DSWPD completed the screening DLMO assessment, 33 of which had a delayed DLMO (97.06%). Sub-analyses were conducted on participants with DSWPD who had delayed DLMO (n = 33). Within this subset, the average DLMO time was 23:52 (SD = 1:58) and the average MEQ score was 34.27 (SD = 10.39). Of these 33 participants, 14 had a DLMO time after 00:00 (42.42%).
Conclusions: These initial data indicate that, on average, participants with DSWPD that completed the screening DLMO assessment had delayed DLMO. Further analyses show that almost half of this subset had a significantly delayed DLMO (00:00 or later). This study is currently ongoing and blinded. Further data will be analyzed as more participants enroll. 'Phase typing' will be important in further understanding the underlying pathophysiology and in the treatment selection for patients with DSWPD.

Diurnal patterns of heart rate variability and associations with markers of mental health in South Africans living in a low-income setting

A. Correia[1], P. Goldie[1], P. Forshaw[1], L. Roden[2], G. Lipinska[3], H.L. Rauch[1], E. Lambert[1], S. Crowley[4], S. Reutrakul[5], B. Layden[5,6], A. Luke[7], L. Dugas[7,8], D. Rae[1]
[1]University of Cape Town, Department of Human Biology, Cape Town, South Africa, [2]Coventry University, Centre for Health and Life Sciences, Coventry, United Kingdom, [3]University of Cape Town, Department of Psychology, Cape Town, South Africa, [4]Rush University Medical Center, Department of Psychiatry & Behavioral Sciences, Chicago, United States, [5]University of Illinois Chicago, Department of Medicine, Chicago, United States, [6]Jesse Brown Veterans Affairs Medical Center, Chicago, United States, [7]Loyola University Chicago, Parkinson School of Health Sciences and Public Health, Chicago, United States, [8]University of Cape Town, School of Public Health, Cape Town, United States

Introduction: Heart rate variability (HRV), indicates the relative contributions from the sympathetic and parasympathetic branches of the autonomic nervous system and exhibits diurnal variation in healthy individuals, increasing during sleep and decreasing during wake. This is attributable to an expected increase in parasympathetic tone ("rest-and-digest" response) during sleep and an increase in sympathetic tone ("fight-or-flight" response) during wakefulness. People residing in low socioeconomic status (SES) environments with high rates of exposure to stressful events, may be in a constant state of hyperarousal, characterised by impaired or dampened diurnal HRV patterns with reduced HRV during sleep. Damped diurnal variation has previously been linked to both poorer sleep and more severe depressive symptoms. The aims of this study were to i) characterize the diurnal variation in HRV over a 24-hour period in South Africans living in a low SES environment and ii) investigate associations between parameters of diurnal variation in HRV with symptoms of depression, anxiety, and post-traumatic stress disorder, which are known to occur widely in this setting.

Materials and methods: Thirty-four African-origin South Africans (25-45y, 75% women) were recruited as part of a larger, longitudinal parent study: the "Modelling the Epidemiologic Transition Study (METS)-Microbiome" study. Demographic and mental health data (Fear of Sleep Inventory, Primary Care for PTSD Screen, Becks Depression Inventory and Becks Anxiety Inventory) were collected while 24h-ambulatory electrocardiography and actigraphy were used to measure HRV and nocturnal sleep, respectively. Actigraphy was used to set the sleep period to compare sleep and wake HRV. HRV data was manually inspected for artifact then 5-minute epochs were averaged in 15-minute intervals for each hour. Sine curves were fitted to the hourly HRV variables to characterise amplitude, mesor, time of peak and time of nadir. Spearman's correlations were used to investigate associations between HRV measures and mental health outcomes.

Results: Actigraphy-derived mean (±standard deviation) sleep duration and sleep time were 9.1 ± 1.0h and 6.9 ± 1.2h respectively. Three diurnal patterns of HRV emerged: rhythmic, dampened and bimodal. Decreased HF amplitude (rho:-0.562, p=0.015) and RMSSD amplitude (rho:-0.551, p=0.018) were associated with more severe symptoms of anxiety. Higher levels of fear of sleep (rho:-0.535, p=0.022), depression (rho:-0.556, p=0.017) and anxiety (rho:-0.560, p=0.016) were all associated with time at which peak in very low frequency (VLF) occurred.

Conclusions: We show dampened diurnal variation in multiple HRV variables in a vulnerable group of South African adults, associated with more severe mood- and anxiety-related symptoms. Specifically, the delayed timing of the VLF peak indicates intrusion of sympathetic activity or delayed increase of parasympathetic activity during the sleep period, which may have implications for sleep quality. This may partly explain the short sleep observed despite sufficient opportunity. Hyperarousal or hypervigilance may in part contribute to impaired HRV during both wake and sleep in these individuals, perpetuating the poor sleep-poor mental health cycle.

Effectiveness of individualized chronotherapy in individuals with subclinical sleep problems - Pilot study

K. Evansová[1,2], K. Červená[1], A. Sochůrková[3,1], M. Nikolič[2,4], M.C.M. Gordijn[5], J. Kopřivová[1]
[1]National Institute of Mental Health, Sleep and Chronobiology Research Centre, Klecany, Czech Republic, [2]Charles University, 3rd Faculty of Medicine, Prague, Czech Republic, [3]Charles University, Psychology, Faculty of Arts, Prague, Czech Republic, [4]National Institute of Mental Health, Psychedelic Research Centre, Klecany, Czech Republic, [5]University of Groningen, Groningen, Netherlands

Introduction: Poor-quality and disrupted sleep can have adverse consequences on overall health and well-being. Yet, a significant portion of the population suffering from mild sleep disturbances doesn't meet the criteria for diagnosable sleep disorders and is therefore left untreated. This research delves into the influence of personalized chronotherapy on the sleep quality of individuals who have not received an official sleep disorder diagnosis but still struggle with their sleep. The study seeks to validate the effectiveness of a specific combination of interventions designed for those with subclinical sleep issues and assess their lasting impact over a moderate timeframe.
Materials and Methods: The research has 3 phases. In Phase 1 screening questionnaires to identify exclusion criteria, such as major clinical disorders, are administered, along with sleep questionnaires (PSQI, ISI, ESS) to determine the extent of sleep quality disruption, chronotype q. (MEQ, MCTQ) to identify circadian parameters to tailor individual chronotherapy and questionnaires for depression and anxiety (BDI, BAI). In phase 2, participants undergo baseline measurements (2 weeks) followed by a 3-week chronotherapeutic intervention. Both the experimental and control group receive core interventions consisting of SHI and individual adjustment of daily routine and sleep timing according to chronotype and preference. Experimental group then receives morning BLT (timed according to MEQ score) along with evening BLB, while the control group only receives placebo glasses and no light therapy.Phase 3 includes a questionnaire 4 weeks post-intervention. MotionWatch8 devices and sleep diaries are used to measure activity for both groups, Lumie Vitamin L lamp is used for light therapy and orange BLB glasses in the experimental group and clear glasses in the control group.
Results: To date, a sample of 17 subjects has been obtained, 9 in experimental and 8 in placebo group. Due to small N and high inter-subject variability, t-statistics have not yet been calculated. The PSQI, ISI and ESS scales were collected at baseline, after the intervention and after 4 weeks. Preliminary descriptive results show an improvement in PSQI and ISI scales in both the experimental group and the control group. In terms of actigraphy data, the experimental condition did not affect either IS or IV, while sleep efficiency was improved in both the experimental and the control group.
Conclusions: Preliminary descriptive results show a steady improvement in sleep quality and insomnia severity scales, as well as sleep efficiency in both the experimental condition and the control condition. Since some improvement occured even in the control group with placebo (clear) glasses, we conclude that education and sleep hygiene alone have a significant effect. The next step in the research will be the inclusion of a group without any intervention. Although these results should be interpreted with caution, we expect a moderate effect size for the intervention in the main study, with a target sample of 60 participants.

Effect of foods rich in tryptophan, melatonin and complex vitamins a, b, c, d and e associated with administration of melatonin on sleep quality of working women overweight night days

P. Teixeira de Santana[1], E. Cristina Marqueze[1]
[1]Catholic University of Santos, Department of Epidemiology, Post-Graduate Program in Public Health, Santos, Brazil

Introduction: Working at night is associated with poor sleep quality and changes in eating habits. Recent studies have shown that the consumption of some foods can improve the quality of sleep, as they are linked to the regulation of the sleep-wake cycle and also because they contain nutrients that are part of the melatonin biosynthetic pathway. Thus, the hypothesis of the present study is that the consumption of foods rich in tryptophan, melatonin and vitamins of complex A, B, C, D and E, associated with the administration of exogenous melatonin can improve the quality of sleep of night workers with excessive of weight.

Materials and methods: This is a controlled, randomized, double-blind, crossover clinical trial, carried out with 27 nursing professionals who worked permanent night shifts (12 hours of work with 36 hours off). Food consumption was analyzed using 24-hour food recalls, recorded between 19:00 and 19:00 both on workdays and days off. Sleep quality was assessed by the Pittsburgh Sleep Quality Index (PSQI). Generalized estimating equations (GEE) were performed to evaluate the isolated effect of consumption of foods rich in tryptophan, melatonin and vitamins of complex A, B, C, D and E and the administration of melatonin on sleep quality, as well as their interaction, on workdays, days off and on the assessment of sleep quality considering work and off time together. The same analyzes were also performed adjusting the models for circadian desynchronization. A significance level of 5% was set.

Results: The mean age of the participants was 37.01 years (SE 5.9 years). Most were married (62,96%) and completed postgraduate studies (40,74%). Most were nurses (51,85%) and worked the night shift for an average of 9.2 years (SE 6.4 years). Most reported having poor or very poor sleep quality (55.56%). The administration of melatonin alone improved sleep quality with and without adjustment for circadian desynchronization. Vitamin E consumption improved sleep quality even after adjusting for circadian desynchronization. Vitamin A consumption only improved sleep quality before adjustment, indicating that greater circadian desynchronization negatively interferes with the positive effect of vitamin A. On the other hand, vitamin B12 consumption improved sleep quality only after the adjustment. The interaction between melatonin administration and the consumption of vitamins D3 and B12, after adjusting for circadian desynchronization, improved sleep quality. The interaction effect between melatonin administration and consumption of vitamins E and B6, which had improved sleep quality, ceased its effect after adjustment.

Conclusions: The consumption of vitamins of complex B, D and E, associated with the administration of exogenous melatonin, improved the quality of sleep of overweight night workers, in which circadian desynchronization interfered in this improvement only in relation to the consumption of vitamin E. In addition, consumption of vitamin A and administration of exogenous melatonin alone also improved sleep quality.

Effects of evening smartphone use on sleep and declarative memory consolidation in adolescents and young adults

C. Höhn[1,2], M.A. Hahn[3], G. Gruber[4], C. Cajochen[5,6], K. Hoedlmoser[1,2]
[1]University of Salzburg, Laboratory for Sleep, Cognition and Consciousness Research, Department of Psychology, Salzburg, Austria, [2]University of Salzburg, Centre for Cognitive Neuroscience Salzburg (CCNS), Salzburg, Austria, [3]University Medical Center Tübingen, Hertie-Institute for Clinical Brain Research, Tübingen, Germany, [4]The Siesta Group Schlafanalyse GmbH, Vienna, Austria, [5]Psychiatric Hospital of the University of Basel, Centre for Chronobiology, Basel, Switzerland, [6]University of Basel, Research Platform Molecular and Cognitive Neuroscience (MCN), Basel, Switzerland

Introduction: The potentially detrimental impact of short-wavelength light emitted by LED screens during the late evening has received considerable attention in the last decade. Numerous studies have reported that exposure to short-wavelength light before bedtime inhibits melatonin secretion and reduces sleepiness. Additionally, enduring negative effects on sleep and cognitive functioning on the following day have been observed. However, aside from melatonin suppression, many of these effects could not be replicated consistently or have only been demonstrated after artificial and prolonged light exposure. It remains unclear whether these potentially sleep-disrupting effects also affect sleep-dependent memory consolidation. Moreover, despite claims that adolescents may be more vulnerable to short-wavelength light, research comparing adolescents with adults regarding their light-sensitivity is scarce. Therefore, we assessed in an ecologically valid within-subjects study design whether evening smartphone use affects sleep physiology and declarative memory consolidation differentially in adolescents and young adults.

Methods: We conducted full-night polysomnography on a sample of healthy male adolescents ($N = 35$, 15.57 ± 1.12 years) and adults ($N = 33$, 21.73 ± 1.92 years). Each participant spent one adaptation night and three experimental nights in the sleep laboratory. During each experimental night, participants were exposed to a certain light condition for 90min until about 45min before bedtime. They read standardized stories either on a smartphone without a blue-light filter (1), on a smartphone with a blue-light filter (2), or from a printed book (3). Salivary melatonin levels and subjective sleepiness ratings were assessed before and throughout the light exposure until bedtime. Additionally, a declarative memory task was performed before the light exposure with an immediate recall session and a delayed recall the next morning.

Results: Subjective sleepiness was not significantly affected by the light conditions, but a clear melatonin suppression effect was present in both age groups after the light exposure and was most prominent after reading on the smartphone without a blue-light filter. However, at bedtime (i.e., 45min later), melatonin suppression was only observed in the adult group, while adolescents showed no significant differences in melatonin levels across the light conditions. Sleep architecture and sleep physiology remained largely unaffected in both age groups, with only a small but significant reduction of N3 sleep during the first night quarter in adults. This light-effect vanished when assessing sleep over the entire night. Sleep-dependent memory consolidation was also unaffected by the light conditions, behaviorally as well as physiologically (as measured by the coupling strength and precision between slow oscillations and sleep spindles).

Conclusions: Evening smartphone usage effectively suppresses melatonin secretion in both, adolescents and young adults but has a longer lasting impact in adults. However, an exposure time of 90min does not necessarily affect subjective sleepiness and has only small effects on subsequent sleep, at least when the exposure is ceased approximately 45min before bedtime. Further research is needed to determine the minimum time required between the end of the light exposure and bedtime to prevent adverse consequences for subsequent sleep and daytime cognitive functioning.

Effects of painful nerve injury on sleep architecture and circadian rhythmicity in mice

V. Palada[1]
[1]University of Helsinki, Department of Physiology & SleepWell Research Programme, Faculty of Medicine, Helsinki, Finland

Introduction: The relationship between sleep and pain is bidirectional since insufficient sleep can precede and exacerbate pain while pain can disturb the quality of sleep. In our current study, we wanted to assess the effects of spared nerve injury (SNI) in mouse model of neuropathic pain (NP) on sleep architecture using telemetric electroencephalography (EEG) and to access the effects of SNI on circadian rhythmicity in mice.

Materials and Methods: EEG recordings were collected from 7 SNI and 4 control sham C57BL/6JRj mice (both males and females). HD-X02 implants (DSI, Harvard Bioscience) simultaneously recorded the EEG, EMG, temperature and locomotor activity. Recordings were done for 72h at the baseline before the injury and for 48h at 7, 14 and 21 days after the SNI. Sleep scoring was performed by Spike 2. Mechanical and thermal hyperalgesia were assessed using Von Frey filament test, dynamic test, hot and cold plate testing. On day 22, pain-regulating sensory tissues were collected for transcriptomic analysis by qPCR.

Results: EEG recordings indicate that the REM sleep is the most severely affected sleep stage in both male and female mice upon SNI and the effects are the most severe at later time points. Total duration of REM was reduced upon SNI in both male and female mice. Gene expression analysis of core circadian genes indicates the circadian disruption in multiple sensory tissues which seems to be time dependent (morning vs afternoon differences) and more pronounced in females. SNI disrupted the temperature cycle in male mice.

Conclusions: Our results provide a detailed insight into the effects of neuropathic pain on sleep-wake cycle and circadian rhythmicity in mice and might be clinically relevant to better understand the mechanisms behind the comorbidity between sleep and pain.

Effects of partial blue light blocking glasses on sleep phase and behavior in schoolchildren: a crossover study

N.J. Maeda-Nishino[1], R. Yoshimoto[2], T. Ono[3], S. Chiba[4], S. Nishino[1]
[1]Stanford University, Palo Alto, United States, [2]Tokyo University, Tokyo, Japan, [3]Kanazawa Medical University, Kanazawa, Japan, [4]Jikei University, Tokyo, Japan

Introduction: In modern society and among schoolchildren, a tendency towards late bedtimes is prevalent and is known to adversely affect academic performance. The influence of nighttime light exposure, particularly blue wavelength light, has long been associated with delayed sleep onset, and the suppression of melatonin due to blue light is considered one of the mechanisms underlying this delayed sleep phase.

Materials and methods: In this study, we examined the effects of wearing partial blue light blocking glasses (specifically JINS Screen Lens Heavy [40% cut]) on salivary melatonin levels, sleep patterns, circadian phase, and daytime behavior in a group of 39 male school children aged 10-12. Employing a crossover design, the participants alternated between wearing either the blue light blocking glasses or standard clean lens glasses (without blue light blocking) for three hours prior to their usual bedtime over a span of two weeks, with a one-week washout period in between sessions. Saliva samples and questionnaires were collected during the first and second weeks of each session, with saliva collected at -3, -2, -1, and 0 hours before the habitual bedtime. Additionally, actigraph data were collected throughout the evaluation periods.

Results: Our findings revealed that while partial blue light blocking glasses did not affect salivary melatonin levels, they did demonstrate a significant advancement in sleep phase when compared to the session without blue light blocking lenses (bedtime: 22.03±0.08h vs. 22.1±0.1h, sleep onset: 22.26±0.08h vs. 22.36±0.10h, p=0.04).

The effects of the glasses were most prominent during the second week, where significant advances in bedtime (-0.12h, p=0.03), sleep onset (-0.14h, p=0.03), wake up time (-0.13h, p=0.02), and leaving-bed time (-0.14h, p=0.02) were observed compared to the first week. However, no changes were observed during the control session (without blue light filter). Furthermore, alongside the advancement in sleep phase, there was a significant decrease in daytime irritability and disruptive behavior towards siblings and friends during the second week of the filter session.

Conclusions: Our results indicate that wearing partial blue light blocking glasses can advance the sleep phase and improve behavior in schoolchildren, but these effects were not mediated by changes in melatonin secretion. Further research is needed to investigate the underlying mechanisms involved.

Enhancing accessible quality care of circadian rhythm disorders through a novel home-based circadian phase assessment tool - circadia study

J. Love[1,2], G. Bormes[1], R. Saxena[3,2,4], F. Scheer[1,4], J. Lane[1,2]
[1]Brigham and Women's Hospital, Sleep and Circadian Disorders, Boston, United States, [2]Broad Institute of MIT and Harvard, Cambridge, United States, [3]Massachusetts General Hospital, Boston, United States, [4]Harvard Medical School, Boston, United States

Introduction: Circadian rhythm sleep-wake disorders (CRSWDs) result from desynchronized timing of physiology relative to the environment. CRSWDs, often undiagnosed, can increase risk of cardiometabolic and psychiatric disorders, and have financial and social impacts. Dim-light-melatonin-onset (DLMO) assay, the current physiological assessment for CRSWDs is expensive/difficult. In a survey of 63 participants, participants were much more inclined to do an at-home study than a hybrid or hospital/clinical. We aim to develop a more accessible melatonin assessment.
Materials and methods: Our DLMO kit is low-cost, home-based and self-administered. It contains all necessary components for a home-based DLMO assay, including 18 time-stamped saliva samples, an actiwatch, and a light meter. We tested the feasibility of our DLMO kit across two assessments, one-week apart, in CRSWDs patients (N=5) and controls (no sleep disorders) (N=5). We concurrently assessed sleep with actigraphy and sleep diaries over four weeks through a self-guided study portal.
Results: We enrolled participants diagnosed with delayed (n=4) and advanced (n=1) CRSWDs and 5 controls (avg. age 38.2 (± SD 11.7) years).; 9 female, 1 male (control)). Participants were 100% compliant completing questionnaires (Health and Lifestyle, Morning-Eveningness, pre-/post-attestation). Daily sleep logging was maintained easily, with participants averaging 40.2 days and only missing 2.2 days, with 5 individuals never missing a day. The average duration of study involvement, from consent to study completion, was 42.4 days. Participants successfully set-up their collection space and collected saliva samples, remaining compliant to objectively measured study protocols, which we could determine through their actiwatch. Overall, 147 (82%) samples were collected within 5 minutes of the scheduled time. We were able to calculate a DLMO for 8/10 participants for at least one collection (we completely missed one participant's collection window while another participant improperly mailed samples and used MEMs cap incorrectly). Additionally, we were able to calculate a DLMO time of 6/10 participants for both DLMO collections (2/10 had one of their collections not yielding a DLMO time). DLMO times were on average 3h18min earlier than self-reported sleep times (DSWPD: 12:04:30 AM, ASWPD: undetermined, controls: 9:55:37 PM). Six participants whose DLMO 1 and 2 were calculated had a 96% correlated (p<0.0005) rate. In addition, based on responses to the Post-DLMO Questionnaire, 70% of participants felt confident completing both DLMOs with just the written and video instructions, all participants felt confident completing both DLMOs with instructions and access to a member of the study team to answer questions during the collections (3/10 participants asked questions during one of their collections).
Conclusions: Our pilot study found that the at-home DLMO kit was feasible and reproducible. Using the kit, we confirmed, using a threshold of 3pg/ul, their previous DSWPD diagnoses and correctly classified controls through melatonin samples. We used objective measures (Actigraph) to verify adherence to testing procedure. We demonstrated the feasibility of a DLMO kit for diagnosing CRSWD patients, reducing cost, removing geographic constraints, and allowing patients greater flexibility. This DLMO kit and procedures will be utilized on a larger scale in the Circadia Study, set to launch in March 2023.

Enrichment of melanopsin genetic variants in a Delayed Sleep-Wake Phase Disorder (DSWPD) patient – whole genome sequencing analysis

J. Brzezynski[1], S. Smieszek[1], C. Johnson[1], A. Goldberg[1], C. Miller[1], A. Kaden[1], C. Polymeropoulos[1], G. Birznieks[1], M. Polymeropoulos[1]
[1]Vanda Pharmaceuticals Inc., Washington, DC, United States

Introduction: Melanopsin (*OPN4*) is a blue light-sensitive opsin-type G-protein coupled receptor. It is highly expressed in photosensitive retinal ganglion cells which mediate responses to light, including regulation of sleep, circadian photoentrainment, and pupillary light response. Mutations in *OPN4* were shown to affect responses to light, ultimately affecting the regulation of circadian rhythms and sleep. Previously, we described a male carrier of an *OPN4* missense variant diagnosed with Delayed Sleep-Wake Phase Disorder (DSWPD), with a consistent recurrent pattern of delayed sleep onset. The rs143641898 [NM_033282.4:c.502C>T p.(Arg168Cys)] variant in the *OPN4* gene was shown in a functional study to render the *OPN4* protein non-functional.

Materials and Methods: We have conducted a rigorous observational research study in suspected DSWPD patients with the aim of detecting consequential variants that may be associated with the delayed sleep phenotype. Altogether, 117 samples were collected from DSWPD participants and compared to 315 healthy controls.

Results: We report an enrichment of *OPN4* rare coding variants (MAF < 1) in the DSWPD samples compared to healthy controls. This significant enrichment likely implies that other rare predicted loss-of-function variants can similarly contribute to the delayed sleep phenotype. A significant association of rs1079610, a common variant in *OPN4* with delayed bedtime in DSWPD patients, was found. This variant has been previously reported in association with altered pupillary responses. This effect is not seen in in a large set of healthy controls without DSWPD diagnoses. The discussed rare *OPN4* variants likely increase the risk of DSWPD via its direct effect on the pathophysiology along the melanopsin axis.

Conclusions: This study offers useful insights for the differential diagnosis and ultimately treatment of DSWPD risk in which patients carry pathogenic variants in the *OPN4* gene.

Acknowledgements: This work was supported by Vanda Pharmaceuticals Inc. Vanda would like to acknowledge the individuals who participated in this study.

Evaluating the circadian and sleep deprivation effects on short inter stimulus intervals in the PVT

L. Lack[1], B. Hartland[2]
[1]Flinders University, Adelaide Institute for Sleep Health, Eden Hills, Australia, [2]Flinders University, Psychology, Adelaide, Australia

Introduction: The Psychomotor Vigilance Task (PVT) is a widely used measure of the effects of sleep deprivation on vigilant attention. The test requires a rapid response to a stimulus occurring at random inter-stimulus intervals (ISIs) between 2 and 10 seconds following a previous response. A few studies have found an ISI effect where shorter ISIs (2-4s) have slower reaction times (RTs) than longer ISIs (8-10s). How this ISI effect is impacted by circadian timing has yet to be investigated.

Materials and Methods: This study compared the ISI effect at 3 time points with 5, 23, and 29 hours of wakefulness. Twenty-three hours of wakefulness coincided with the circadian trough. Data were taken from 16 healthy participants during a 30 hour period of sleep deprivation.

Results: A repeated-measures (3 x 3) ANOVA (3 time points, 3 ISIs) found that RTs were slower and lapses (RT>500msec) more frequent in short ISIs compared with medium and long ISIs. RTs were also slower and lapses more frequent at the circadian trough compared to both the early testing session and after 29h of total sleep deprivation. The short ISIs were associated with particularly slower Reaction times and more lapses at the circadian trough.

Conclusions: Increased lapses in shorter ISIs could be explained by an involuntary mental "rest period" after responding, that gets longer and more frequent under sleep pressure from both circadian and homeostatic sleep pressure. These findings have implications for interpreting PVT results and their application to everyday tasks, such as driving. Further research could involve neuroimaging the brain's responses during different ISIs to confirm the mental 'rest period' following a response in the PVT task.

Acknowledgements: Project Title: Determining the effectiveness of vestibular and ocular motor function screening assessments for identifying sleepy drivers, Adelaide institute for Sleep Health, Flinders University

Factors influencing the adherence to Bright Light Therapy in youths with insomnia and eveningness: a mixed-methods study

F.T.W. Cheung[1], N.Y. Chan[2], J.W.Y. Chan[2], W.T.Y. Wong[1], M.P.Y. Lee[1], H.F. Sit[1], R.R. Wang[1], J. Zhang[2,3], A.M. Li[4], C.A. Espie[5], M. Gradisar[6,7], Y.-K. Wing[2], S.X. Li[1,8]
[1]The University of Hong Kong, Sleep Research Clinic & Laboratory, Department of Psychology, Hong Kong, Hong Kong, SAR of China, [2]The Chinese University of Hong Kong, Li Chiu Kong Family Sleep Assessment Unit, Department of Psychiatry, Faculty of Medicine, Hong Kong, Hong Kong, SAR of China, [3]The Affiliated Brain Hospital of Guangzhou Medicine University, Center for Sleep and Circadian Medicine, Guangzhou, Guangdong, China, [4]The Chinese University of Hong Kong, Department of Paediatrics, Faculty of Medicine, Hong Kong, Hong Kong, SAR of China, [5]Nuffield Department of Clinical Neurosciences and Sleep & Circadian Neuroscience Institute, University of Oxford, Oxford, United Kingdom, [6]WINK Sleep Pty Ltd, Adelaide, Australia, [7]Sleep Cycle AB, Gothenburg, Sweden, [8]The University of Hong Kong, The State Key Laboratory of Brain and Cognitive Sciences, Hong Kong, Hong Kong, SAR of China

Introduction: Bright light therapy (BLT) has increasingly been used as a chronotherapeutic intervention for sleep and circadian problems. Previous research has raised concerns about non-adherence to BLT due to the behavioural commitment required, which could lead to less optimal treatment outcomes. Nonetheless, there has been limited research to examine BLT adherence in the youth population. This study used a mixed-methods approach to explore the factors related to BLT adherence.

Methods: Seventy-five youths (age = 20.1±2.0, 54.7% female) with insomnia and eveningness underwent six-week group-based cognitive behavioural therapy for insomnia with BLT (either active BLT [CBTI+BLT]: n = 38, or placebo BLT [CBTI-BLT: n = 37]). BLT was delivered using a portable device (Re-timer[TM]) and participants were instructed to use for 30 minutes each morning immediately after waking up for five consecutive weeks with gradual timing advance. Daily diaries were used to measure light device use. Adherence was calculated as a percentage of the number of days used out of the number of days prescribed (7 days x 5 weeks = 35 days). All participants completed a baseline assessment of their motivation for treatment. Post-treatment assessments included treatment creditability and expectancy, as well as a single-item measure of the perceived helpfulness of light therapy. These factors were used to predict BLT adherence using univariate regression analysis. A subset of participants (n = 20, age = 19.4±3.3, 60.0% female) were additionally invited to partake in a one-to-one semi-structured interview after the intervention to explore factors associated with their motivation and barriers for adherence to BLT. All interviews were audio-recorded and transcribed verbatim. The contents of the interviews were analysed using a qualitative thematic analysis approach.

Results: The overall adherence to BLT was 51.7% (95%CI [43.1, 60.2]) for CBTI+BLT and 54.0% (95%CI [46.6, 61.4]) for CBTI-BLT (p = .68). Only the perceived helpfulness of light therapy significantly predicted BLT adherence (β = .361, p = .004). Thematic analysis indicated that almost all participants (18/20) were motivated by the potential (11/20) or perceived benefits (7/20) of using BLT during treatment. However, participants reported practical constraints, including a lack of time in the mornings (20/20) and discomfort from using the device (13/20, e.g., the device is bulky and often slides down) that hindered continuous adherence to BLT. Lastly, participants indicated that they would be more willing to adhere to the prescription if they were given more psychoeducation on its benefits and if incorporating supervision and monitoring (e.g., daily report on online messengers) from the clinicians.

Conclusions: The adherence rate to BLT in the current trial was suboptimal. Both quantitative and qualitative analyses showed that patients' perceived benefits of BLT could best motivate their adherence to therapy. The findings from this study may inform future clinical practices of employing light therapy and suggest the need to provide psychoeducation on the benefits of BLT and monitor patients' use of BLT with timely feedback.

Favorable profile of NREM oscillations is associated with evening preference and high circadian rhythmicity

I. Filchenko[1,2], A.K. Eberhard-Moscicka[3], C. Gutierrez Herrera[1,4], S. Duss[1], C. Cajochen[5], C. Bernasconi[1], M.H. Schmidt[1], C.L.A. Bassetti[1]
[1]Inselspital, University Hospital Bern, Department of Neurology, Bern, Switzerland, [2]University of Bern, Graduate School for Health Sciences, Bern, Switzerland, [3]University of Bern, Department of Psychology, Bern, Switzerland, [4]Inselspital, University Hospital Bern, Department of Biomedical Research (DBMR), Bern, Switzerland, [5]University Psychiatric Clinic Basel, Centre for Chronobiology, Basel, Switzerland

Introduction: Homeostatic and circadian processes play a pivotal role in sleep regulation and structure. However, little is known about the association of the characteristics of circadian rhythm with NREM oscillations. While morning preference is associated with decreased sleep spindle (SS) density and increased overnight changes in SS amplitude [Merikanto, 2017; Pesonen, 2020], the associations of objective characteristics of circadian rhythm with NREM oscillations are sparsely investigated. Here, we explored the association between properties of NREM oscillations and circadian rhythm.

Materials and Methods: We pooled data from two observational studies, "Sleep and cognitive functioning" and "Sleep and creativity". The studies included volunteers in good or excellent health condition (Eastern Cooperative Oncology Group grade of 0-1). Known pre-existing brain damage (e.g., stroke, neuroinfection, tumors), progressive neurological diseases, known psychiatric diseases, concomitant benzodiazepine medication, drug abuse and pregnancy were exclusion criteria. Clinical history, circadian parameters and NREM sleep architecture were assessed at study inclusion. Circadian assessment included Morningness-Eveningness Questionnaire and two-week actigraphy (fall-asleep time, get-up time, non-parametric circadian rhythm analysis). NREM architecture was characterized with SS and slow wave (SW) density and morphology based on overnight polysomnography. Association between NREM architecture as dependent variables and circadian parameters as independent variables were explored using multiple linear regression adjusted for age, sex and arousal index.

Results: Data of 95 participants were analyzed showing a median age of 32.7 years old (interquartile range, IRQ [24.0, 55.0]); 54% men); polysomnographic total sleep time median of 6.6 hours (IQR [5.1, 7.5]); polysomnographic sleep efficiency median of 82.1% (IQR [69.2, 90.1]); and arousal index median of 14.4/hr (IQR [5.6, 27.9]).

SS density was associated with late least 5 active hours start (L5; 0.66/min, p=0.019) and low interdaily stability (IS; 6.19/min., p=0.009). SS wavelength was associated with late get-up times (β=33.17 ms, p=0.030) and fall-asleep times (1.36 ms, p=0.030) and low IS (-393.55 ms, p=0.008). SS amplitude was associated with early get-up times (-0.87 uV ms, p=0.016), high IS (12.21 uV, p=0.014) and low intraday variability (IV; -7.21 uV, p=0.004). SS globality was associated with later L5 (3.6%, p=0.039). Circadian parameters were differentially associated with slow (<12 Hz) and fast SS (≥12 Hz): high prevalence of fast SS was associated with late L5 (8.3%, p=0.015), maximal 10 active hours start (M10, 7.9%, p=0.005) and fall-asleep times (10.3%, [MS3] p<0.001).

SW amplitude was associated with low IV (β=-15.43 uV, p=0.010). High-amplitude (>40 uV) and medium-amplitude SW (15-40 uV) had differential associations with circadian parameters: late M10 was associated with increased high-amplitude (8.43%, p=0.26) and reduced medium-amplitude SW (β=-8.71%, p=0.16).

Morningness-Eveningness Questionnaire had limited associations with NREM oscillations.

Conclusions: Objective circadian parameters were associated with NREM oscillations, especially sleep spindles. Evening preference, as well as regularity and low fragmentation of circadian rhythm, appears to indicate a favorable profile of NREM oscillations. It remains unclear whether the increase of SS amplitude in morning preference and the decrease of SS density, wavelength and globality in evening preference may reflect a circadian compensatory mechanism.

Acknowledgements: European Stroke Research Foundation and UniBe IRC "Decoding sleep"

Higher activity and more stable rest-activity rhythm are related to better working memory among university students during the COVID-19 pandemic

M.C.M.M. David[1], G.R. Vieira[1], N.F. dos Santos[2], L.L. Duarte[2], R.J.B. Matos[2]
[1]Federal University of Pernambuco, Recife, Brazil, [2]Federal University of Recôncavo da Bahia, Santo Antônio de Jesus, Brazil

Introduction: With the COVID-19 pandemic, emergency remote classes were implemented during the second half of 2020 in most Brazilian universities. Thus, the rest-activity rhythm may have been influenced by changes in light exposure, physical activity and social interaction, which may have had an impact on memory. Therefore, the aim was to investigate the relationship between the rest-activity rhythm and the memory of university students during the pandemic.

Materials and Methods: The study took place between August and November 2020 with university students aged between 18 and 30, of both genders, who lived in Campina Grande and Recife, Brazil. The actimeter was used for 12 complete days to acquire rest-activity rhythm data. The Digit Span Test was applied in the last week (between 5pm and 9pm), in forward (F-DST) and backward (B-DST) order to assess working memory. The study was approved by the Ethics and Research Committee of the Federal University of Pernambuco (32360720.4.0000.5208). The actimetric variables were processed using parametric (by Cosinor) and non-parametric methods. After the normality test, Pearson's Correlation test was applied for parametric variables and Spearman's correlation test for non-parametric variables, considering $P<0.05$.

Results: The sample consisted of 62 university students aged 21.6 ± 2.1 years (80.6% females). It was found that performance on the F-DST was related to inter-day stability ($r=0.25$, $P<0.05$), mean estimated statistic over rhythm (MESOR, $r=0.31$, $P<0.05$) and amplitude ($r=0.32$, $P<0.05$). On the other hand, the B-DST was related to M10 ($r=0.25$, $P<0.05$), which represents the average activity of the 10 continuous hours with greater activity.

Conclusions: Greater activity during wakefulness and a more stable rest-activity rhythm over the days were related to better working memory among university students during the first year of the COVID-19 pandemic.

Higher Morningness Polygenic Scores Are Associated with Earlier Chronotype among U.S. Young Adults, but Less So among non-European Genetic Ancestry Groups

J.M. Meyer[1], B. Levitt[2], A.E. Aiello[3,4], K.M. Harris[2,5]
[1]University of Kansas Medical Center, Department of Population Health, Kansas City, United States, [2]University of North Carolina at Chapel Hill, Carolina Population Center, Chapel Hill, United States, [3]Mailman School of Public Health, Columbia University, Department of Epidemiology, New York, United States, [4]Mailman School of Public Health, Columbia University, Robert N. Butler Columbia Aging Center, New York, United States, [5]University of North Carolina at Chapel Hill, Department of Sociology, Chapel Hill, United States

Introduction: Polygenic scores (PGSs) constructed from results of large-scale genome-wide association studies (GWASs) represent a potentially useful tool for measuring genetic predictors of sleep and circadian rhythms. Results from a recent GWAS (Jones et al. 2019) in UK Biobank participants of European ancestry have been used to construct PGSs for morningness (i.e., identifying as a "morning" person). However, much remains to be understood regarding how well such PGSs predict chronotype in population-based, U.S. samples of diverse genetic ancestry. The present study addresses this gap by examining the association of morningness PGS with chronotype in a population-based sample of U.S. young adults.

Materials and Methods: We analyzed data from the National Longitudinal Study of Adolescent to Adult Health to identify the association between morningness PGS (constructed from Jones et al. 2019 results) and chronotype. Chronotype was measured as midpoint of sleep on free days, corrected for sleep debt (MSF_{SC}). MSF_{SC} was calculated from self-reported bedtime and wake time when participants were approximately 24-32 years old. Genetic ancestry was categorized as European, African, Hispanic, or Asian, based on principal component analysis. PGSs were standardized within genetic ancestry.

Results: Higher morningness PGS was significantly associated with earlier MSF_{SC} among participants with European genetic ancestry. Although the direction of this association was the same among participants with African, Hispanic, or Asian genetic ancestry, the association was smaller in magnitude and not statistically significant. For the European genetic ancestry group, adding morningness PGS to the model explained an additional 1.43% of the variation in MSF_{SC}.

Conclusions: Our results suggest that this morningness PGS is associated with chronotype in a population-based U.S. sample, though statistically significantly so among individuals of European genetic ancestry only. Findings are potentially consistent with the expectation that the PGS predictive ability is stronger among individuals of European genetic ancestry due to the European-ancestry sample of the GWAS used to construct this PGS. However, findings may also be related to the larger size of the European genetic ancestry group in our sample, which provides greater statistical power. Additional research is needed to better understand and ameliorate disparities in the performance of genetic predictors of chronotype for groups of non-European genetic ancestry.

How is the relationship between chronotype and working memory during the COVID-19 pandemic?

M.C.M.M. David[1], G.R. Vieira[1], N.F. dos Santos[2], L.L. Duarte[2], R.J.B. Matos[2]
[1]Federal University of Pernambuco, Recife, Brazil, [2]Federal University of Recôncavo da Bahia, Santo Antônio de Jesus, Brazil

Introduction: Cognitive functions may vary according to chronotype and time of day, especially in terms of working memory and attention. As the COVID-19 pandemic changed the routine of individuals, it is necessary to investigate whether there was a change in the relationship between chronotype and memory. Therefore, the aim was to evaluate working memory according to the chronotypes of university students during the COVID-19 pandemic.
Materials and Methods: The study took place in two moments of the pandemic: between August and November 2020 (M1); and between July and December 2021 (M2). University students of both genders, between 18 and 30 years old, from the cities of Campina Grande and Recife in Brazil were included. The Digit Span Test was applied in forward (F-DST) and backward (B-DST) order to assess participants' working memory between 5pm and 9pm. In addition, the Morningness and Eveningness Questionnaire by Horne & Ostberg was applied to characterize individuals according to chronotype. The study was approved by the Ethics and Research Committee of the Federal University of Pernambuco (32360720.4.0000.5208). After the normality test, the Spearman correlation and the Kruskal-Wallis tests were applied, considering $P<0.05$.
Results: The mean age in M1 was 21.7 ± 2.2 years (n=70, 75.7% females) and 22.5 ± 2.7 years in M2 (n=112, 66.1% females). There was a predominance of individuals from the intermediate chronotype (M1=41.4%, M2=54.5%), followed by the evening chronotype (M1=40.0%, M2=27.7%). There was correlation between chronotype and B-DST in M2 (r=0.24, $P<0.01$). When comparing chronotypes, individuals with an intermediate chronotype (5.9 ± 1.3) performed better on the B-DST than evening individuals (5.0 ± 1.2, $P<0.01$) in M2.
Conclusions: During the second year of the pandemic, working memory during the evening was related to chronotype, so that university students with morning trends performed better. However, individuals with an intermediate chronotype performed better than evening individuals.

Impact of timing and regularity on sleep and cardiorespiratory metrics: a large observational study

G. Garcia-Molinia[1], V. Chellamuthu[1], B. Le[1], M. Aloia[1], M. Wu[1], R. Mills[1]
[1]Sleep Number Corporation, Minneapolis, United States

Introduction: The placement of sleep in the 24-hour day, chronotype, and regularity of the sleep-wake cycle have been identified as sleep health domains. Using metrics collected during sleep, we explored the impact of chronotype and sleep/wake regularity on sleep duration, restful sleep duration, time to fall asleep (TTFA), percent restful sleep, mean heart rate (HR), and mean breathing rate (BR).

Materials and methods: This observational study used data collected by the Sleep Number smart bed from January 1st, 2019 to December 30th, 2019. Participants were assigned into 1 of 3 chronotypes by their sleep onset time in ≥ 67% of the recorded sleep sessions: early (before 10:00pm), intermediate (10:00–11:59pm) or late (12:00am or later). Chronotype consistency was determined by the percentage of months a participant aligned with their assigned chronotype (high: 80%; moderate: 50–80%; low: < 50%).

Participants were categorized into regular (< 60 minutes) or irregular (≥ 90 minutes) sleep groups, based on deviation from their mean sleep onset time. The impact of chronotype and regularity on sleep duration, restful sleep duration, TTFA, percent restful sleep, HR, and BR were assessed by estimating odds ratios (ORs), variation was assessed by standard deviation (SD), and group comparisons were assessed by Cohen's d effect size (d).

Results: Over 330 000 participants (mean age: 55.7 years [SD: 14.0]; 51.2% female) contributed > 64 million sleep sessions for analysis. Of the participants, 16.8%, 62.2% and 20.9% were assigned to early, intermediate, and late chronotype, respectively. Chronotype consistency was high in 58.5%, moderate in 38.6%, and low in 2.9% of participants. Most participants (66.1%) had regular sleep and 4.7% had irregular sleep. Participants with regular sleep had shorter sleep duration (mean: 7:41 [SD: 0:37] h:min), restful sleep duration (6:46 [0:34]), and TTFA (0:30 [0:06]) compared to participants with irregular sleep (8:13 [0:28]; 7:00 [0.25]; 0:45 [0:06], respectively). Regular participants had slightly higher percent restful sleep than irregular participants (88.0% [0.70] vs 85.4% [1.03]).

Overall, participants with regular sleep had lower HR and BR versus participants with irregular sleep (61.8 vs 63.6 beats per minute and 15.1 vs 15.6 breaths per minute, respectively). Early-chronotype participants were 2.4 times more likely to have regular sleep than late-chronotype participants (OR: 2.42 [95% confidence interval: 2.36, 2.47]). Sleep duration and restful sleep duration in early versus late chronotypes were significantly different between regular and irregular participants (sleep: d=1.54 and 0.88; restful sleep: d=1.46 and 0.82, respectively).

Conclusions: Most participants with regular sleep were early- or intermediate-chronotype sleepers. Chronotype consistency was high in most participants. Regularity, regardless of chronotype, was associated with shorter TTFA, higher percent restful sleep, and lower HR and BR, suggesting that regularity positively impacts sleep quality and cardiorespiratory metrics during sleep. Differences in sleep duration and restful sleep duration were significantly higher among participants with regular versus irregular sleep, suggesting an association between regularity and objective aspects of sleep quality.

Implementation of two biomathematical models for personalising sleep timing recommendations in shift workers

P. Varma[1], S. Postnova[2], A. Phillips[1], S. Knock[2], M. Howard[3], S. Rajaratnam[1], T. Sletten[1]
[1]Monash University, Turner Institute for Brain and Mental Health, Clayton, Australia, [2]The University of Sydney, School of Physics, Camperdown, Australia, [3]Institute for Breathing and Sleep, Austin Health, Heidelberg, Australia

Introduction: Sleep disturbances and circadian disruption have adverse effects on health, safety, and performance in shift workers. Mathematical models of sleep and alertness regulation can provide physiologically optimal times for an individual to sleep when experiencing circadian disruption, such as in shift work. The implementation of these models in real-world shift work contexts is crucial but unexamined. This study implemented two models - the Phillips-Robinson Model, and the Model for Arousal Dynamics, to provide personalised sleep recommendations to shift working nurses. It examined: (i) the overlap between model recommendations and sleep; and (ii) the alignment between model recommendations and actual sleep onset and offset times.

Methods and materials: Participants were 28 nurses regularly engaged in shift work, defined as work schedules outside 7 am to 6 pm (37.2±9.7years, three males). Sleep behaviour was monitored for two weeks using an online sleep diary. Habitual sleep patterns were monitored during Week 1. In Week 2, participants were provided sleep recommendations from one of the two models and instructed to follow the recommendations (n=14 for each model). Model recommendations were based on participants' pre-provided work schedules and personal commitments. An attempt was made to allocate participants with similar shift combinations to each model. Upon conclusion of the study, participants provided feedback and suggestions for improving the practicality and implementation of recommendations.

Results: Sleep percentage overlap between model recommendations and actual sleep suggested that an individual was asleep when their model suggested sleep for (i) 69.0±9.9% for the Phillips-Robinson Model; and (ii) 79.2±8.1% for the Model of the Arousal Dynamics. Alignment between model recommendations and sleep onset-offset times was significantly better with the Model of Arousal Dynamics than with the Phillips-Robinson Model (Sleep onset times: Intercept = 104.0 mins, Model of Arousal Dynamics = -54.1 mins, p=.01; Sleep offset times: Intercept = 91.3 mins, Model of Arousal Dynamics = -28.5 mins, p=.04). Alignment was significantly better with the Model of Arousal Dynamics for sleep onset times in 24 hours prior to morning (38.4±23.3 v/s 141.0±99.8 mins, p=.001) and afternoon shifts (21.7 ± 20.7 v/s 56.0 ± 59.9 mins, p=.001). Alignment with the Phillips-Robinson Model was significantly better for sleep offset times prior to afternoon shifts (71.3±44.6 v/s 104.9±81.5 mins, p=.01), suggesting that models may have utility across different shift types.

Primary feedback based on thematic analysis included: (i) tailoring recommendations to account for diurnal preferences; and (ii) automated delivery of recommendations (n=11). Participants suggested that for the Phillips-Robinson Model, increasing the sleep duration after night shifts (n=4), and for the Model of Arousal Dynamics, reducing the number of naps (n=6) can improve usability.

Conclusion: This study demonstrates the potential application of biomathematical models for personalising sleep-wake timings in shift work settings. Randomised controlled trials with follow-up assessments of health outcomes are needed to assess the effectiveness and longer-term compliance. Incorporating user feedback to personalise the recommendations further, improving their utility, and automated delivery via smartphone application can support the translation of these models into operational settings.

Influence of rotating shift schedule on subjective perceptions of hunger and satiety and its correlation with sleep duration and energy intake: an observational and prospective study

L. Marot[1], L. Balieiro[1], T. Lopes[1], D. Rosa[1], K. Wright[2], C. Moreno[3], C. Crispim[1]
[1]Federal Univesity of Uberlândia, Uberlândia, Brazil, [2]University of Colorado Boulder, Boulder, United States, [3]Universidade de São Paulo, São Paulo, Brazil

Introduction: Studies have described that the shiftwork rotation schedule may lead to irregular eat/sleep times among shift-workers. However, little is known about the influence of a rotating shift schedule on perceptions of hunger and satiety. The aim of this study is to investigate the subjective rates of hunger before meal and satiety after meal variability of rotating shift workers throughout ten consecutive days and its association with energy intake and sleep duration.

Materials and Methods: Mining company shift workers (n=30) were evaluated in a complete rotation shift schedule over 240 consecutive hours (10 days; two days of morning shifts (M1 and M2), two days of afternoon shifts (A1 and A2), 24-hour free (24F), two days of night shifts (24F) and three days off (F1, F2 and F3)). Subjective perceptions rates (hunger and satiety) were evaluated by a visual analogue scale (VAS), sleep duration by actigraphy, and dietary intake by 24h recall. Mixed models were used to analyze the fixed effects of shift day on subjective perceptions of hunger and satiety. The correlation between sleep and energy and perception variables was accessed using Spearman's rho test.

Results: For hunger, the last day of night shift (N2) (6.4 ± 0.4) had higher rates than both morning shift days (M1:4.7 ± 0.4, $p < 0.001$ and M2: 5.4 ± 0.4, $p = 0.005$) and the second afternoon shift (A2: 5.7 ± 0.3, $p = 0.031$). We did not find significant variation throughout the schedule on satiety after meal ($p = 0.358$). We did not find significant correlation between sleep and perceptions variables (hunger, $p = 0.316$; satiety, $p = 0.703$), nor for energy ($p = 0.305$). Energy was positive correlated with satiety ($p<0.001$), but not with hunger ($p = 0.074$).

Conclusions: Rotating shift workers exhibit variations in subjective perceptions related to food intake as the shift progresses. However, it doesn't seem to be related to sleep duration.

Influence of social jet lag on weight loss and food intake in bariatric patients: a one-year follow-up study

A. Cunha Carvalho[1], M.C. Mota[1], L. Pereira Marot[1], L.A. Mattar[2], J.A. Gomides de Sousa[2], A.C. Tomaz Araújo[3], C. Aparecida Crispim[4]
[1]Federal University of Uberlandia, FAMED, Uberlândia, Brazil, [2]Clínica LEV, Surgery, Uberlândia, Brazil, [3]Clínica LEV, Nutricionist, Uberlândia, Brazil, [4]Federal University of Uberlândia, FAMED, Uberlândia, Brazil

Introduction: Circadian misalignment is a failure in the synchronization between endogenous factors (central and peripheral clocks) and environmental signals, causing changes in the physiological circadian rhythm. Social jet lag (SJL) is a measure of the degree of this misalignment that has been associated with an increased risk of overweight and obesity, as well as changes in food consumption. So far the literature is still scarce studies assoaciating SJL and health outcomes of patients undergoing bariatric surgery. So far, literature is still scarce with studies that associate SJL with health outcomes of patients undergoing bariatric surgery.
Objective: Evaluate the association between SJL with anthropometric and food consumption outcomes one year after bariatric surgery.
Materials and Methods: A total of 122 bariatric patients were included (77% female, aged 33 years (range 28 - 41); 79.5% underwent Roux-en-Y gastric bypass). Anthropometric and food consumption variables and SJL were evaluated in the preoperative evaluation and in the third and sixth months and one year after surgery. SJL was calculated based on the absolute difference between the mid-sleep time on weekends and weekdays. The food consumption was evaluated by two 24-h recalls (24HR) at each evaluation moment (Totaling 976 recalls) with one occurring on a weekday and the other one on the weekend according multiple-pass method. Generalised estimating equations were performed to evaluate effect of time, isolated effect of SJL and the interaction of these variables on food consumption during first year of surgery. Linear regression models were performed to evaluate the associations between mean SJL exposure and the weight loss during this same period.
Results: The group more exposed to SJL had higher intakes of calories (p = 0.001), carbohydrates (p = 0.038), proteins (p= 0.001) and total (p = 0.002) and polyunsaturated (p = 0.011) fats when compared with the group less exposed to SJL. Linear regression showed a negative association between mean SJL exposure over the 6 months and one year and body weight loss (kg) (β= -0.14 ; p= 0.032 and β= -0.24 ; p= 0.037), percentage of weight loss (β= -0.21 ; p= 0.020 and β= -0.29 ; p= 0.030) and the reduction of BMI (β= -0.18 ; p= 0.021 and β= -0.25 ; p= 0.039).
Conclusions: SJL was negatively associated with anthropometric and food consumption outcomes one year after bariatric surgery. Future studies with longer follow-up are needed to confirm these findings.

Investigating the wake maintenance zone with acute sleep restriction: a promising diagnostic

S. Snipes[1], R. Huber[1,2]
[1]University Children's Hospital of Zurich, Child Development Center, Zurich, Switzerland, [2]Psychiatric Hospital, University of Zurich, Department of Child and Adolescent Psychiatry and Psychotherapy, Zurich, Switzerland

Introduction: The wake maintenance zone (WMZ) is a 2-4 h circadian window before habitual bedtime in which sleep initiation is substantially more difficult, even under elevated levels of sleep pressure. The WMZ in healthy populations is likely meant to avoid initiating sleep too early, which would desynchronize the sleep/wake pattern from the light/dark cycle. Instead, an overactive and prolonged WMZ could cause sleep-onset insomnia. Despite being potentially clinically relevant, there are very few studies of the WMZ because it has so far required at least 40 h of sleep deprivation to reliably measure effects, making it too burdensome for both patients and many researchers. Instead, by using acute sleep restriction, we have found that the WMZ can be reliably detected with substantially less effort.

Materials and methods: We have developed the 4/24 extended wake paradigm, in which participants sleep the first 4 h of the night, then stay awake for 24 h, with repeated recordings of EEG, pupillometry, and questionnaires. We tested 18 young healthy adults (19-26, 9 female) in controlled laboratory conditions. We looked at subjective sleepiness, EEG spectral power, pupil diameter and standard deviations, blinks (eye-closures < 1 s) and ocular microsleeps (eye-closures > 1 s). The effect of the WMZ on various outcome measures was evaluated with paired t-tests, comparing the two recordings before and after the WMZ, with the two recordings during the WMZ. Values were z-scored to better compare different measures.

Results: We found highly significant effects of the WMZ in subjective sleepiness ($p = .004$, Hedge's $g = -1.13$), EEG theta power ($p < .001$, $g = -2.17$), ocular microsleeps ($p < .001$, $g = -2.16$), and pupil diameter ($p < .001$, $g = 1.26$). We found smaller effects in alpha power ($p = .002$), pupil size variability ($p = .111$ $g = -.065$), and no effect in blink rates ($p = .229$, $g = -0.42$).

Conclusions: Given the large effect sizes, independent yet converging outcome measures, and the substantial reduction in experiment duration, we propose the use of the 4/24 extended wake paradigm to better study the WMZ in the broader population, especially clinical populations suffering from sleep-onset insomnia. Should differences in the WMZ be found between healthy and clinical populations, then this could become a viable diagnostic tool, comparable to the multiple sleep latency test already used in clinics.

Irregular Sleep-Wake Rhythm Disorder in transgender individuals

A. Kokash[1], M. Vendrame[1]
[1]Lehigh Valley Fleming Neuroscience Institute, Allentown, United States

Introduction: Mounting evidence indicates that transgender individuals represent a health disparity population with a heightened vulnerability to sleep disorders such as insomnia and sleep apnea. Notably, a circadian disorder known as Irregular sleep-wake rhythm disorder (ISWRD), characterized by the absence of a distinct sleep-wake pattern, has not yet been fully acknowledged within the transgender community.

Materials and Methods: We reviewed two cases of patients undergoing gender reassignment and treated with hormone replacement. The first case is a 25-year-old transgender woman who underwent gender reassignment at age of 21, presenting with a prolonged history of ISWRD. The second case is a 20-year-old transgender male presenting with onset of ISWRD following initiation of male sex hormones.

Results:

Case 1: A 20-year-old transgender man (designated female at birth) sought consultation at our sleep clinic due to a persistent 6-month history of fatigue and daytime sleepiness. His medical background revealed a prior diagnosis of anxiety/depression and post-traumatic stress disorder. He was currently taking fluoxetine, aripiprazole, and receiving a daily dose of 6mg transdermal testosterone for the past year (with testosterone levels ranging from 550-600 ng/dL). The patient's body mass index (BMI) was measured at 23 kg/m2, and his Epworth Sleepiness Scale (ESS) score was 14. Notably, there were no records of snoring, witnessed apneas, or abnormal leg movements during sleep. Analysis of a two-week sleep diary showed a lack of a discernible major sleep period and multiple irregular sleep bouts within a 24-hour period, indicative of ISWRD. Our recommended treatment plan included timed melatonin administration of 6mg at 10 p.m., scheduled light exposure at 7 a.m., and the establishment of a regular sleep schedule with morning out-of-bed activities at 7 a.m. After an 8-week follow-up, the patient reported modest improvement in waking schedule adherence in the mornings and a slight reduction in daytime sleepiness (ESS score of 11). However, his two-week sleep diary still displayed patterns consistent with ISWRD.

Case 2: A 27-year-old transgender woman (assigned male at birth) visited our sleep center due to a persistent 3-year history of insomnia and daytime sleepiness, along with recent involvement in a nontraumatic motor-vehicle accident. Her medical history indicated gender reassignment at the age of 21, and prior medical therapy included medroxyprogesterone acetate and parenteral estrogen. At present, she was taking spironolactone and oral ethinyl estradiol as her current medications. Her BMI measured 28 kg/m2, and her ESS score was 16. Upon evaluation of her two-week sleep diary, it supported the diagnosis of ISWRD. Unfortunately, the patient was lost to follow-up, and further assessment and intervention were not possible.

Conclusions: The increasing attention towards transgender health necessitates a more comprehensive examination of how the frequency of various sleep disorders impacts this population. When addressing sleep-related issues, it is important to assess disturbances in sleep patterns and schedules. The link between circadian disorders and gender reassignment may involve multiple factors and is not yet fully understood from a pathophysiological standpoint. Therefore, further investigation is warranted to gain a deeper understanding of this relationship.

Is the treatment worth the effort? Light therapy, melatonin and sleep scheduling for Delayed Sleep-Wake Phase Disorder (DSWPD): a qualitative study

I.W. Saxvig[1], I. Dundas[2], S. Pallesen[1,3], B. Bjorvatn[1,4], I.H. Nordhus[2], A. Wilhelmsen-Langeland[5]
[1]Haukeland University Hospital, Norwegian Competence Center for Sleep Disorders, Bergen, Norway, [2]University of Bergen, Department of Clinical Psychology, Bergen, Norway, [3]University of Bergen, Department of Psychosocial Science, Bergen, Norway, [4]University of Bergen, Department of Global Public Health and Primary Care, Bergen, Norway, [5]Haukeland University Hospital, Division of Psychiatry, Bergen, Norway

Introduction: A treatment protocol with morning bright light, evening exogenous melatonin and sleep scheduling has shown to effectively advance the sleep-wake pattern in patients with Delayed Sleep-Wake Phase Disorder (DSWPD). Since this protocol requires behavioral changes as well as adherence to new daily routines, it can be challenging in terms of motivation and effort. No qualitative study has explored how patients with DSWPD experience this kind of treatment protocol. The aim of the present study was to explore how young adults with DSWPD experience the treatment protocol.
Materials and Methods: Individual semi-structured interviews were conducted with 11 young adults with DSWPD who had undergone 3 months of treatment. An introductory request was to rate whether they thought the treatment was worth the effort, from 0 (not worth the effort at all) to 100 (totally worth the effort). Interviews were analyzed using thematic analysis.
Results: For the introductory request, the mean rating was 72.5 (range 60-100), indicating that all participants considered the benefits to outweigh the effort. Three themes emerged: 1) Tailoring of treatment: Participants described that by gradually tailoring the treatment protocol and their daily routines to their individual needs, the treatment effort could be minimized; 2) Cost-benefit reflections: Participants described that, although at a cost, the treatment protocol helped them become more in tune with the societal rhythm; 3) Self-perception and beliefs regarding how others perceived them: Participants described that being more in tune with the societal rhythm, changed their perception of themselves for the better, as well as their beliefs about how others perceived them.
Conclusions: All participants considered the treatment to be worth the cost, but several described that individual tailoring was necessary to minimize the effort. The benefits of the treatment extended beyond sleep/circadian phase, positively affecting self-perception and beliefs regarding others perception.

Melanopsin-mediated post-illumination pupillary response (PIPR) correlated with sleep timing, chronotype and overnight urinary 6-sulphatoxymelatonin in older individuals

J.W.Y. Chan[1], S.W.H. Chau[1], T.M.H. Li[1], N.Y. Chan[1], Y.K. Wing[1]
[1]The Chinese University of Hong Kong, Department of Psychiatry, Hong Kong, Hong Kong, SAR of China

Introduction: Light is the most important time cue for entrainment of human biological clock. The intrinsically photosensitive retinal ganglion cells (ipRGCs) have a peak spectral sensitivity to blue spectrum light and they relay light signals to areas that modulate melatonin release and sleep[1]. A study in healthy young adults found an association between a more pronounced PIPR to a later mid-sleep timing[2]. The ipRGCs also contributes to a sustained pupillary constriction response after cessation of light stimulus (Post-illumination pupillary response, PIPR). This study aims to investigate if PIPR is correlated to sleep midpoint (SMP), chronotype and nocturnal melatonin secretion in a cohort of older individuals from the community.

Materials and methods: Older persons who were free from psychiatric disorder, untreated sleep disorder, unstable medical condition, cognitive impairment, severe ocular disease and who were not taking medications that affects pupil were recruited from the community. They were invited to fill in the Morningness-Eveningness Questionnaire (MEQ) and a 1-week prospective sleep diary. Overnight urine sample was collected to analyzed for 6-sulphatoxymelatonin level which was adjusted to urine creatinine level (aMT6s). Assessment of the PIPR was conducted by a binocular pupillometer (NeurOptics, DP2000, Irvine, SA, USA) and was conducted between 10:00am to 05:00pm to avoid circadian fluctuation. After 20 minutes of dark adaptation, 1-second blue light pulse (463nam, 2.0log lux) was presented to both eyes, with continuously pupil size recording till 60 seconds post-illumination. The assessment was repeated with a red light pulse (632nm, 2.0log lux) after 3-minutes of rest in between the light pulses. The average pupil size from post-illumination 10 to 30 seconds (PIPR) was corrected from the baseline pupil size. The Net PIPR was obtained by subtracting the response of red light from that of the blue light. Partial correlation, adjusting for age, time interval between PIPR and wake up time, and photoperiod on the day of PIPR, was conducted to examine the relationships between the PIPR to SMP, MEQ and aMT6s.

Results: Forty-eight older persons [Age: mean±SD: 62.9 (7.3) years, Range: 48-77 years; Male: n (%):21 (44)] were recruited. The mean±SD for SMP, MEQ, and aMT6s were 03:19±00:57, 55.8±7.5, 6.0±3.6, respectively. Significant correlations were shown between a more pronounced Net PIPR to an earlier SMP (r=-0.33, p=0.028), a greater MEQ (r=0.33, p=0.026) and a higher urinary aMT6s (r=0.31, p=0.049).

Conclusions: In this group of older individuals, significant correlations were found between a more pronounced Net PIPR with an earlier sleep midpoint, greater tendency towards morningness and a higher overnight urinary aMT6s secretion, suggesting PIPR may mediate the individual difference in behavioral sleep, chronotype and nocturnal melatonin secretion.

Melatonin supplementation improves work capacity and mental health of overweight nurses

P. Santos de Souza[1]
[1]Catholic University of Santos, Santos, Brazil

Introduction: The deletionof melatonin in night workers is one of the factors that contribute to premature functional aging. This suppression is often associated with poor quality and reduced sleep duration, as well as various deleterious health effects, especially mental health, factors that reduce the ability to work.

Objectives goals: To evaluate melatonin supplementation in overweight night workers on work ability and mental health.

Methods: A clinical, phase II, crossover, double-blind, randomized clinical trial was carried out with 27 overweight nursing professionals who worked fixed night shifts of 12x36 h.Melatonin supplementation was performed for three months, as well as the use of placebo. To theoutcome variables were work ability and mental health, assessed using the work ability index (WAI).The proportion test was performed to compare the proportion of participants who had good or excellent work ability, before and after the intervention, as well as to evaluate themild and severe emotional disturbances (ICT issues) and the self-perception ofsymptoms of Premenstrual Tension (PMS), anxiety, mood, physical and mental disposition.Repeated measures ANOVA was performed to compare mean WAI scores before and after the intervention.

Results: The average age of participants was 37 years (SE 1.1%); 55.6% were nurses and 59.3% were married. The median length of service was 5.6 years (AIQ 4.1-8.2 years), working time at the hospital was 6 years (AIQ 5-10.7 years) and working time on the night shift 4.7 years (AIQ 2-7.8 years). It was found that at baseline, 40.7% of participants had good or excellent work ability. After exogenous melatonin supplementation, this proportion significantly increased to 74.1%, decreasing to 59.3% after the use of placebo (p=0.045). When assessing the mean work ability score after melatonin supplementation (mean 38.2 points, SE 0.70 points) it improved relative to baseline (mean 34.6 points, SE 0.92 points) and placebo (average 36.9 points, EP 0.87 points) (p<0.0001). Mild emotional disturbances were reported by 25.9% and 14.8% at baseline (own opinion and medical diagnosis, respectively), but no statistically significant difference was found after melatonin use. The prevalence of perceived improvement in anxiety symptoms, physical and mental disposition after the use of exogenous melatonin (48.1%; 63%; 59.3%, respectively) was greater compared to placebo (18.5%, 22.2% and 22.2%, respectively) (p<0.05). No differences were found regarding PMS and mood symptoms before and after the intervention.

Conclusion: Exogenous melatonin supplementation improves work capacity andattenuates symptoms of anxiety, physical and mental disposition in overweight night nursing professionals.

Keywords: Melatonin, Ability to work, Mental health, Night work.

Migraton, mental health and sleep

A. Büttner-Teleagă[1,2]
[1]Institute for Cognitive Science, Woosuk University, Wanju-gun, Korea, Republic of, [2]University Witten-Herdecke, Department of Psychiatry, Witten, Germany

Introduction: In the past years millions of refugees came to Germany. Many of the refugees are accommodated in makeshift accommodation. Many doctors and nurses are involved in support activities and the health care of these immigrants. The participating sleep physicians, psychologists and nurses have a good insight into the life situation. In addition to the general medical conditions, the sleep medical conditions are also rather bad and necessarily improvable. Especially, we sleep-medically trained experts know what health consequences may have worse, non-restful sleep on mental and physical health.

Narrow spatial conditions, poor acoustic and light-related conditions, poor bedding conditions and possible posttraumatic stress disturbances increase sleep disturbances and sleep disorders and can trigger them.

So sleep disorders should be very common in migrants, adult and child refugees. Disturbed sleep in migrants and refugees usually could appear as co-morbid disorder to different somatic, psychiatric diagnosis and psychological disturbances as metabolic syndrome, posttraumatic stress disorder, depression and anxiety disorders. There could be many different predictors for sleep disturbances in these vulnerable groups: pre-migration stress in the home country, acculturation, trauma before, while and after migration, integration and life style in the host country.

I will talk about the differences in risk factors, vulnerability, and traumatic life events for different migrant populations, origins of sleep difficulties vary, depending on the migrant populations and I involve

1. Relationship between Migration and Sleep Disorders
2. Influence of PTSD, Depression and Anxiety on Sleep
3. Chronobiology and Sleep Disorders in Refugees and Peoples with Migration background
4. Pathophysiology in Sleep of Refugees and Peoples with Migration background
5. Treatment possibilities in Refugees and Peoples with Migration background

Methods: In our actual study, we could include around 100 participants (migrants, asylum seeker and refugees) from different countries: 51.52 % were women and 48.49 % were men.

The participants were examined by psychiatric anamnesis and sleep anamnesis; they even were tested with different sleep questionnaires.

Findings: In our population, we found 96.96 % patients with Insomnia, 75.75 % with Nightmares, 18.18 % with Sleep Apnea Syndrome, 0.06 % with Restless Legs Syndrome and each 0.03 % with Pavor nocturnus, Somnambulism, Hypnotic Hallucinations and / or Sleep Wake Rhythm Disorder. Fig 1: Sleep in Refugees

Summary: We can conclude that migration is an important factor, which influenced the good sleep in refugees and resulted in many different sleep disorders.

Sleep disturbances in migrants are predicted by war experience on the past. In working migrants, the integration and adaptation to the host society bears higher risk for snoring, metabolic diseases and insomnia. Sleep difficulties in adult and child refugees are strongly correlated to trauma.

Keywords: Sleep, Sleep disturbances, Sleep disorders, Insomnia, Migrants, Refugees, Asylum seeker, Trauma

Negative social jetlag - an emerging topic in leisure research

C. Randler[1]
[1]Eberhard Karls University Tübingen, Biology, Tübingen, Germany

Introduction: Social jetlag is a well-documented phenomenon that assesses differences in the sleep-wake rhythm between weekdays and free days. The amount of social jetlag is related to possible health outcomes, such as obesity. In previous times, social jetlag was often considered in a unidirectional manner. However, there is considerable negative social jetlag in some leisure activities. The current evidence is reviewed and a study on birdwatchers is presented. Birdwatching (birding) is a nature-based recreational activity, often including arising early in the morning.Here, the effect of a negative social jetlag (SJL) in birdwatchers has been described and set into relation with variability in the leisure activity. Negative SJL implies that people have an even earlier sleep–wake rhythm on free days or weekends.

Materials and Methods: The study was an online survey with 2,404 German birdwatchers (55% male) who responded to questions about their sleep–wake times and about their birding activities. Three scenarios were asked for: weekday sleep-wake rhythm, free day sleep wake rhythm, and finally, birdwatching days and their sleep wake rhythm. Further, the commitment or specialization (in terms of leisure research) has been assessed.

Results: Similar to nearly all other people, birders show the same differences between weekdays and weekends/free days sleep with a typical social jetlag. But when it comes to their leisure activity birdwatching, respondents started their day earlier even when compared to weekdays (14 min) and the time being awaken (wakefulness) was longer, thus, their day lasted longer. Thus, birdwatching days are shifted towards an earlier sleep–wake rhythm in total. Birdwatchers experience a sleep curtailment during birding. Instead of sleeping ~30 min longer on weekends, they arise ~15 min earlier, summing up to a sleep reduction of about ~45 min compared to a free weekend. Concerning the specialization, i.e., the effort, the commitment and the centrality to lifestyle in this hobby, there was a significant relationship between sleep schedules and birding. The more time, effort and engagement the birders showed, the more were the sleep schedules shifted toward a negative social jetlag, and a higher sleep curtailment.

Conclusions: The study shows that negative social jetlag might be an important, yet overlooked topic to study, especially in areas of leisure research, e.g., in birders, but probably also in sports. Rather than sleeping in at weekends, these people get up even earlier than during their normal weekday activities.

Popularization of chronobiology on social media

Y.C. Novais[1], P.H.L. Mondes[1], B.J. Brandão[1], A.A. Da Hora[1], R.V.N. Paiva[1], K.S.O. Silva[1], J.S. Souza[1], E.K. Tamura[1]
[1]State University of Santa Cruz, Health Sciences, Ilhéus, Brazil

Introduction: Considering the widespread dissemination of unsubstantiated information, scientific communication emerges as a potential tool to mitigate the impacts of this reality. In this regard, Comprehending the influence of the environment on our internal circadian rhythms could potentially facilitate interventions and strategies aimed at enhancing health and preventing diseases.

Materials and methods: The scientific communication project in chronobiology is an inherent component of the extension project called "*Divulgando a Cronobiologia*" (Spreading Chronobiology) at the State University of Santa Cruz (Ilhéus-Bahia), through the digital platform Instagram, @CRONOUESC. The activities are doing through a multidisciplinary group work, which involves weekly meetings to discuss scientific articles and the publication process, including: 1) editorial agenda with a list of topics for publication; 2) schedule for posting scientific cards; 3) production of audiovisual material; 4) interaction with the audience; and 5) analysis of reach and engagement results. The work organization involves a digital platform use (trello.com), and image/video editing platform (canva.com). Moreover, the "Facebook Creator Studio" tool is used to schedule posts on specific days and times. Metrics are collected directly from Instagram and used to define future strategies.

Results: The content dissemination starts in January 2021 and explored more than 85 topics related to chronobiology, calls from ''scientific doses''. The publications have shown great success, particularly in the comments section with content consisting of questions, personal accounts, requests for specific topics for new publications, and congratulations. The most engaging content relates to publications about sleep and circadian rhythm disorders. The reached audience mainly resides in the cities of Itabuna-BA (20%), Ilhéus-BA (18.6%), and São Paulo-SP (3.8%); the main age group comprises 36.6% of followers aged 25 to 34, followed by 32% aged 18 to 24. In terms of gender, the predominantly reached audience is women, representing 72.4%. Currently, the account has 1,174 followers. About the metrics achieved on the social network, considering only the ''scientific doses'', there were 8,831 likes, 1,310 comments and 909 shares, in terms of interaction with the feed posts. Additionally, the visited number increased by 51.3% in 2022, with 6,704 visits, compared to 4,430 visits in 2021. During the same period, there was also a growth of 12.8% in the number of unique accounts that saw any of the feed or stories posts at least once, reaching 11,932 accounts in 2021 and 13,458 in 2022.

Conclusions: In this way, it is possible to observe that the topics posted in the publications are not well-known by the general population. However, there was a perception that the concepts are relevant and part of everyday life, leading to identification and awareness. Furthermore, the dissemination strategy has a good reach for the publications, and the engagement with the content and feedback from followers are satisfactory but with ample growth.

Possible mechanisms by which mindfulness acts on sleep in undergraduate students during COVID-19 pandemic: chronotype as a moderator

J. Vallim[1], E. Mello[1], H. Fagundes[2], S. Tufik[1,3], B. Xylaras[4], A. Rosa[5], M. Demarzo[6], V. D'Almeida[1,2]
[1]Universidade Federal de São Paulo, Department of Psychobiology, São Paulo, Brazil, [2]Universidade Federal de São Paulo, Department of Pediatrics, São Paulo, Brazil, [3]Sleep Institute, São Paulo, Brazil, [4]Centro Universitário São Camilo, São Paulo, Brazil, [5]Universidade Federal de São Paulo, Department of Public Health, São Paulo, Brazil, [6]Universidade Federal de São Paulo, Mente Aberta – Brazilian Center for Mindfulness and Health Promotion, São Paulo, Brazil

Introduction: There is evidence that sleep and health-related outcomes manifest differently according to chronotype. Mindfulness-based interventions have been widely used in therapeutic proposals, especially for health promotion. However, their effects on sleep are still under investigation, mainly due to high heterogeneity across studies. Knowing that some undergraduate students have impaired sleep and that the COVID-19 pandemic exacerbated sleep disturbances and complaints in this population, it is reasonable to assume that adding mindfulness training to their routine may improve sleep. We hypothesized that evening students would respond better to a mindfulness-based intervention. Therefore, our aim was to assess the effect of chronotype as a moderator of mindfulness on sleep-related outcomes.

Materials and Methods: Randomized controlled trial (1:1 allocation) with two parallel arms (active control group: sleep psychoeducation; experimental group: Mindfulness-Based Health Promotion program) and three assessment time points: (A) baseline (one week before the interventions); (B) during (half); (C) post (one week after) conducted in 2020 and 2021. The Pittsburgh Sleep Quality Index was used to assess subjective sleep quality, the Sleep Hygiene Index, and the Munich Chronotype Questionnaire to assess chronotype. The interventions were delivered in the format of eight weekly sessions via a videoconferencing platform, each lasting approximately one hour. Participants who attended fewer than four sessions were excluded from the analysis, and a qualitative survey was conducted one week after the last session.

Results: The final sample consisted of 31 students (84% female; mean age: 22±3 years), 19 in the experimental group and 12 in the control group. Regardless of the group, we observed that subjective sleep quality improved during (p=0.02) and after the interventions (p=0.001). Chronotype was a moderator only in the experimental group (during p=0.001, β=-2.0; post p<0.001, β=-2.8), an effect not observed in the control group (during p=0.3, post p=0.3). We did not observe an effect of mindfulness on the Sleep Hygiene Index. In the qualitative research, we observed some evening students with narratives like "Sometimes I get anxious and I can't sleep, it takes me two hours, but practicing mindfulness doesn't take that long" and "My sleep was terrible before the research, I couldn't even sleep six hours a night and woke up very worried...This difficulty decreased during the program, I don't know if it was the influence of meditation, I can't say".

Conclusions: Chronotype was a moderator of the effects of mindfulness on subjective sleep quality: evening students improved their subjective sleep quality less during and after mindfulness training (about a 3-point reduction in the mean difference of PSQI scores). However, evening students' narratives did not supported the quantitative findings. Future work examining chronotype-dependent effects should be considered in mindfulness research, as well as scheduling practices tailored to chronotype.

Sleep disturbances associated with *DEAF1* pathogenic variants

P. Guerreiro[1], M. Moysés-Oliveira[1], A. Kloster[1], L. Cunha[1], T. Bassani Deconto[1], A. Cristina Mosini[1], B. Pereira Marquezini[1], M. Paschalidis[1], L. Nayara Gallego Adami[1], M. L. Andersen[1,2], S. Tufik[1,2]
[1]Instituto do Sono, Associação Fundo de Incentivo à Pesquisa, São Paulo, Brazil, [2]Universidade Federal de São Paulo, Psicobiologia, São Paulo, Brazil

Introduction: The Deformed Epidermal Autoregulatory Factor 1 (*DEAF1)* gene encodes a transcription factor that plays a role in the establishment of transcriptional programs which are relevant for neuronal differentiation. Variants on this gene are associated with a rare neurodevelopmental genetic syndrome in which sleep disturbances, such as sleep onset and maintenance insomnia, are commonly reported. Yet the specific sleep disorders associated with these syndromes and the molecular mechanisms underlying this association are unknown.

Aims: Our study aimed to identify specific regulatory mechanisms related to sleep disturbances in patients with *DEAF1* variants. Additionally, we assayed *DEAF1* target genes associated with sleep traits to pinpoint specific molecular pathways that may be disrupted by pathogenic *DEAF1* variants.

Methods: We generated a list of *DEAF1* target genes by mapping its binding sites, retrieved from ENCODE chromatin immuno-precipitation (ChIP)-seq datasets, to gene promoters using the BioMart tool. We benefited from a list of genes associated with insomnia, which was driven by recent large-scale genome-wide association studies. Both lists were then compared using the Fisher exact test and significance threshold of *p-value*<0.1. The intersect gene list was used as input for pathway enrichment analysis, which considered Gene Ontology (GO) and Kyoto Encyclopedia of Genes and Genomes (KEGG) terms for pathway representations, Benjamini-Hochberg test adjusting for multiple comparisons and significance threshold of adjusted *p-value*<0.05.

Results: There were 39 overlapping genes between *DEAF1* direct regulatory targets (1,179 genes) and insomnia-associated genes (569 genes), demonstrating that those 2 gene lists are more overlapped than expected by chance (*p-value*=0.1, OR=1.3). The intersect gene list was found to be strongly associated with the ubiquitin mediated proteolysis (*p-value*=2.5E-3, OR=12.06, KEGG) pathway, as well as with positive regulation of mitotic cell cycle (*p-value*=2.1E-7, OR=99.07, GO:0045931).

Conclusions: Insomnia-related genes regulated by *DEAF1* play a role in mitosis and ubiquitin-mediated protein degradation. Ubiquitination is a regulatory process which is responsible for the breakdown of clock and synaptic proteins, with known implication on neurodevelopmental rare syndromes. This pathway may be disrupted by pathogenic variants in *DEAF1*, possibly explaining the insomnia manifestation in patients harboring rare variants of this gene.

Sleep duration and bedtime are associated with BMI among adults in a Brazilian National Survey

G. Longo-Silva[1], A. Pedrosa[2], M. Lima[3], P. Oliveira[2], R. Serenini[4], R. Menezes[2]
[1]Federal University of Alagoas, Faculty of Nutrition, Maceio, Brazil, [2]Federal University of Alagoas, Maceio, Brazil, [3]Federal University of Alagoas, Maceió, Brazil, [4]Sapienza University of Rome, Faculty of Economics, Rome, Italy

Introduction: The circadian clock is an endogenous timekeeper system that controls and optimizes biological processes, which are consistent with a master circadian clock and peripheral clocks and are controlled by various genes. These natural processes respond primarily to light and dark and are studied by chronobiology (Partch, Green, Takahashi, 2014). Circadian misalignment, which occurs when the natural sleep-wake cycle is disturbed, can have significant implications for metabolic health and increase the risk of obesity (Chaput et al., 2023; McHill, Wright,2017).
Thus, sleep duration, bedtime, and wake-up time have been targeted by chronobiology researchers as important factors that may influence circadian health (Chaput et al, 2023; McHill, Wright, 2017). There is still no specific recommendation on the ideal clock time to sleep and wake up, however, regarding sleep duration, Sleep Foundation recommends from 7 to 9 hours/night (18 to 64 years old) (Hirshkowitz et al., 2015). Thus, this study was carried out to evaluate whether sleep duration, bedtime, and wake-up time were associated with BMI, using data from, as far as we know, the largest chrononutrition and sleep-related survey among Brazilian adults.
Materials and Methods: Participants (n=2050) were part of exploratory, population-based research, with data collection in a virtual environment. For anthropometric evaluation, the BMI [weight(Kg)/height(m)²] was calculated, based on self-reported weight and height. The weekly average of bedtime and wake time were calculated as follows: [(5×weekday/work day value) + (2×weekend/free day value)]/7. Sleep duration (h) was calculated as the difference between bedtime and wake time. The average sleep duration across the entire week was calculated as follows: [(5×sleep duration on weekdays) + (2×sleep duration on weekends)]/7. Linear regression analyses evaluated differences in BMI (as the outcome) associated with sleep duration, bedtime, and wake-up time. Restricted cubic splines were used to study the shape of the associations. Analyses were adjusted for age, sex, marital status, weekly duration of physical exercise, and diet quality.
Results: After adjusting for possible confounding variables, BMI decreased by 0.19Kg/m2 for each additional hour of sleep duration [IC95%=-0.37,-0.02; P=0,03] and increased by 0.19Kg/m² for each additional hour of bedtime [IC95%=0.04,0.36; P=0,017]. Wake-up time did not show statistically significant associations. Restricted cubic splines modeling showed that the lowest value of BMI was seen in the sleep duration of ~8h/night. Also, higher values of BMI can be seen upon bedtime from ~23:00. Finally, lower values of BMI can be seen in the wake-up time from ~6:00 to 8:00.
Conclusions: Because we found that, independent of age, sex, marital status, weekly duration of physical exercise, and diet quality, beyond sleep duration, bedtime was significantly associated with BMI, our data reflect the pertinence of assessing sleep timing patterns in disentangling sleep-obesity association.

Sleep duration on overweight and obesity: an overview of systematic reviews

M. Benfica[1], K. Silva[1], M. Oliveira[1], T. Ribeiro[1], R. Messa[1], E. Tamura[1], E. Alves[1,2]
[1]Universidade Estadual de Santa Cruz (UESC), Health Sciences, Ilhéus, Brazil, [2]Griffith University, Health Sciences and Social Work, Gold Coast, Australia

Introduction: The epidemic of overweight and obesity has been increasing significantly worldwide, being considered part of a global syndemic. This issue affects individuals' well-being and generates considerable impacts on public health. Many factors contribute to this process of illness, known as obesogenic systems. In this context, several studies published in recent years have shown that sleep duration indirectly contributes to these systems. These articles have given rise to a series of systematic reviews and meta-analyses in the last 15 years. Therefore, the aim of this study is to provide an overview of these systematic reviews and meta-analyses in the literature that have evaluated the effects of sleep duration on overweight and obesity. Additionally, we sought to assess the methodological quality of these studies using validated tools, in order to determine the risk of bias and identify existing gaps.

Materials and Methods: We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. The search was conducted in the following databases: Medline (PubMed), Web of Science, and Cochrane. The search terms used were: Sleep Duration, Overweight, Obesity, and Systematic Reviews. The study selection process was semi-automated, using the Rayyan application. Subsequently, data extraction and assessment of the methodological quality of the studies were conducted using the ROBIS tool. The entire process was performed by pairs (M.A.B, K.S.O.S, and T.C.R, M.R.N.O) with consensus from E.S.A.

Results: After removing duplicates, 471 studies remained. Out of these, 24 systematic reviews met the eligibility criteria and were included in the descriptive synthesis. The reviews were conducted between 2008 and 2022. Regarding the population, 75% evaluated children and adults and 63.5% evaluated adolescents. As for the research designs, 16.67% included randomized controlled trials, 79.17% included longitudinal studies, and 33.33% included cross-sectional studies. The number of studies included in the review ranged from 6 to 103 studies. Eighteen studies observed a relationship between short sleep duration, overweight, and obesity. Only two studies observed a similar relationship for long sleep duration. Additionally, short sleep duration was associated with an increase in waist circumference (n=4), body fat (n=3), dietary intake (n=3), body weight (n=5), and reduced energy expenditure (n=3). Three studies included leptin and ghrelin as outcomes. In terms of overall quality interpretation, 83.33% were classified as low risk of bias and 16.67% as unclear risk.

Conclusions: We conclude that there is a relationship between sleep duration, especially short duration, and weight gain, overweight, and obesity. This association was more pronounced in the younger population. The current evidence does not support the association of cross-sectional studies with overweight and obesity, with prospective cohort studies being more suitable for assessing this association. Additionally, randomized controlled trials provided a good perspective on potential short-term markers that could contribute to this issue, such as energy expenditure. However, further experimental studies are needed to strengthen this association.

Sleep inertia, not chronotype, is a marker of circadian misalignment and a risk factor for psychiatric disorders: genetic and epidemiological evidence

A. Burns[1], N. Sinnott-Armstrong[2], I. Daghlas[1], D. Windred[3], A. Phillips[3], S. Cain[3], M. Rutter[4], S. Jones[5], M. Weedon[6], A. Wood[6], K. Kantojärvi[5], T. Palviainen[5], M. Udler[1], H. Dashti[1], T. Paunio[5], J. Kaprio[5], J. Pritchard[2], H. Ollila[1], R. Saxena[1], J. Lane[1]
[1]Harvard Medical School, Boston, United States, [2]Stanford University, Stanford, United States, [3]Monash University, Melbourne, Australia, [4]University of Manchester, Manchester, United Kingdom, [5]University of Helsinki, Helsinki, Finland, [6]University of Exeter, Exeter, United Kingdom

Introduction: Sleep inertia, low arousal during the sleep-wake transition, covaries with circadian phase. Waking in the biological night (i.e., misaligned wake) is more difficult compared to appropriately timed wake. Therefore, sleep inertia may represent a marker of circadian misalignment. Late chronotypes tend to have delayed circadian timing and greater sleep inertia due to more frequently waking in their biological night. Late chronotypes also have a consistently higher risk for psychiatric disorders, however, whether this is driven by circadian misalignment of their sleep-wake cycle or simply being delayed is yet to be explored. We used epidemiological and genetic approaches to tease apart the associations of delayed timing versus circadian misalignment with psychiatric illness in the large-scale UK Biobank study.

Materials and Methods: We performed a cross-sectional analysis and genome-wide association study of sleep inertia, measured by self-reported difficulty awakening in the UK Biobank (n=457,776; 54% female; age 62.4±7.4 years). We examined the independent associations of chronotype and sleep inertia with psychiatric disorders (MDD, bipolar disorder, GAD, PTSD, and psychosis) and accelerometry-derived sleep regularity index and mid-point, adjusting for age, sex, physical activity, employment, season and sleep duration. We also performed gene, pathway and tissue enrichment to elucidate the biological underpinnings of sleep inertia with sensitivity analyses adjusting for other sleep, circadian and lifestyle factors. We investigated the causal association of sleep inertia with psychiatric disorders using Generalized Summary-Data-Based Mendelian Randomization (GSMR).

Results: Independent of chronotype, greater sleep inertia was associated with increased risk for MDD (odds ratio (OR)=2.82, $p<0.0001$), bipolar disorder (OR=2.10, $p<0.0001$), GAD (OR=2.41, $p<0.0001$), PTSD (OR=2.34, $p<0.0001$) and psychosis (OR=1.58, $p<0.0001$). Before adjustment for sleep inertia, late chronotype was associated with increased risk for MDD (odds ratio (OR)=1.42, $p<0.0001$), bipolar disorder (OR=1.32, $p<0.0001$), GAD (OR=1.23, $p<0.0001$), PTSD (OR=1.26, $p<0.0001$) and psychosis (OR=1.19, $p<0.0001$), however these effects were almost entirely mediated by sleep inertia (ORs after adjustment for sleep inertia = 0.95–1.06). Sleep inertia and chronotype were both associated with later sleep mid-point ($\beta_{chronotype}$=.52, $\beta_{inertia}$=.35, $p_{both}<0.0001$; $n_{accelerometry}$= 86,772), however, only sleep inertia was associated with a lower sleep regularity index ($\beta_{inertia}$=-.56, p<0.0001). Sleep inertia was heritable (SNP heritability=12%) and we identify 98 genome-wide significant genomic risk loci ($p<5x10^{-8}$) which are enriched for circadian rhythms-related genes, pathways and tissues. Genetic correlations demonstrate strong overlap in the genetic architecture of sleep inertia with other circadian-related traits (chronotype r_g=0.80 & accelerometry-derived mid-sleep r_g=0.60) while weak and non-significant genetic correlations were observed for homeostatic sleep traits (sleep duration, sleep efficiency, daytime sleepiness; all $r_{gs}<0.11$). We identify a causal association of genetically instrumented sleep inertia with increased risk for MDD and schizophrenia using two-sample Mendelian randomization (both $p<5x10^{-10}$), while no such effects were observed for chronotype.

Conclusions: We report epidemiological and genetic evidence that sleep inertia, a marker of misaligned wake, drives the association of late chronotype with psychiatric disorders. This suggests the increased likelihood of circadian misalignment in this group increases their risk of psychiatric disorders, not the delayed timing.

Sleeping more improves verbal memory, but increases vulnerability to distractors in college students during the COVID-19 pandemic

M.C.M.M. David[1], G.R. Vieira[1], N.F. dos Santos[2], L.L. Duarte[2], R.J.B. Matos[2]
[1]Federal University of Pernambuco, Recife, Brazil, [2]Federal University of Recôncavo da Bahia, Santo Antônio de Jesus, Brazil

Introduction: The academic routine was abruptly modified during the COVID-19 pandemic and may have led to impacts on sleep and cognitive aspects. Therefore, the aim was to evaluate the relationship between the sleep and verbal memory of university students during the implementation of emergency remote teaching due to the COVID-19 pandemic.
Materials and Methods: A total of 62 university students (18 to 30 years old) living in Campina Grande and Recife (Brazil) participated in the survey between August and November 2020. Data from bed time, get up time, time in bed, total sleep time, sleep onset latency, sleep efficiency, wake time after sleep onset (WASO) and awakenings were obtained through a diary and actimetry of the night before the memory test. The Rey Auditory-Verbal Learning Test was applied (between 5pm and 9pm) to investigate verbal memory through a list of 15 words (List A) and another list of 15 distracting words (List B). The study was approved by the Ethics and Research Committee of the Federal University of Pernambuco (32360720.4.0000.5208). Pearson's correlation test was applied for parametric variables and Spearman's correlation test for non-parametric variables, considering $P < 0.05$.
Results: University students were 21.6 ± 2.1 years old (80.6% females). Bedtime correlated with first attempt on list A ($r = 0.27$, $P < 0.05$) and forgetting speed ($r = -0.27$, $P < 0.05$). Total time in bed was related to retroactive interference ($r = -0.30$, $P < 0.05$). Similarly, total sleep time was related to retroactive interference ($r = -0.33$, $P < 0.05$) and learning curve ($r = 0.29$, $P < 0.05$). On the other hand, sleep latency time was related to proactive interference ($r = 0.26$, $P < 0.05$). In turn, WASO was related to memorization of list B ($r = -0.27$, $P < 0.05$). However, there was no correlation for get up time and awakenings during sleep ($P > 0.05$).
Conclusions: It is suggested that longer sleep time is related to better verbal memory, but with greater interference from distractors.

Sleep-wake disorders increase the incidence of falls in the older adult: a systematic review

A.O. Donato[1], L.S. Moraes Júnior[1], C.F.S. Santana[1], C.V.N. Aguiar[1], M.G. Meira e Cruz[2,3,4], C. Salles[1,5,6]
[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]European Sleep Center, Lisbon, Portugal, [3]University of Lisbon, Sleep Unit, Cardiovascular Center, Faculty of Medicine in Lisbon, Lisbon, Portugal, [4]College São Leopoldo Mandic, Campinas, Brazil, [5]Jorge Amado University Center, Salvador, Brazil, [6]Federal University of Bahia, University Hospital Professor Edgar Santos, Salvador, Brazil

Introduction: Sleep disorders are estimated to be found in 50% of individuals over 55 years old. The World Population Prospects 2022 reports that world life expectancy will increase from 72.8 years in 2019 to 77.2 years in 2050. On the other hand, aging is associated with loss of muscle mass and bone density impairment, leading to falls. Studies have shown that the circadian rhythms of the autonomic nervous system activity can play an essential role in maintaining orthostasis. Circadian rhythm disorders are characterized by changes in the natural sleep-wake pattern, produced by a misalignment in the body's endogenous pattern, which results in sleep that starts earlier or later than normal. The objective of this study is to analyze the possible association between sleep-wake pattern disorder and the occurrence of falls in the older adult.

Materials and Methods: The search was conducted through the PubMed Central and Scielo databases, using the descriptors "sleep", "circadian rhythms", "accidental falls" and "elderly". Inclusion criteria: studies investigating the relationship between sleep-wake pattern disorders and falls in the older adult; individuals older than 65 years; occurrence of falls. Exclusion criteria were: animal studies; non-robust elderly; systematic reviews; posters; abstracts; letters; and congress proceedings.

Results: In order to prepare this systematic review, 112 studies were found, from which three were selected, obtaining the following results: the total sample evaluated comprised 11,175 individuals; of these, a total of 8,144 were female, aged 65 years or older. In the study by Rogers TS et al., they evaluated 3,001 elderly males finding that delayed acrophase of the circadian rhythm, occurring after 3:29pm, is related to a higher frequency of falls in the older adult over 65 years old (OR= 1.46, 95% CI: 1.08 - 1.97). Meanwhile, Stone KL et al. studied 8,101 American elderly women over a one-year period, and those who reported the need to nap daily (the authors characterized as sleep-wake pattern disruption) had a higher incidence of falls (18.2%) compared to those who did not nap (10.6%). These elderly women had a higher chance of hip fracture than those who did not nap (HR= 1.29, 95% CI: 1.02 - 1.65), allowing the authors to identify greater bone fragility in the sleep-disordered group.

Conclusions: This systematic review showed that sleep-wake pattern disorders contribute to the increased frequency of falls in the older adult. Despite the results, the evidence supporting the relationship between sleep-wake pattern disorders and falls in elderly women still needs more studies to support these findings. Thus, further studies must be carried out for the scientific strengthening of this theme, considering the high rates of morbimortality in the older adult because of accidental falls, as well as the significant percentage of the older adult population with sleep-related problems.

Study of associations between chronotype, binge eating disorder and obesity

G.L.R. Ciutti[1], A.G. Bezerra[1], M. Mônico-Neto[1], L.R. Bittencourt[1], S. Tufik[1,2], G.N. Pires[1,2], J.C.F. Galduróz[1]

[1]Universidade Federal de São Paulo, Sao Paulo, Brazil, [2]Sleep Institute, Sao Paulo, Brazil

Introduction: Chronotype has been associated with several mental health disorders (including depression, schizophrenia, bipolar disorder and drug abuse) and eveningness is consistently associated with a worse behavioral profile. Obesity is considered as a major public health problem, considering its several negative outcomes for the individual's health. Binge eating, characterized by a increased food intake in a short period of time, has been associated to both eveningness and obesity. However, the possible contribution of chronotype to binge eating among obese individuals has not been evaluate so far. The present project evaluated whether there is an association between binge eating behavior and chronotype among bariatric surgery candidates.

Materials and Methods: This was a convenience sample study, performed with a database of patients who sought treatment at a bariatric surgery clinic. Only measures acquired before surgery were considered for the analyses. Binge eating was assessed using the Binge Eating Scale and chronotype was assessed using the Horne and Ostberg Morningness-Eveningness Questionnaire (MEQ). Depression, Anxiety and Stress Scale (DASS-21) was applied to evaluate these symptoms. Finally, sleep was objectively assessed by means of a full-night polysomnography. Categorical variables are presented as frequency or percentage, and numeric variables are presented as mean ± standard deviation. The association between chronotype and binge eating was evaluated using a X^2 test and considering $p<0.05$ as statistical significance threshold.

Results: The final sample was composed by 100 bariatric surgery candidates (19 men and 81 were women). The mean age of the sample was 35.3±9.2 years. The average BMI of the sample was 40.6±5.2, and all patients were in the BMI range compatible with obesity, and of these, two were in the obesity category I, 43 in obesity II and 39 in obesity III (there were 16 missing data for BMI). The prevalence of obstructive sleep apnea was of 74%. The sample was composed mostly of individuals without symptoms or signs of stress (n=85, 84.2%), anxiety (n= 85, 84.2%) and depression (n=88, 87.1%). The mean score on the morningness and eveningness questionnaire in the sample was 53.65±11.34. Among these, one was considered as extreme evening, 15 as moderate evening, 45 as intermediate, 32 as moderate morning, and 7 as extreme morning. Approximately half of the sample (50.5%) had a score compatible with binge eating, 39 (38.6%) at a moderate level and 12 (11.9%) at a severe level. There was no statistically significant association between chronotype and binge eating categories (p=0.741).

Conclusions: Although the prevalence of binge eating found among bariatric surgery candidates was high, there was no association with chronotype in this sample.

Systematic light exposure to prevent fatigue and sleep disturbances in prostate cancer patients (PC-LIGHT Study)

L. Wu[1], R. Fox[2], A. Amidi[3], L. Walker[4], K. Bovbjerg[4], A. Matharu[4], S. Malhotra[4], J. Kalapurakal[4], D. Wang[5], S. Ancoli-Israel[6], F. Penedo[7], K. Reid[4]
[1]Northwestern University Feinberg School of Medicine, Medical Social Sciences, Chicago, United States, [2]University of Arizona, Tucson, United States, [3]Aarhus University, Aarhus, Denmark, [4]Northwestern University Feinberg School of Medicine, Chicago, United States, [5]Rush University Medical Center, Chicago, United States, [6]University of California San Diego, San Diego, United States, [7]University of MIami, Miami, United States

Introduction: Sleep disturbances and fatigue are commonly reported by prostate cancer survivors undergoing radiation treatment. Circadian rhythm disruption may underlie these symptoms, and therefore systematic bright white light (BWL) exposure (known to stimulate the circadian system) may be useful as a tool to prevent fatigue and sleep problems in prostate cancer patients during the course of radiation treatment. This study aims to assess the effect of morning administration of BWL on fatigue and sleep quality in prostate cancer patients undergoing radiation treatment.
Methods: Sixty-seven prostate cancer patients scheduled to undergo a course of 4 to 9 weeks of radiation therapy were randomized to either a BWL or a comparison dim red light (DRL) condition. Participants were instructed to use a light box every morning for 30 minutes during the entire period of their radiation therapy. Adherence was measured with the use of integrated meters on the light boxes, and light use logs. Measures of sleep quality (i.e., the Pittsburgh Sleep Quality Index) and fatigue (i.e., Functional Assessment of Chronic Illness Therapy – Fatigue) were administered at multiple time points throughout radiation therapy and at follow-up. Preliminary analyses were undertaken using linear mixed models to examine changes in fatigue and sleep quality over time from the start of treatment to the 4th week of the intervention. **Results:** A two-sided t-test indicated that there was no significant difference between groups in terms of the number of days that they used their allocated light box for at least 20 minutes in the morning (DRL = 23.0 days, BWL = 22.6 days; $t(59) = .21$, $p = .64$). Repeated measures linear mixed models indicated a statistically significant time by treatment group interaction effect in the opposite direction than hypothesized with fatigue increasing significantly more in the BWL condition over time compared with the DRL condition [$F(1,57)=7.29$; $p=0.01$]. A post-hoc Tukey test indicated that fatigue was significantly worse in the BWL group four weeks into the intervention than in the DRL group ($p=.02$). There was also a significant main effect for time indicating that fatigue worsened overall for both groups $(p<.0001)$, and a significant main effect for light condition with those in the BWL group experiencing worse fatigue than the DRL group ($p=0.01$). However, a repeated measures linear mixed model indicated that there were no significant main effects or interaction effects related to sleep quality over time.
Conclusions: Preliminary findings indicate that systematic BWL exposure in the morning did not have beneficial effects on sleep or fatigue in this sample of prostate cancer survivors undergoing radiation treatment. Further examination of treatment fidelity with respect to light box use (e.g., if it was positioned correctly), clinical factors, and also the severity of any circadian rhythm disruption needs to be undertaken before determining whether light therapy is contraindicated in this population.

Tasimelteon for the treatment of delayed sleep-wake phase disorder and optic nerve hypoplasia: a case study

S. Smieszek[1], A. Kaden[1], C. Johnson[1], A. Goldberg[1], C. Miller[1], J. Brzezynski[1], C. Xiao[1], C. Polymeropoulos[1], G. Birznieks[1], M. Polymeropoulos[1]
[1]Vanda Pharmaceuticals Inc., Washington, DC, United States

Introduction: We are conducting a double-blind, randomized, clinical study to evaluate the effects of tasimelteon versus placebo in Delayed Sleep-Wake Phase Disorder (DSWPD) participants with extensive clinical phenotyping. We report our first completed participant from the 11-month Open-Label Extension (OLE) phase, who also has a history of Optic Nerve Hypoplasia (ONH).

Materials and methods: The study consists of screening and treatment phases, followed by the OLE. During the OLE, participants answer daily sleep diaries and are instructed to take one dose of tasimelteon 60 minutes before their desired bedtime. Desired bedtime is defined as the time the participant would need to go to bed the night before a commitment, in order to feel fully rested in the morning. The objective is to explore the long-term safety and efficacy of daily dosing with tasimelteon over 11 months. As this study is currently ongoing, conclusions cannot be made about treatment assignment during the double-blind phase.

Results: We present a case of a 24-year-old female diagnosed with DSWPD and ONH, with a confirmed delayed Dim Light Melatonin Onset (DLMO), who reports the inability to fall asleep at their desired bedtime and the ability to have a full night's sleep when not required to be up at a specific time. After enrolling and completing the treatment phase of the study (which is currently blinded), they opted in to the OLE.

The participant's average sleep onset was 01:27 during screening and 00:42 during the OLE, an improvement of 45 minutes. At screening, the participant reported their symptoms as moderate (3) on the Patient Global Impression of Severity (PGI-S). On average during the OLE, the participant reported their symptoms as mild (2) on the PGI-S and much improved (2) on the Patient Global Impression of Change (PGI-C).

During their time in the study, there were no significant changes in their physical examinations, vital signs, ECGs, suicidal ideations or behaviors, or BMI. Clinical laboratory parameters (hematology, chemistry, urinalysis) were consistent throughout the study.

The participant reported a history of ONH, which could indicate lack of proper optic response to light. Abnormal rest-activity rhythmicity patterns are present in 30% of children with ONH. Further research is necessary to characterize the relationship between light response and sleep in this individual.

This participant has a variable number of tandem repeat (VNTR) PER35/5 genotype, associated with normal sleep patterns, and no predicted loss-of-function (pLOF) mutations within circadian genes were identified.

Conclusions: This case illustrates the general positive effect of tasimelteon on a participant diagnosed with DSWPD, based on earlier sleep onset shift during OLE compared to screening, overall improvement of PGI-S responses during OLE compared to screening, and PGI-C responses over time. It also provides the opportunity for research into ONH and its relationship with DSWPD, and potentially sighted Non-24-Hour Sleep-Wake Disorder.

The relationship between circadian type and physical activity on markers of nightshift adaptation: a randomised controlled trial

D.F. Easton[1], C.C. Gupta[1], G.E. Vincent[1], S.A. Ferguson[1]
[1]Central Queensland University, Appleton Institute, Adelaide, Australia

Introduction: Adaptation to the nightshift is often discussed via phase shifts in circadian markers. However, other markers of adaptation exist, and can include improvements in cognitive performance, mood, or subjective fatigue independent of circadian shifts. The degree to which workers adapt to nightshift is influenced by many factors. Circadian type, a measure of circadian rhythm amplitude and stability rather than phase, may be one such factor. In addition, physical activity might be a nonphotic strategy which could support adaptation for night workers. Thus, this study investigated the relationship between circadian type and physical activity as determinants of adaptation across consecutive nightshifts.

Materials and Methods: Thirty-two healthy adults (age M±SD: 24.3±4.6 years; 19 females) participated in a 7-day laboratory study, with 5 consecutive nightshifts (2200-0600). Participants were randomised to the Breaking up sitting (BUS; n=19) or Sedentary (SED; n=13) condition. Overnight, BUS participants completed 3-min bouts of light-intensity walking every 30-min, while SED participants remained seated. At 2200, 0000, 0200, 0400 and 0600, participants completed the 10-min Psychomotor Vigilance Task (mean RRT), Stroop Task, and Digit Symbol Substitution Task. On the first day of the study, participants completed the two-factor 11-item revised Circadian Type Inventory (factor 1: rigid/flexible; factor 2: languid/vigorous), resulting in four-subgroups (rigid; n= 12, flexible; n= 11, and languid; n= 11, vigorous n= 13). Participants may be categorised as more than one subgroup from either factor (i.e. rigid and vigorous).

Results: Linear mixed models showed a significant 3-way interaction between nightshift (1-5), condition (BUS, SED), and circadian type (rigid/flexible) for mean RRT (p=0.03), such that flexible types in the breaking up sitting condition performed better than flexible types in the sedentary condition and rigid types in the breaking up sitting condition. Participants in all conditions performed worst on the first nightshift. No significant interactions between experimental day, condition and circadian type (languid/vigorous) were found for mean RRT. Analyses are ongoing, and results from Stroop and Digit Symbol Substitution Task will be presented

Conclusions: Being a flexible or rigid type is an innate individual characteristic that is associated with different cognitive performance across the nightshift and across successive nightshifts, with flexible types outperforming rigid types. Breaking up sitting as an intervention can improve performance further for flexible types over rigid types, indicating a relationship between circadian type and physical activity level during nightshift. These findings have significant implications for nightshift rostering, with the potential to optimise cognitive performance, and therefore work efficiency, overnight by breaking up sitting, particularly for rigid types.

Towards personalized burnout prevention system: causal inference approach for understanding the effect of circadian rhythm disruption on well-being

R. Švihrová[1,2], A. Dei Rossi[3,2], D. Marzorati[2], M. Bechny[1,2], M. Grossenbacher[4], F.D. Faraci[2]
[1]University of Bern, Institute of Computer Science, Bern, Switzerland, [2]University of Applied Sciences and Arts of Southern Switzerland, Department of Innovative Technologies, Institute of Digital Technologies for Personalized Healthcare, Lugano, Switzerland, [3]Università della Svizzera italiana, Faculty of Informatics, Lugano, Switzerland, [4]Resilient Inc., Lausanne, Switzerland

Introduction: Burnout has become a significant concern in modern society due to its detrimental effects on individuals' well-being and productivity. This study aims at investigating the causal relationship between circadian rhythm disruption and daily stress levels, a first step for the development of a causal data fusion system for a personalized burnout prevention system.
Methods: Data were collected from 23 workers over a span of 18 to 41 days, resulting in 681 nights and days in total, during which participants continuously wore Garmin devices to collect physiological data. Participants also reported their normal bedtime and wake-up time in an onboarding questionnaire.The midpoint of deviance of the observed bedtime from the declared one served as a quantifiable measure of circadian rhythm disturbance. A binary treatment variable was established using a 2-hours threshold to signify disruption. Objective data collected from wearable devices were used to quantify stress score on the subsequent day, and body battery recovery during sleep computed as the difference between the value measured at the end and start of the sleep. These two variables were used as outcome variables. From previous studies we learned that stress score computed by Garmin devices is increased after physical activity, thus the number of intensity hours will serve to control for this confounder.
Results: The research employed linear mixed-effect models to forecast stress score for the subsequent day and body battery recovery during the night. To account for potential confounding of treatment and outcome, propensity score weighting was incorporated into both models. Propensity scores were derived from a logistic regression using a contextual predictor of the subsequent day being a weekend (indicating a probable shift in bedtime). This approach helped mitigate the effects of confounding variables and provided causal estimates of the treatment effect in the observational data. Both models showed a statistically significant treatment effect evaluated by Satterthwaite's method. Specifically, the treatment variable increased stress scores of the subsequent day from the baseline value of 29.91 (sd=1.46) by 5.36 (sd=1.35), controlling for a confounder variable number of intensity hours by random slope effect with significant estimated fixed effect of 2.52 (sd=1.04). The body battery recovery baseline of 53.18 (sd=1.61) was decreased by the treatment variable and the estimated effect was -13.38 (sd=3.00). Both models were fitted with random intercepts to control for individual differences in the outcome variable.
Conclusions: The study revealed a significant causal effect of circadian rhythm disruption to increased stress levels on the next day, as well as to reduction of body battery recovery during sleep, emphasizing the potential impact of circadian disturbances on individuals' well-being. Although causal inference tools for observational data in general rely on strong assumptions, findings from this analysis are an invaluable source of information for better design of a subsequent interventional study for a personalized burnout prevention system.

Weekend sleep extension (catch-up sleep) is associated with lower incidence of coronary calcium score: *the ELSA-Brasil study*

É. Peixoto de Miranda[1], B. Parise[1], R. Santos[1], S. Giatti[1], A. Aielo[1], L. Cunha[1], W. Silva[1], S. Souza[1], P. Lotufo[1], I. Bensenor[1], M. Bittencourt[1], L. Drager[1]
[1]University of Sao Paulo, Sao Paulo, Brazil

Background: Insufficient sleep is a worldwide public health problem with potential cardiovascular consequences. Therefore, strategies aiming at improving sleep patterns are highly desired. Cross-sectional studies showed that weekend sleep extension (catch-up sleep) is associated with better glucose metabolism and cognitive function profiles, but longitudinal studies are lacking. We aimed to explore whether catch-up sleep may have protective effects on subclinical atherosclerosis.
Material and methods: In this prospective cohort study, we performed a 7-days wrist actigraphy for monitoring sleep duration and a sleep study to detect sleep apnea. Catch-up-sleep was measured by calculating weekend sleep duration (Friday-Saturday nights) minus weekday sleep duration (Sunday-Thursday nights). Coronary artery calcium, CAC (64-slice multi-detector computed tomography) was measured at two different time points throughout the study (baseline, between 2010-2014, and follow-up, between 2016-2018). Incidence of subclinical atherosclerosis was defined as baseline CAC=0 followed by CAC>0 at a 5-year follow-up visit. The association of incident CAC outcome was assessed using logistic regression adjusting for age, sex, race, body mass index, hypertension, diabetes mellitus, smoking, low- and high-density lipoprotein, use of statin, sleep apnea and interscan period). Analysis of incidence was Inverse probability censoring weighted.
Results: We analyzed 1,832 participants with available CAC scores at baseline (age: 48.8±8.0years; 57.8% women; 32.1% with sleep apnea). The mean sleep duration was 6.6±1.0 hours. Catch-up-sleep >90 minutes was observed in 28.0%. Incidence of CAC was 27/141 (19.1%) among subjects with catch-up-sleep >90 minutes and 326/1029 (31.7%) among those with catch-up-sleep ≤90 minutes (P<0.001). In covariate-adjusted analyses (n=1,170, follow-up=5.4±0.90 years), we found a lower incidence of CAC in those participants with weekend sleep extension >90 minutes (OR=0.62; 95% CI 0.52–0.74).
Conclusion: Catch-up sleep is independently associated with a lower incidence of CAC. These results underscore that catch-up sleep may mitigate the adverse cardiovascular effects of weekdays sleep restrictions frequently observed in our Society.

X-chromosome functional dosage impact neuronal molecular signatures and circadian regulation

M. Moyses-Oliveira[1], M.L. Andersen[2], S. Tufik[2,1]
[1]Sleep Institute, Associação Fundo de Incentivo à Pesquisa, São Paulo, Brazil, [2]Universidade Federal de São Paulo, Departamento de Psicobiologia, São Paulo, Brazil

Introduction: Biological factors and mechanisms that drive sex differences observed in sleep disturbances are understudied and poorly understood. Although hormonal differences are the most studied underlying factors, functional genetic dosage corresponds to another relevant source of variation between biological sexes. The extent to which sex chromosome constitution impacts on sex differences in circadian patterns is still a knowledge void in the Sleep Medicine field. Genes that escape from X-chromosome inactivation (Xi escapees) in women correspond to a source of gene expression variability between males and females, which impact sex-related dimorphisms on brain transcriptional programs.

Materials and Methods: We focus on the neurological consequences of X-chromosome functional imbalances between males and females and how this molecular inequality might affect sex divergencies on sleep. Benefited from publicly available large-scale genetic, transcriptional and epigenomic data, we curated and contrasted 3 different gene lists. The first gene list was composed by X-linked genes, including gene assignments for X-chromosome inactivation patterns and disease associations. The second gene list contained sleep-associated genes which were implicated by an array of recent large-scale genome-wide association studies. The third gene list encompassed gene expression markers for the suprachiasmatic nucleus (SCN) identified by single-cell transcriptomics. Gene lists were contrasted in 2-way comparisons by 2 tailed Fisher exact test using $p<0.05$ as significance threshold.

Results: Contrasting a curated list of 1,065 sleep-associated genes distributed across the entire human genome to the 829 protein-coding X-linked genes, the resulting intersect contained 11 genes, including Xi escapees, and non-escapees. Among those 11 sleep genes, 9 were robustly expressed in brain tissues, and 8 were disease-associated, indicating a statistically significant enrichment of clinically relevant genes ($p=0.0028$). Many X-linked disease genes were causative of rare monogenic syndromes, in which a higher prevalence of excessive daytime sleepiness and insomnia have been described. Among the 240 SCN markers, 17 were located on the X-chromosome, 9 of them being disease-associated, which demonstrates statistically significant enrichment for clinically relevant genes ($p=0.03$). Out of those 9 SCN markers which are disease-associated X-linked genes, 3 were Xi escapees (*CSF2RA*, *SMC1A*, and *USP9X*) and, thus, known to harbor functional imbalance between males and females in certain cell types.

Conclusions: The X-chromosome content is significantly enriched for genes associated to neurological conditions which are frequently related to sleep disorders and neural circadian regulation. Understanding how X-linked genes manifest in sleep-associated transcriptional networks might point to female-specific clinical manifestations and therapeutic responses. Sex-related dimorphisms on brain transcriptional programs must be considered when designing health care strategies for mental and sleep illnesses with biases prevalence rates between males and females.

Dental

A multicenter clinical trial for the treatment of sleep-disordered breathing with a non-permanent orthodontic slow expansion oral appliance in children

C. Kushida[1], J. Stevens[2], M. Bennett[3], T. Heit[4], D. Klemp[5], D. Raio[6], J. Cozean[7], C. Cozean[7]
[1]Stanford University, Stanford, United States, [2]James E. Stevens, DMD, Private Practice, Sunnyside, United States, [3]Steven Michael Bennett, DDS, Dental Practice, Colorado Springs, United States, [4]Avalon Dental, Edmonton, Canada, [5]Klemp Family Dentistry, Astoria, United States, [6]Raio Dental, Hempstead, United States, [7]The EyeDeas Company, Lake Forest, United States

Introduction: Oral appliances are primarily indicated for adults for the treatment of mild-to-moderate patients with obstructive sleep apnea (OSA). The goal of this multicenter clinical trial was to evaluate whether maxillary expansion with a non-permanent slow expansion oral appliance would improve snoring and OSA in children.

Materials and methods: The customized oral appliance (Vivos Therapeutics, Inc., Highlands Ranch, CO) evaluated is a maxillary, a day and night appliance (DNA). The maxillary (DNA) portion of the appliance consists of customized polymer subunits with embedded metallic coils designed to increase airway volume over time. The patient wears the appliance nightly and can be worn throughout the day; at regular intervals (usually 1x/week but at least 1x/month) the patient's caregiver or dentist gradually adjusts the appliance for maxillary expansion. Treatment duration is typically 6-24 months.
This non-randomized interventional pre-post clinical trial approved by the WCG Institutional Review Board was conducted from 10/11/2018 to 12/10/2021. Fifty-five patients were enrolled to participate in this clinical trial at 5 dental sites (4 US sites and 1 Canada site). Inclusion criteria consisted of age<18 years, permanent teeth or mixed dentition at time of evaluation, diagnosis of sleep-disordered breathing, in need of orthodontic treatment, and living in the U.S. (for U.S. sites). Exclusion criteria consisted of uncontrolled diabetes, any severe respiratory condition, braces, and protocol nonadherence. The three co-primary endpoints were the total score on the Pediatric Sleep Questionnaire (PSQ), apnea-hypopnea index (AHI) derived by home sleep test approved for pediatric use, and dentist-measured intramolar width. The secondary endpoints were the Sleep-Related Breathing Disordered (SRBD) subsection of the PSQ and airway volume from cone-beam computed tomography (CBCT). All objective posttreatment measures were conducted without the DNA in the patients' mouths.

Results: Total sample size was 48 participants (28M, age 10.7±2.56 years, height 55.4±5.77 inches, weight 83.6±29.56 lbs; 20F, age 10.4±2.70 years, height 54.6±8.32 inches, weight 85.0±37.62 lbs) who completed the trial after 12-24 months. PSQ scores revealed a 50% decrease in symptoms of sleep-disordered breathing from a pretreatment score of 0.28±0.13 to a posttreatment score of 0.14±0.11 ($p < 0.00001$). The PSQ SBRD subsection scores decreased from 0.32±0.21 to 0.13±0.14 ($p < 0.00001$). AHI decreased 51.4% from 9.1 ± 6.8 to 4.4 ± 4.7 ($p = 0.0002$). All participants showed an intramolar width increase, averaging 13.6% from 31.9 ± 4 to 36.1 ± 3.6 ($p < 0.00001$). CBCT scan-derived airway volume increased 40% from 9864 to 13798 mm^3 pre- to posttreatment ($p < 0.00001$). There were no safety concerns.

Conclusions: This is the first clinical trial that demonstrates the efficacy and safety of a non-permanent orthodontic oral appliance in children. All participants showed objective and subjective improvement in their symptoms of sleep-disordered breathing, and all demonstrated maxillary expansion as measured by intramolar width. Eighty-four percent of participants showed improvement in their AHI, with 61% improving by 50% or more and 18% with resolution of their sleep-disordered breathing. Slow maxillary expansion by this non-permanent device that is intermittently worn demonstrated qualitative and quantitative improvement in symptoms of sleep disordered breathing in children.

Beauty and breathing: optimizing dentofacial cosmesis and function during adult maxillary expansion for sleep-disordered breathing

C. Pinter[1], C. Leonhardt[2]
[1]Private Practice, Wels, Austria, [2]Private Practice Dr. Christian Leonhardt, Augsburg, Germany

Introduction: Distraction Osteogenesis Maxillary Expansion (DOME) for adults has shown to be effective in reducing airway resistance and alleviating symptoms of sleep disordered breathing (SDB). Despite significant health benefits, the diastema from mid-palatal suture opening in the early process of treatment is a drawback for patients. A diastema is the area of separation between maxillary incisors closed by orthodontic treatment after maxillary expansion. Prior to closure, the diastema causes diminished quality of life including difficulty with mastication, articulation, and social interactions. To optimize DOME for sleep-disordered breathing without prolonged functional deficits, the simultaneous use of clear aligners in contemporary orthodontics is discussed. This treatment protocol accelerates the orthodontic rehabilitation needed for the maxillary expansion treatment process for form and function.

Materials and Methods: In this retrospective study a series of subjects underwent this accelerated protocol for DOME from year 2021 to 2023. Subjects were recruited from an orthodontic practice who present with transverse maxillary hypoplasia and complaints of sleep-disordered breathing. A Home Sleep Apnea Test (WatchPAT One) was conducted or questionnaires such as ESS and NOSE were administered to screen for sleep-disordered breathing.

An intraoral scan is then taken to proceed with fabrication of the bone borne expander. To ensure aligner fit throughout treatment, digitally planned aligners coordinate dental realignment during the bony expansion process.

Slow maxillary expansion protocol is implemented, with 2 turns per week resulting 0.5 mm expansion of the jackscrew. Subjects change aligners every 7 days, accounting to 0.25mm of buccal displacement of posterior teeth per side. This measurement is planned into concurrent dental alignment. Pre- and post-op cone beam CT scans and intra-oral scans are taken to assess:
1) degree of maxillary expansion, and
2) efficacy of planned simultaneous dental movements.

Results: The comparison of pre- and post-expansion CBCT scans mean maxillary expansion of 4.7 mm at the level of internal nasal valve. Mean dental displacement is 0.42 mm per week. The mean diastema created measures 0.2 mm during weeks 2, 4 and 8. Mean overall treatment time is 50 weeks. Subjects report improvement in nasal breathing after 16 weeks. 92% of subjects described their functional and social deficits to be mild during the treatment process.

Conclusions: After the advent of maxillary expansion for adults to address both dentofacial deficits and sleep-disordered breathing, patient acceptance and comfort during the treatment process become increasingly critical. This protocol provides useful guidelines for orthodontists working closely with sleep medicine physicians. By maintaining a weekly maxillary expansion velocity of up to 0.5 mm, clear dental aligners can be designed to restore occlusion concurrently. The reduction of treatment time and functional deficits shows promise. With digitization of anatomic data, more pooled data and research is likely to improve accuracy of aligner design.

Bruxism and excessive daytime sleepiness

P. Nogueira Costa[1], L. Gomes[1], D. Rodrigues[1], F. Teixeira[2], J. Moita[2]
[1]Centro Hospitalar e Universitário de Coimbra, Serviço de Pneumologia, Coimbra, Portugal, [2]Centro Hospitalar e Universitário de Coimbra, Centro de Medicina do Sono, Coimbra, Portugal

Introduction: Bruxism is a clinical phenomenon that can manifest itself both in children and adults. By definition it is a repetitive action of the masticatory muscles characterised by clenching or rubbing of the teeth. Bruxism has two distinct circadian manifestations: it can occur during sleep or during wakefulness. The assessment and diagnosis of bruxism is a real challenging task. Evaluation is based on reports of teeth grinding sounds during sleep and the presence of clinical signs and symptoms, such as structural damage of the dental pieces, temporal headache and facial discomfort. However, only an electromyography recording of the masticatory muscles can confirm the diagnosis.
Clinical Case: 51-year-old male, retired, occasional alcohol comsumption, active smoker. With a history of hypertension, diabetes mellitus, depression, stroke, sinusitis and bruxism.
The patient was assessed for complaints of initial insomnia (despite being medicated with benzodiazepine), ronchopathy and a past history of apneas. He also reported daytime complaints of hypersomnolence, morning headaches and non-restorative sleep with frequent dreams and memory for what had happened, without abnormal movements of the limbs or somniloquies. Reference also to bruxism at rest, at night and during sleep, impairing his wife's sleep. Epworth Sleepiness Scale of 15/24. Long build, body mass index of 20 kg/m2, teeth with generalized abrasion.
Polysomnography (level I) was carried out, revealing bruxism during wakefulness, when relaxing, and during long and frequent periods during sleep, associated with micro-arousals and, sometimes, arousals. No periodic limb movements. Apnea-Hypopnea Index of 5.9/h. Low efficiency and fragmented sleep. Subsequently, the patient was medicated with clonazepam and referred to stomatology for application of a mouth guard.
Conclusions: This clinical case aims to highlight the importance of bruxism, a frequent disorder, often undervalued and underdiagnosed, but with potential to induce an important disturbance in sleep efficiency, causing diurnal symptoms secondary to sleep fragmentation, besides the damage to the dental structure.

Cephalometric evaluation in patients with and without obstructive sleep apnea: a case-control study

J. Roa-Mora[1], M.J. Rodríguez-Gómez[2], S.J. Rueda-Velásquez[3], A. Pinto[4], L.L. Ariza[5], C. Bayuelo[5], C. García[5], I. Pacheco[5], L. Vargas Ramírez[6], C.A. Machado[6]
[1]Universidad Santo Tomás/Instituto Neumológico del Oriente, Orthodonctics/Sleep Medicine, Bucaramanga, Colombia, [2]Universidad Santo Tomás, Pediatric Dentistry, Epidemiology, Bucaramanga, Colombia, [3]Universidad Santo Tomás, Oral Pathology, Bucaramanga, Colombia, [4]Case Western Reserve University, Oral Medicine, Cleveland, United States, [5]Universidad Santo Tomás, Orthodontics, Bucaramanga, Colombia, [6]Instituto Neumológico del Oriente, Sleep Medicine, Bucaramanga, Colombia

Introduction: Obstructive Sleep Apnea (OSA) is a common sleep breathing disorder in adults, characterized by frequent episodes of upper airway collapse during sleep. Craniofacial disharmony is an important risk factor for OSA. Lateral cephalometric analysis is an effective way for diagnosing airway obstruction by evaluating skeletal and soft tissue abnormalities in patients with sleep-disordered breathing. The objective of this study was to assess the cephalometric findings in patients with and without diagnosed OSA by polysomnography to identify predictors of this condition.

Materials and methods: A case-control study was conducted and approved by the Ethics and Research Committee of the Universidad Santo Tomás and the Instituto Neumológico del Oriente. The case patients were 42 subjects who were diagnosed with OSA, and the control patients were 42 who were not diagnosed with OSA after a polysomnography exam was carried out. Lateral cephalometric analysis was taken for orthodontic needs. We analyzed the age, gender, Body Mass Index (BMI) and 17 cephalometric measurements, 11 linear and 6 angular. Skeletal measurements (maxillary, mandibular, hyoid bone position and intermaxillary relationship), soft tissue and airway measurements were made. A descriptive analysis of the population was carried out, as well as a bivariate analysis. For this purpose, the Chi-square, Fisher's Exact, Student's t or Mann Whitney U tests were used depending on the nature and distribution of each variable. For the multivariate analysis, a logistic regression was performed with the variables that presented a value of p≤0.20 in the bivariate analysis and those biologically important for the development of OSA, such as age, gender, and BMI. A value of $p<0.05$ was considered statistically significant.

Results: Among 84 study subjects, 45 were male and 39 females with a mean age of 53.2 ± 13.1 years in the case group and 48.2 ± 11.6 years in the control group. There was no statistically significant difference in relation to age, body mass index and gender between cases and controls. A statistically significant difference was evidenced when comparing cases vs. controls in relation to the age (b: 0.04 95% CI 0.04 - 0.08 p=0.031), SNB (b: 0.21 95% CI 0.05 - 0.36 p=0.008), N-ANS (b: -0.13 95% CI -0.26 - 0.01 p=0.155), upper pharyngeal space (b: -0.14 95% CI -0.29 - 0.00 p=0.046).

Conclusions: When performing the cephalometric comparison of patients with and without OSA, we report that age, the upper pharyngeal space and the SNB angle may be predictors of the presence of OSA in a limited sample. Skeletal morphology plays a significant role in the risk for OSA adult population.

Edentulism in individuals with obstructive sleep apnea: a bibliometric study with a systematic review

R. Galtieri[1], C.M. Guimarães[2], C. Salles[2,3,4], A. Souza-Machado[1,5,6]
[1]Federal University of Bahia, Postgraduate Program in Interactive Processes of Organs and Systems, Institute of Health Sciences, Salvador, Brazil, [2]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [3]Federal University of Bahia, Professor Edgard Santos University Hospital, Salvador, Brazil, [4]Jorge Amado University Center, Salvador, Brazil, [5]Federal University of Bahia, Department of Biomorphology, Institute of Health Sciences, Salvador, Brazil, [6]Federal University of Bahia, Program for Asthma Control in Bahia (ProAR), Salvador, Brazil

Introduction: Edentulism (ED) is characterized by the total or partial loss of teeth and is described as an independent risk factor for obstructive sleep apnea (OSA) because of its association with decreased retropharyngeal space and reduced upper airway muscle tone. Edentulism affects biological, physiological, functional, aesthetic, and psychosocial systems; however, treating the individual with associated OSA has been described as challenging. The objective of this study is to identify the relationship of edentulism with: the pathophysiology of OSA, use of total prostheses (TPs), intraoral mandibular advancement devices (MAD) and/or bone surgery for treating OSA.
Materials and Methods: A search on PubMed was conducted by associating the descriptors "edentulism", "obstructive sleep apnea" and "obstructive sleep apnea syndrome". In order to analyze trends, organizations, authors, countries, and journals, the VOSviewer version 1.6.19 tool was used. The eligibility criteria used were studies that considered the relationship between edentulism and obstructive sleep apnea in individuals ≥ 18 years old.
Results: A total of 73 articles were identified, of which 40 were selected. The most cited article with the most links was Bucca et al. (2006). The journal with the most citations and links was *Sleep and Breathing*. The most frequently cited author was Caterina Bucca. The most cited organization was the Department of Prosthodontics, BBD College of Dental Sciences, Lucknow, India. The changes caused by ED that may be related to OSA are: a decreased vertical dimension of occlusion, lower facial height, and oral innervation; relative macroglossia; changed position of the mandible and hyoid bone; impaired function of the oropharyngeal muscles; and impaired osseoperception. The relationship between the nocturnal use of TPs during sleep and OSA is controversial; some authors have shown that using TPs improves OSA by enlarging the pharyngeal airway space. Arisaka et al. (2009) demonstrated in 34 edentulous patients that the mean apnea and hypopnea index (AHI) in 27 patients with OSA who slept with TPs was lower than in those without prostheses (13.3 ± 10.0 versus 17.7 ± 14.6, p = 0.022). However, other authors have reported that sleeping with TPs increases the AHI because the prosthesis base may occupy the retrolingual space. Chen et al. (2017) evaluated 30 edentulous patients, and 24 showed higher AHI when sleeping with TPs than without prostheses (16.3 ± 14.7 versus 13.4 ± 14.0/h, p < 0.05). The studies indicate that treating with an intraoral MAD and/or bone surgery is a therapeutic possibility for edentulous and apneic individuals.
Conclusions: This study shows that edentulism acts through complex mechanisms ranging from anatomical changes to impairment of neural reflexes and neuromuscular activity of the upper airways favoring obstructive events. Nevertheless, the causal evidence is inconclusive: whether tooth loss induces OSA or edentulism or the use of total prostheses is related to the severity of OSA. Thus, the role of edentulism in the pathogenesis of OSA still needs to be further investigated, and the literature needs to be expanded.

Effectiveness of oral appliance therapy in severe Obstructive Sleep Apnea

P. Guerrero[1], L. Correa[1]
[1]Tufts University School of Dental Medicine, Diagnostic Sciences, Boston, United States

Introduction: Obstructive sleep apnea (OSA) is a common condition affecting roughly 1 in 7 of the world's population. The management of patients with OSA requires a multidisciplinary approach with many treatment options currently available. OSA has been effectively managed with positive air pressure (PAP) since the early 1980's and is considered first line of treatment for severe OSA patients. Many patients find PAP therapy cumbersome with compliance decreasing over time. According to current guidelines, oral appliance therapy (OAT) is indicated for patients with mild to moderate OSA. This case report demonstrates successful management of severe OSA with OAT when anthropomorphic factors along with sleep study data and clinical expertise of the provider are carefully considered before treatment.

Materials and Methods: 55-year-old female diagnosed with an apnea hypopnea index (AHI) of 37 events per hour of sleep (severe OSA), and 84% O2. Epworth Sleepiness Scale (ESS) 8/24. BMI of 23.5, neck circumference 12.5", and cephalometric analysis revealed a low mandibular angle and reduced hyoid bone- to-mandible distance. PAP therapy was implemented, yet patient was not able to tolerate the device. She was referred to Tufts Dental Sleep Clinic for assessment and therapy with oral appliance therapy. An oral appliance with bilateral interlocking design was fabricated with 80% of maximum mandibular protrusion at as a starting point. Oral appliance was fitted and follow up appointments completed to assess changes in symptoms; no additional adjustments needed and patient reported no side effects.

Results: Follow up sleep study with oral appliance revealed a reduction of AHI under 5 respiratory events per hour, and increased O2 to 91% while reporting reduction on sleepiness scale (0/24).

Conclusions: Oral appliance therapy efficacy in severe OSA cases is reserved and requires an understanding of patient characteristics and predictors of success. This case report demonstrates successful management of severe OSA with OAT therapy when anthropomorphic factors along with sleep study data and clinical expertise of the provider are carefully considered before treatment.

Acknowledgements: Authors declared no financial support provided for this case report or conflict of interest.

Elective discipline "obstructive sleep apnea and snoring. Diagnosis. Treatment. Prevention" in the help of educating dental medicine students in Medical University – Varna

M. Milkov[1], M. Stoykov[1], S. Peev[1], S. Baycheva[2], G. Georgieva[1], M. Enchev[1], M. Milkova[3], J. Kostadinov[4]
[1]Medical University "Prof. Dr. Paraskev Stoyanov", University Medical and Dental Center, Faculty of Dental Medicine, Varna, Bulgaria, [2]Medical University "Prof. Dr. Paraskev Stoyanov", Faculty of Dental Medicine, Varna, Bulgaria, [3]Eye Clinic St. Petka - Varna, Varna, Bulgaria, [4]Medical University - Varna, Varna, Bulgaria

Introduction: Obstructive sleep apnea and snoring syndrome, along with different sleep disturbances, are commonly diagnosed pathologies nowadays. Their effects on the quality of life of the affected individuals can be vast and detrimental. The elective discipline "Obstructive sleep apnea and snoring. Diagnosis. Treatment. Prevention" was founded in Medical University – Varna in 2016. It is taught in both Bulgarian- and English-language programs for students from 4th and 5th years. It is comprised of theoretical lectures and practical exercises with patients. All students sit a test and write topics from an approved syllabus at the end of the elective course. Suggested literature to train and raise their knowledge consists of the most up-to-date books in the field, visiting organized international symposiums and practical courses, etc.
The aim of the present study is to share the experience of the authors teaching students to recognize the basic and most common symptoms of the obstructive sleep apnea and snoring syndrome and to be familiar with the measures that should be first undertaken.
Materials and methods: Authors share their experience of teaching the elective discipline for 8 consecutive years. More than 600 students were educated in the clinical characteristics of obstructive sleep apnea and snoring syndrome. All shared their opinion whether or not the course was of aid.
Results: Students strongly prefer to have the chance to communicate with patients. They actively aid the process of questioning and examining patients, discussing the different comorbidities with them and trying to educate the individuals in leading a healthy lifestyle. Patients approve those measures and cooperate lively. Students replied positively and recommended that the course should be continuously held for the future.
Conclusions: The combat with obstructive sleep apnea should be lead on different front lines. Physicians in dental medicine must be aware with the symptoms of obstructive sleep apnea, although they may not be the medical specialists who will put the final diagnosis. Educating medical specialists in the field should start from the student years and having that kind of elective disciplines in the University is a preferable way to raise the skills and knowledge of the students.

Long-term oral appliance therapy effectiveness for Obstructive Sleep Apnea: an update of the ORANGE study

Y. Chen[1], F. Almeida[1], N. Huynh[2], M. Dieltjens[3], O. Vanderveken[3], K. Sutherland[4], P. Cistulli[4], G. Aarab[5], F. Lobbezoo[5], Z. Huang[5]
[1]University of British Columbia, Vancouver, Canada, [2]Université de Montréal, Montréal, Canada, [3]University of Antwerp, Antwerp, Belgium, [4]University of Sydney, Sydney, Australia, [5]Academic Centre for Dentistry Amsterdam (ACTA), Amsterdam, Netherlands

Introduction: Oral Appliance Network on Global Effectiveness, short-titled ORANGE, is a multicenter observational cohort study developed to evaluate the long-term effectiveness of oral appliance (OA) therapy for obstructive sleep apnea (OSA). It also aims to assess the long-term health outcomes of OA therapy related to cardiovascular disease. The study currently included 5 centers from 4 countries in the development phase.

Materials and Methods: Patients older than 19 years old and eligible for OA therapy will be recruited from all centers and followed for 5 years. During the 5 years study, there will be a minimum of 6 follow-up clinic visits (baseline, 3-month, 6-month, 1-year, 3-year, and 5-year) and 2 phone follow-ups (2-year and 4-year).

During each follow-up visit, the data of anthropometrics, sleep tests, questionnaires, dental exam variables, objective and subjective side effects, adherence, and titration factors will be obtained. Each participant's medical history including cardiovascular events, medication, and hospitalization will also be collected. The long-term cardiovascular incidents will be monitored by linking the patient information to provincial databases. All data will be made anonymous and standardized, then entered and stored in a secure database at the UBC Vancouver campus.

OA treatment efficacy will be quantified by comparing predictors of treatment outcome to baseline, including the severity of sleep-disordered breathing, improvement of symptoms, improved health outcomes, and adherence. All predictors will be analyzed with background data and living habits. In a parallel assessment, the cost-effectiveness of treatment will also be analyzed.

Results: By March 2023, the data of 163 patients (128 male, 35 female) from 4 research centers have been entered into the database. The mean AHI and ODI were 18.12 ± 13.22, 10.31 ± 11.43 events/h, respectively. 87.1% of patients were prescribed a custom-made, titratable oral appliance, and would perform titration in the follow-up visits.

At the UBC site, a total of 31 patients have completed the 5-year follow-up, consisting of 23 current users and 8 non-users. There was no statistical significance of the age, gender, baseline AHI, and follow-up period between the current-users and non-users group by now. However, there was a tendency that the proportion of men might be higher in the current-users group. And the current users might have higher AHI and longer follow-up time than non-users.

Conclusions: In conclusion, ORANGE plans to generate data to fulfill the needs and identify the elements for integrated care that are central to tracing the trajectory of treatment, providing patient-centered medicine, supporting longitudinal evaluation of patients, and accomplishing accessible, comprehensive, and coordinated treatment.

All centers in the ORANGE study have started the data collection, which will facilitate funding opportunities to enlarge the cohort and continue data collection. Current efforts are expected to facilitate funding opportunities and enlarge the number of centers and patients in the cohort.

New generation oral appliances for treatment of obstructive sleep apnea

R. Silva[1], L. Pires[2,3], I. Belchior[2,3], A. Moniri[2,3,4,5]
[1]Vitra Clinic, Lagoa, Portugal, [2]Centro Hospitalar Universitário do Algarve, Portimao, Portugal, [3]HPA Health Group, Portimao, Portugal, [4]University of Algarve, Faro, Portugal, [5]Sahlgrenska University Hospital, Gothenburg, Sweden

Introduction: Oral appliances (OA) have become one of the most important treatments for obstructive sleep apnea (OSA). Efficacy and compliance have been issues raised with this treatment modality. The new generation OAs, using precision technology, are generally smaller devices occupying less space in the mouth. They create less protrusion of the mandible compared to the classical devices. Previous studies on theses devices report superior efficacy and compliance. In this study we evaluate the efficiency and compliance of a new generation OA, the Prosomnus EVO, in patients with mild-moderate OSA.

Materials and Methods: Twenty-two patients, six females and sixteen males with the median age of 55.5 years, median BMI of 29.5 with a base-
line AHI of 21 (min 6; max 29) and an ODI of 19 (min 6 max 27) were included in this study. The demographic data are summarized in Table 1. Seven of the patients had another treatment modality for OSA with unsatisfactory compliance/efficacy (four subjects were under treatment with OA and three with CPAP). A level III sleep study was performed (Philips Alice) without treatment and after 4 weeks of adaptation to OA.

Results: All patients adapted well to the treatment. The median total sleep time was 412min before and 401min after treatment with OA (P= 0.8). The median AHI and ODI were reduced from 21 and 19.0 respectively to < 5 (p<0.001) with OA. With OA the individual AHI (Fig. 2) was ≤ 10 in 21 (95%) and ≤ 5 in 13 (59%) patients. The compliance during the three months of follow-up was 100%. Transient discomfort was described in 4 cases and was dependent on device adaptation.

Conclusions: All patients responded well to the treatment and the compliance was 100% during the follow-up time of three months. Side effects were transient and dependent on device adaptation. New generation oral appliances provide an efficient treatment for patients suffering from mild to moderate sleep apnea with significant reduction in AHI after treatment.

OSA as a consideration in upper jaw surgery

M.V. Firmalino[1], T. Kim[1], S.Y. Liu[2]
[1]UT Southwestern, Oral and Maxillofacial Surgery, Dallas, United States, [2]Stanford University, Otolaryngology - Head & Neck Surgery (OHNS), Palo Alto, United States

Introduction: Segmental LeFort I osteotomy is useful for the management of transverse and vertical maxillary discrepancies. However, some patients in need of orthognathic surgery may also have risk factors for obstructive sleep apnea (OSA) in which clinicians must be conscious about how surgery will affect the soft palate, the most commonly involved area of obstruction (77.9%). [1] Furthermore, it is important to consider whether the segmental LeFort I osteotomy will provide similar advancement of the palate compared to the single-piece LeFort. The purpose of this study is to identify any differences in length of the hard palate between the two groups in order to determine whether the palatal island advances in conjunction with the maxillary arch in a segmental Lefort. The investigators hypothesize that the distance between the anterior nasal spine (ANS) and posterior nasal spine (PNS) will be greater in that of a segmental than a single-piece LeFort.

Materials and Methods: CBCT is a reliable imaging method for cephalometric assessment and was used to identify the ANS and PNS point on sagittal cut. [2] Distance between the two points was measured preoperatively and >6 weeks postoperatively, the time at which initial bone healing in the maxilla occurs.[3] The difference between postoperative and preoperative ANS-PNS length was found and the means were compared between the two groups. A retrospective cross-sectional study design was implemented. Extrapolation of data and statistical analysis was performed using two-sample t-tests. Statistical significance was determined to be $P < 0.01$ with 99% confidence interval (CI) to account for any variation in measurements.

Results: 108 patients ages 18-45 who underwent segmental or single-piece Le Fort I osteotomy from 2018 to 2022 was collected. Of these, 59 patients were excluded because imaging was taken outside of the study timeframe, imaging was not reliable for measurement, or procedure performed was a 2-piece Le Fort osteotomy without creation of a palatal island. 24 patients were male and 25 were female, totaling 49 patients. 29 patients underwent single-piece LeFort and 20 patients underwent segmental LeFort. The mean difference between pre- and postoperative ANS-PNS distance was 0.21mm in the single-piece group and 2.14mm in the segmental group. The postoperative palatal length proved to be significantly greater in the segmental LeFort group at >6 weeks ($P < 0.01$) with a CI = 99%.

Conclusions: This study serves as an initial analysis of the position of the hard palate when performing a segmental LeFort osteotomy. By observing an increase in palatal length when producing a palatal island, we can assume there to be a similar effect on the soft palate. However, soft tissue is variable between patients and thus an additional study should be done to examine the direct change in the position of the soft palate. In addition to using palatal expansion for transverse discrepancies >7mm[4], it may be reasonable to opt for palatal expansion with subsequent single-piece maxillary advancement for patients with risk factors for OSA or for patients undergoing maxillary advancement to treat their OSA.

Pediatric obstructive sleep apnea screening and management practices among Brazilian Dental Specialists

N. Fernandes Fagundes[1], C. Flores-Mir[2], D. Normando[1]
[1]Universidade Federal do Para, Belem, Brazil, [2]University of Alberta, Edmonton, Canada

Introduction: Increasingly, pediatric dentists (PD) and orthodontists (OT) are actively involved in pediatric obstructive sleep apnea (OSA) screening and/or management, even though pediatric OSA pathophysiology and its relationship to craniofacial features have not been completely elucidated. There is limited knowledge regarding pediatric OSA OT and PD practice patterns, which is essential to formulate policies and improving the quality of interdisciplinary care delivered to children with OSA. This study assessed the pediatric OSA screening and management practices among Brazilian OT and PD.

Materials and Methods: This cross-sectional study was conducted from April to June 2023. First, a theoretically informed survey was developed, validated, and piloted to answer the aim of this study. Previous literature and individual interviews with field experts helped conceptualize the survey items. In Brazil, OT and PD with active clinical practice were invited to participate through their professional associations and social media. Based on the total Brazilian population of OT and PD, a 95% confidence interval, a 5% margin of error, and a sample size of 381 participants were estimated. The survey was administered using Google Forms, and data were analyzed descriptively.

Results: OT and PD from all regions of Brazil participated in the survey (n=384). The participants ranged from 23 to 77 years (46.1±11.1), and half had 5-20 years of clinical experience. Regarding screening, 62.1% of specialists reported screening children for OSA as part of their clinical routine. The most common signs and symptoms assessed were snoring, tiredness and mouth breathing. Most of the respondents (81.8%) assessed children for high-risk of OSA based on craniofacial anatomical features, more specifically maxillary constriction (73.4%) and retruded mandibular position and size (63.9%). Questionnaires were the most common tool used to screen for high-risk pediatric OSA; however, non-validated questionnaires were designed by themselves (58.1%) and were the most frequently used. Most specialists provided orthodontic/orthopedic management (73%), and half (56.9%) indicated these treatments to manage OSA specifically. The most common management options offered were rapid maxillary expansion (71%) and functional mandibular advancement (72%). Regarding sleep medicine training received, only 16.3% reported having received training during their graduate studies, while 65.20% have received training elsewhere. In-person short-term courses (50.6%) and short-term online courses (39.2%) were the most common additional training received.

Conclusions: Screening of pediatric OSA was common practice for about half of Brazilian orthodontists and pediatric dentists. Specific craniofacial features (maxillary constriction, mouth breathing and mandible position and size) guided their screening and management options offered. Attention should be given to the perceived knowledge and practices among dental specialists while screening and managing children with OSA since their practices are not aligned with the available evidence. Developing specific policies and continuous education opportunities for Brazilian dental specialists focused on screening and managing children with suspected OSA are needed.

Prevalence and predictors of non-adherence to mandibular advancement device in Asian patients with moderate-to-severe obstructive sleep apnea and hypertension

J.T. Colpani[1], Y.-H. Ou[2], W. Loke[1], C.-H. Lee[2,3,4,5]
[1]National University of Singapore, Dentistry, Singapore, Singapore, [2]National University of Singapore, Medicine, Singapore, Singapore, [3]National University Hospital, Cardiovascular Research Institute, Singapore, Singapore, [4]National University Heart Centre, Cardiology, Singapore, Singapore, [5]National University of Singapore, Cardiovascular Translation Research Programme, Singapore, Singapore

Introduction: Adherence to obstructive sleep apnea (OSA) therapy is essential for blood pressure control. Mandibular advancement device (MAD) is an approved therapy for patients who do not accept or adhere to continuous positive airway pressure (CPAP). MAD is commonly used in patients with mild OSA, and the adherence to MAD in patients with moderate-to-severe OSA remains unclear. Moreover, due to the restrictive craniofacial features, Asians may benefit from MAD. We determined the prevalence and predictors of non-adherence to MAD therapy among Asian patients with moderate-to-severe OSA and hypertension.

Materials and methods: As part of the CRESCENT trial, which compares the relative efficacy of MAD versus CPAP in blood pressure lowering, Asians with known hypertension and elevated cardiovascular risk underwent in-laboratory polysomnography. Participants (n=85) with an apnea-hypopnea index (AHI) ≥15 events/hour received treatment with MAD (SomnoDent Fusion®, SomnoMed). The starting position was set at 70% of the maximum comfortable protrusion. The adherence was monitored using a compliance micro-recorder chip (DentiTrac®, Braebon). Non-adherence of usage was defined as less than 4 hours/night over the first month.

Results: Among the participants (age, 61 ± 8.1; male, n=72; body mass index, 28.3 ± 3.9 kg/m²), the baseline AHI was 40.6 ± 18.6 events/hour (AHI 15-30, n=27; AHI >30, n=58), arousal index was 16.9 ± 12.7 events/hour, and % T SpO_2 <90% was 8.8 ± 14.1%. Epworth Sleepiness Scale (ESS) Score was >10 in 23 participants (27%). Important cardiovascular risk factors include diabetes mellitus (n=54, 64%), significant coronary artery disease (n=52, 61%), and previous stroke (n=3, 4%). All patients were treated by the same experienced dentist and received weekly communication via phone calls or messages during the first month of treatment to manage pain or discomfort. After one month, the average was 4 hours 27 min/night (21 minutes — 10 hours 25 min). Overall, 23 (out of 85, 27%) participants were found to be non-adherent to the MAD (non-adherent group). Compared with the adherent group, the non-adherent group had a higher body mass index (30.1 kg/m² *vs.* 27.6 kg/m², P=0.009), weight (86.6 kg *vs.* 77.5 kg, P=0.011), waist circumference (103.9 cm *vs.* 98.1 cm, P=0.010), hip circumferences (106.7 cm *vs.* 101.7 cm, P=0.010), and a shorter baseline protrusion distance (8.9 mm *vs.* 9.9 mm, P=0.0234). The baseline number of dental visits, AHI, ESS score, blood pressure, cardiovascular risk factors, and the number of teeth were similar between the two groups (P>0.05 for all). The multivariate logistic regression analysis indicated the arousal index (odds ratio [OR]: 1.05, 95% confidence interval [CI]: 1.00 to 1.10, P=0.045), waist circumference (OR: 0.94, 95% CI: 0.88 to 1.00, P=0.038), and baseline protrusion distance (OR: 1.48, 95% CI: 1.08 to 2.05, P=0.015) were independent predictors of non-adherence to the MAD therapy.

Conclusions: Our study demonstrated that among Asian patients with moderate-to-severe OSA and hypertension, approximately a quarter of the participants were non-adherent to MAD after one month of treatment. Non-adherence was predicted by arousal index, waist circumference, and baseline protrusion distance. The findings would inform the treatment selection for Asian patients with moderate-to-severe OSA.

Sleep and other indicators of quality of life during orthodontic treatment with fixed or removable appliance

W. Valkeapää[1], L. Arrais de Campos[2], T. Ikävalko[1], T. Peltomäki[3]
[1]Kuopio University Hospital, University of Eastern Finland, Department of Oral and Maxillofacial Diseases, Institute of Dentistry, Faculty of Health Sciences, Kuopio, Finland, [2]Tampere University Hospital, Tampere University, Department of Oral and Maxillofacial Diseases, Faculty of Medicine and Health Technology, Tampere, Finland, [3]Kuopio University Hospital, University of Eastern Finland, Tampere University Hospital, Tampere University, Department of Oral and Maxillofacial Diseases, Institute of Dentistry, Faculty of Health Sciences, Faculty of Medicine and Health Technology, Kuopio, Tampere, Finland

Introduction: The aim was to study self-reported indicators of quality of life (QoL), including sleep, in Finnish children during an early orthodontic treatment with a fixed appliance (quad helix) or a removable appliance (eruption guidance).

Materials and Methods: Sixty-five 6-8-year-old children were invited to participate in the study and were allocated into two groups based on their malocclusion. Children with functional lateral crossbite were treated with the quad helix (n=33, 21 girls, mean age: 7.9 (SD=0.6) years) and children with increased overjet and overbite were treated with the eruption guidance appliance (n=32 children, 16 girls, mean age: 8,2 (SD=0.7) years). Participants filled in a questionnaire before and two months after the beginning of the orthodontic treatment. The questionnaire had Likert-type response scales and encompassed sleep, oral symptoms and function, well-being, and treatment-related questions. The responses to indicators of QoL were compared between the different time points and groups using non-parametric mixed ANOVA (α=5%). A Spearman's Correlation test (α=5%) was used to determine the relationship between wakening up and appliance falling during the night (eruption guidance group) and between pain and difficulties to fall asleep (quad helix group). The relationship between grinding teeth while sleeping and a headache in the morning was also studied using Spearman's Correlation test in both groups. The analyses were conducted in SPSS (IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp).

Results: Most indicators of QoL were not statistically different before and after beginning of the treatment and between the groups. However, both treatments caused speech difficulty, with the quad helix having greater disadvantage on speech (p≤0.001). Correlation between wakening up and appliance falling during the night was observed in the eruption guidance group (Spearman's ρ=0.43, p=0.016). In the quad helix group, pain at the beginning of the treatment was not correlated to difficulty falling asleep (Spearman's ρ=0.05, p=0.769. There was no correlation between grinding while sleeping and wakening up with a headache in the morning (Spearman's ρ=0.17, p=0.058).

Conclusions: Initial phase, i.e., two months after beginning of early orthodontic treatment was found to cause difficulties for children to speak, and greater difficulty when the quad helix were used. The appliance falling during the night in the eruption guidance group was correlated with wakening up at night, indicating that it may have an impact on the quality of sleep of the patients. The ongoing study will reveal if early orthodontic treatment has a long-lasting effect to sleep and other indicators of QoL with one year follow-up.

Sleep bruxism unveiled: understanding assessment and risks in children and adolescents

T. Al-Jewair[1], R. Koch[2], A. Monegro[3], S. Warunek[1]
[1]University at Buffalo, Department of Orthodontics, Buffalo, United States, [2]Private Practice, Geneseo, United States, [3]University at Buffalo, Department of Sleep Medicine, Buffalo, United States

Introduction: The aim of this study was to objectively assess the prevalence of sleep bruxism (SB) and identify associated risks among children and adolescents.

Methods: In this cross-sectional study, we utilized overnight sleep mandibular movement (MM) monitoring to determine the presence or absence of SB in individuals aged 7-16 years. Each participant wore a disposable self-adhesive inertial measurement sensor for two consecutive nights. Data obtained from the sensor were extrapolated, processed using a machine learning algorithm, and analyzed to automatically detect rhythmic masticatory muscle activity indicative of SB. Additionally, risks of SB were assessed using previously validated questionnaires, clinical examinations, lateral cephalometric radiographs, and digital study models.

Results: A total of 87 subjects (56.3% female, mean age=12.82yrs ± 2.24, and mean BMI =21.45 ± 5.49) participated in the study. The prevalence of SB was 60.7%. Univariate analysis showed that academic performance over the last year, nasolabial angle, nyctophobia (fear of sleeping in the dark), and objective sleep variables were significant risks for SB. Multivariate logistic regression analysis with stepwise forward selection revealed that SB had statistically significant association with sleep efficiency percentage (OR = 0.74, 95% CI = 0.55-0.93, P = 0.022) and obstructive respiratory disturbance index (ORDI, OR = 1.43, 95% CI = 1.07-2.09, P = 0.033). None of the orthodontic or dental variables were significant.

Conclusions: SB is very common in pediatric populations. In this study, SB is related to sleep efficiency percentage and ORDI. MM monitoring is a simple objective tool for identifying SB.

Upper airway outcomes on pediatric OSA after interceptive orthodontic treatment with MAD twin block appliance: a clinical study

S. Falardo Ramos[1], S. Marques[2], A. Feliciano[3]
[1]Universidade Católica Portuguesa, Faculty of Dental Medicine, Centre for Interdisciplinary Research in Health, Invited Assistant Professor of Orthodontics, Viseu, Portugal, [2]Lusíadas Clinic, Clinical Director and Sleep Medicine Coordinator, Almada, Portugal, [3]Universidade Católica Portuguesa, Faculty of Medicine, Centre for Interdisciplinary Research in Health, Assistant Professor, Rio de Mouro, Portugal

Introduction: Pediatric Obstructive Sleep Apnea has a prevalence rate from 2 to 4% in children between 4 to 8 years old. The most common risk factors described in the scientific literature, are adenoids and tonsils hypertrophy, mouth breathing patron, which lead to growth modification of craniofacial skeletal . Partial or complete upper airway obstruction during sleep in children with OSA leads to decreased blood oxygen saturation and high blood carbon dioxide content, which consequently results in cognitive impairment, excessive daytime sleepiness, and attention deficit. The orthodontic interceptive treatment in children with skeletal class II and retrognathic mandible with Twin Block Appliance, who advance the mandibula, has been show improvements on PSG evolution reducing AHI as well ODI.

Materials and methods: A sample of 16 subjects of both genders, between 6 to 15 years old. Distinctive complains were referred: snoring, difficulties on chewing, mouth breathing syndrome, alopecia areolate, low school performance. All subjects were evaluated by an ENT expert on sleep medicine, only 1 subject performed adenotonsillectomy before orthodontic treatment, were submitted to a complete evaluation with a type II polysomnography, a 2D teleradiograph, photographs, study cast models and intra-oral observation. The PSG revealed POSA (AHI >2,1/h < 26,3/h, RDI > 1,3/h < 26,3/h; ODI >1/h <17,3/h); associated with periodic limb movements in 13 individuals (PLMS >0 <24,6/h) and sleep bruxism in 6 individuals (bruxism index >1,7/h <11,6/h). The cephalometric analyses and cast models' study, identified a skeletal class II with retrognathia mandibula. All individual were submitted to a interceptive orthodontic treatment with a Twin Block with bite jumpers, how advance the mandibula forward and expand the dental arches on both jaws. This device allows protrusion titration and expansion by turning the screws ¼ turn per week /per day, at test 6 to 9 months, according to the bite occlusion achievements of correction. After bite correction confirmation, the activation was stopped and a second PSG was performed to reevaluate the sleep condition. All individuals had adherence to the treatment.

Results: All individuals complete the treatment and showed a decrease in respiratory events (AHI >0,5 /h <11,1/h; in RDI <1,3 <26,3/h; ODI >0,1/h <11,1/h); PLMS index (>0/h <9,4/h); Bruxism Index >0/h <3,5/h, with Snore index elimination.

Conclusions: Early diagnosis of obstructive sleep related disorder followed by an early interceptive orthodontic intervention, showed great outcomes on the clinical signs and symptoms, better sleep quality and structure were identified on comparing before and after treatment PSG. Improvement on the behavioral and school performance were mentioned by parents and schoolteachers. All the individuals improved and showed no signs of obstructive sleep apnea after treatment which seems to correlate the upper way patency with the orthodontic treatment. The authors stress that early interceptive orthodontic treatment with mandibula advance device on very well diagnosed patients, can improve upper way patency and stimulate balance growth of the craniofacial skeletal leading to great outcomes. Further studies should include a bigger sample of patients to provide more accurate and reliable results.

Upper airway outcomes on pediatric OSA after interceptive orthodontic treatment with RME - rapid maxillary expansion: a clinical study

S. Falardo Ramos[1], S. Marques[2], A. Feliciano[3]
[1]Universidade Católica Portuguesa, Faculty of Dental Medicine, Centre for Interdisciplinary Research in Health, Invited Assistant Professor of Orthodontics, Viseu, Portugal, [2]Lusíadas Clinic, Clinical Director and Sleep Medicine Coordinator, Almada, Portugal, [3]Universidade Católica Portuguesa, Faculty of Medicine, Centre for Interdisciplinary Research in Health, Assistant Professor, Rio de Mouro, Portugal

Introduction: Pediatric Obstructive Sleep Apnea (POSA) has a prevalence rate from 2 to 4% in children between 4 to 8 years old. The most common risk factors described in the scientific literature, are oral breathing, adenoids and tonsils hypertrophy which led to growth modification of craniofacial skeletal, posture and vision plan asymmetry. The application of RME in children has shown good results on nasal function, reducing nasal resistances, independently from a previous adenotonsillectomy. Positive effects have also been reported for the treatment of conductive hearing loss and of OSA, with the reduction of Apnea Hypopnea Index (AHI), possibly due to an increased pharyngeal dimension and a new tongue posture.

Materials and methods: A sample of 8 subjects of both genders, between 7 to 11 years old, complains of "misalignment teeth", snoring, unilateral chewing, mouth breathing, enuresis, irritability and bad behavior were mentioned by parents. All evaluated by a ENT expert on Sleep Medicine and 1 adenotonsillectomy was performed. The 8 subjects were submitted to a complete evaluation with a type II polysomnography, a 2D teleradiograph, photographs, study cast models and intra-oral observation. The PSG revealed moderate-severe POSA (AHI >4,2/h < 20/h, RDI > 5/h < 20/h; ODI >3/h <8,6/h;), in association with periodic sleep movements in 8 subjects (PLMS >2 <17,3/h) and bruxism in 3subjects (bruxism Index >2,2/h <6,9/h). The cephalometric analyses and cast models' study, identified a skeletal transversal maxillary discrepancy. The intraoral observation confirmed a unilateral or bilateral cross bite registered on mixed dentition. All individuals were submitted to a rapid upper maxillary expansion (RME) with a Hyrax fixed appliance, which induce rapid maxillary expansion by separating the medial palatal suture. The protocol of appliance activation stablished was ¼ turn of the screw twice /per day, during at least 8 days. After confirmation of the correction of the cross bite and the disjunction of the palatine middle suture by intraoral occlusal XR, the activation was stopped, and a second PSG was performed to reevaluate the sleep condition.

Results: All individuals complete the treatment and showed a mean decrease in AHI 2,7/h (final AHI>0,4/h <4/h, except for 1 individual who registered AHI 8/h; RDI <0,4 <8/h; ODI >0,4/h <2,7/h; the IPLMS normalized except on 25% of the sample (2 individuals increase the index) >2/h <9,2/h and the total elimination of snore and bruxism indexes.

Conclusions: Early diagnosis of obstructive respiratory sleep related disorders followed by an early interceptive orthodontic intervention, showed great outcomes on the clinical signs and symptoms. Better sleep quality and structure were identified on comparing before and after treatment PSG. Improvement school performance were mentioned by parents and schoolteachers. All individuals showed no signs of obstructive sleep apnea after treatment which seems to correlate the upper way patency with the orthodontic treatment. The authors stress that early interceptive orthodontic treatment can improve upper way patency and stimulate balance growth of the craniofacial skeletal leading to great outcomes. Further studies should include a bigger sample of patients to provide more accurate and reliable results.

Excessive Daytime Sleepiness (not Narcolepsy)

Correlation between excessive daytime sleepiness, number of awakenings, and naps in post-COVID-19 patients

D.M. Santos[1], S.R. Cahú[2], L.M. Studart-Pereira[3], A.D. Andrade[1], A.M.J. de Lima[4]
[1]Universidade Federal de Pernambuco, Fisioterapia, Recife, Brazil, [2]Universidade Federal Rural de Pernambuco, Educação Física, Recife, Brazil, [3]Universidade Federal de Pernambuco, Fonoaudiologia, Recife, Brazil, [4]Universidade Federal Rural de Pernambuco, Morfologia e fisiologia, Recife, Brazil

Introduction: The infection caused by the SARS-CoV-2 virus brings health repercussions on affected patients. Even after hospital discharge, there may be alterations in sleep parameters, negatively impacting sleep quality and leading to excessive daytime sleepiness (EDS). Since EDS is measured subjectively, it is important to find objective variables that represent this parameter. Therefore, the aim of this study is to correlate the number of awakenings and naps with the score on the Epworth Sleepiness Scale (ESS) in post-COVID-19 patients.
Materials and methods: This cross-sectional study was approved by the ethics and research committee (No. 5,536,992) and conducted from November 2022 to June 2023 at the Cardiopulmonary Rehabilitation Laboratory of the Department of Physical Therapy at the Federal University of Pernambuco. The assessment of the number of awakenings and naps was performed using actigraphy, with participants wearing an actigraph on their wrist for 9 days. Excessive daytime sleepiness was measured using the Epworth Sleepiness Scale (ESS). Participants aged 18 years or older of both sexes, diagnosed with COVID-19 confirmed by a positive test result, were included in the study. Volunteers who used sleep-inducing medication or had any cognitive impairment that hindered questionnaire understanding were excluded. Descriptive analysis was presented as percentages, mean, and standard deviation (SD). Spearman's correlation test was used to evaluate the correlation between variables, considering a p-value ≤ 0.05 as the level of statistical significance.
Results: A total of 30 patients were selected (age=46.3 ± 12.3 years/female predominance: 72.3%). Twenty-six percent of the total sample required hospitalization due to COVID-19. Regarding the number of awakenings, an average of 5.43 ± 3.2 awakenings per night was observed, with 4.25 ± 2.1 naps per day and absence of EDS (8.23 ± 4.3). No correlation was found between the number of awakenings and ESS score (p=0.46; r=0.54), nor between the number of naps and ESS score (p=0.24; r=0.43).
Conclusion: According to the results, excessive daytime sleepiness does not show a correlation with the number of awakenings per night and the number of naps per day in post-COVID-19 patients.
Acknowledgment: This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001.
Keywords: COVID-19; excessive daytime sleepiness; actigraphy.

Daytime sleepiness and vigilance in untreated obstructive sleep apnea patients - the preliminary results from Vietnam

K. Bui-Diem[1,2], N.V. Tho[1,3], T. Nguyen-Binh[1], Q. Vu-Tran-Thien[1], L. Phung-Khanh[1], S. Duong-Quy[4]
[1]University of Medicine and Pharmacy at Ho Chi Minh City, Ho Chi Minh City, Vietnam, [2]University Medical Center, Ho Chi Minh City, Vietnam, [3]University Medical Center, Ho Chi Minh City, Vietnam, Ho Chi Minh City, Vietnam, [4]Lam Dong Medical College, Da Lat, Vietnam

Introduction: Obstructive sleep apnea (OSA) involves repetitive partial or complete collapse of the upper airway during sleep, leading to momentary interruptions in breathing. These nocturnal breathing disruptions trigger microarousals, negatively impacting sleep architecture and causing daytime sleepiness. The maintenance wakefulness test (MWT) is used to assess the ability of alertness and wakefulness of the patients. It is employed in evaluating the efficacy of interventions for OSA and determining whether the treatment has restored adequate wakefulness. In addition, the Psychomotor Vigilance Test (PVT) focuses on measuring vigilance and cognitive performance. It involves reaction time tasks that assess an individual's ability to respond to visual stimuli promptly. Impaired vigilance due to conditions like OSA can result in increased lapses in attention, negatively influencing psychomotor function and overall productivity. This article describes the primary database of wakefulness and vigilance collected in untreated OSA patients.

Materials and Methods: Prospective study on 31 adult patients diagnosed with OSA. All patients had not been treated for OSA yet. MWT and PVT were conducted 4 times a day, 2 hours apart. The 40-minute protocol was applied for MWT. The PVT software was PC-PVT 2.0.4, running on Windows 10 OS, with a Logitech G103 mouse.

Results: The subjects' average age was 49 years, 81% were male, and 90% were married. The median AHI was 43 times/hour (IQR 26-59), and the minimum SpO2 when sleeping was 77% (IQR 69, 80). The Epworth score had a median of 10 (IQR 4-14). The common comorbidities were gastroesophageal reflux disease, dyslipidemia, hypertension, rhinitis/sinusitis/tonsillitis, and arrhythmia. MWT results showed a median sleep latency of 28 minutes (IQR 14-35). PVT results showed that the median of minor lapse was 2.5 times (IQR 1.4, 5.3), major lapse was 0.25 times (IQR 0.00-0.63), response time (RT) was 312 milliseconds (IQR 281, 342), fastest 10% was 212 milliseconds (IQR 196, 228), slowest 10% was 480 milliseconds (IQR 420, 608). AHI had a significant negative association with MWT sleep latency (p=0.01) and PVT RT (p=0.03). AHI had no significant relationship with other PVT parameters (minor lapse, major lapse, fastest 10%, slowest 10%). MWT sleep latency had no significant association with PVT parameters.

Conclusions: The results showed that patients with more severe OSA had shorter sleep latency on MWT but more rapid response on PVT. This article is part of a before-after study and provides preliminary information on daytime sleepiness and vigilance in untreated Vietnamese OSA patients. Larger sample sizes are being collected. The process of studying the effectiveness of OSA treatment through MWT and PVT is in progress.

Effects of solriamfetol on cognition in participants with cognitive impairment associated with excessive daytime sleepiness in obstructive sleep apnea: SHARP study results

H.P.A. Van Dongen[1], E.B. Leary[2], C. Drake[3], R. Bogan[4], J. Jaeger[5], R. Rosenberg[6], C. Streicher[2], H. Kwak[2], J. Bates[2], H. Tabuteau[2]
[1]Washington State University, Translational Medicine and Physiology & Sleep and Performance Research Center, Spokane, United States, [2]Axsome Therapeutics, New York, United States, [3]Henry Ford Health System, Detroit, United States, [4]SleepMed, Inc., Columbia, United States, [5]CognitionMetrics, Stamford, United States, [6]NeuroTrials Research, Atlanta, United States

Introduction: The SHARP study evaluated whether solriamfetol improves cognitive function in patients with obstructive sleep apnea (OSA) experiencing excessive daytime sleepiness (EDS) and extant impaired cognition. OSA is characterized by repeated intermittent airway collapse resulting in disrupted sleep and excessive daytime sleepiness (EDS). EDS often persists even with Positive Airway Pressure (PAP) therapy. Cognitive impairment is a burdensome symptom in many patients with OSA and EDS, leading to occupational and social dysfunction and degraded quality of life. Solriamfetol (Sunosi®) is approved in the U.S., Canada, and Europe to improve wakefulness in adults with OSA and EDS; its effect on cognitive impairment was not previously assessed.

Methods: SHARP (NCT04789174) was a randomized, double-blind, placebo-controlled, crossover trial in 59 patients with OSA and EDS and concurrent cognitive impairment. All patients received solriamfetol (75 mg for 3 days followed by 150 mg/day) for 2 weeks, and placebo for 2 weeks, with treatment periods separated by a 1-week washout. The primary endpoint was the score on the Coding Subtest (a variation of the Digit Symbol Substitution Test) of the Repeatable Battery for the Assessment of Neuropsychological Status (DSST RBANS) at the end of each treatment period, averaged across 2, 4, 6, and 8 hour time points post-dose. Secondary endpoints included DSST RBANS scores at each of the individual time points, as well as scores on the British Columbia Cognitive Complaints Inventory (BC-CCI), the Epworth Sleepiness Scale (ESS), and a Patient Global Impression of Severity (PGI-S) scale measuring perceived symptom severity. All endpoints were expressed relative to baseline.

Results: The study completion rate was 96.7%. Solriamfetol treatment improved performance on the DSST RBANS compared to placebo (6.49 vs. 4.75, $p=0.009$), with an effect size (Cohen's d) of 0.36. Across individual time points, solriamfetol yielded DSST-RBANS score improvements (solriamfetol–placebo difference) at 2 hours (1.91, $p=0.033$), 4 hours (1.38, $p=0.089$; not significant), 6 hours (2.33, $p=0.004$), and 8 hours (1.58, $p=0.022$) post-dose. There were improvements in self-reported cognitive complaints and daytime sleepiness in the solriamfetol group compared to the placebo group, as measured by the BC-CCI (-4.70 vs -3.11, $d=0.43$, $p=0.002$) and the ESS (-4.41 vs -2.31, $d=0.50$, $p=0.004$), respectively. Scores on the PGI-S improved with solriamfetol compared to placebo (-0.90 vs -0.61, $p=0.034$). The most common adverse events with solriamfetol were nausea (6.9%) and anxiety (3.4%).

Conclusions: Solriamfetol (150 mg/day) improved objective and subjective measures of cognitive function in patients with impaired cognition associated with OSA and EDS and exhibited sustained effects over an 8-hour period while reducing perceived symptom severity. The adverse events profile and high study completion rate suggest solriamfetol was well tolerated. These findings support the use of solriamfetol to improve cognitive performance and daytime sleepiness through the day in patients with cognitive impairment associated with OSA and EDS.

Support: Axsome Therapeutics and Jazz Pharmaceuticals

From sleepiness to inattention: investigating the attentional impacts of hypersomnolence in children through electrophysiological and cognitive markers

M. Thieux[1], J. Lioret[1], A. Guyon[1,2], R. Bouet[1], J.-P. Lachaux[1], V. Herbillon[1,2], P. Franco[1,2]
[1]Lyon Neuroscience Research Center, INSERM U1028, CNRS UMR5292, Lyon, France, [2]Hôpital Femme-Mère-Enfant, Hospices Civils de Lyon, Pediatric Sleep Unit, Department of Clinical Epileptology, Sleep Disorders and Pediatric Functional Neurology, Lyon, France

Introduction: Children with hypersomnolence (HYP) often complain about attention problems that are rarely objectified. The overarching goal of this pilot study was to describe their attentional performance, compared with controls and children with attention deficit hyperactivity disorder (ADHD), using cognitive and electrophysiological markers typically disturbed in children with ADHD. The latter generally show poor attentional performance and an elevated EEG theta activity (and theta/beta ratio, TBR), which is a marker of cortical hypoarousal. The second objective was to assess the relationship between these markers and conventional sleepiness measurements.

Materials and methods: 38 children with HYP (66% girls, mean age 12.9 years) were included during a hospital stay for diagnosis, consisting of polysomnography followed by 5 nap opportunities during the multiple sleep latency test (MSLT), and completion of the Epworth and Stanford sleepiness scales (AESS, SSS). They also underwent the BLAST-EEG protocol, which consists of a resting EEG (eyes open and closed for 2 minutes), followed by the BLAST attentional test (BLAST-Classic and BLAST-Color). Associations between subjective (AESS, SSS) and objective (MSLT sleep latencies) measures of sleepiness, BLAST scores (reaction time, RT, error percentage, 2 composites measures of the attentional stability: BLAST-Intensity and BLAST-Stability) and EEG measures (theta activity, TBR) were investigated using age-adjusted regression models. The BLAST-Color scores of 35 children with HYP was compared with those of 33 age-matched controls, while the BLAST-Classic and EEG markers of 23 children with HYP were compared with those of 23 age-matched children with ADHD.

Results: In children with HYP, the AESS score was positively associated with the percentage of errors (adjusted-$\eta2 = 0.23$, $p = 0.02$) and negatively associated with the BLAST-Intensity (adjusted-$\eta2 = 0.33$, $p = 0.05$). No other association was found between sleepiness and EEG or cognitive measures, which were not associated with each other. Compared with controls, children with HYP had lower RT (683 vs 570 ms, $p = 0.01$) and BLAST-Stability (39 vs 33, $p = 0.02$). Compared with children with ADHD, children with HYP showed no significant difference in BLAST and EEG markers.

Conclusions: Children with HYP had lower RT and BLAST-Stability than controls, suggesting impulsivity and attentional fluctuations. They did not differ from children with ADHD on BLAST-Classic and EEG measures. These results support the hypothesis that sleepiness generates an unstable state of arousal, leading to the investment of cognitive resources to stabilize vigilance, with additional cognitive costs and repercussions on other aspects of the task in hand. Because of its ability to capture brief attentional lapses with excellent temporal resolution, the BLAST-EEG protocol is a promising tool for the objective assessment of attentional fluctuations in children with HYP. Future studies would be useful to better define the mechanisms of the relationship between sleepiness and attention.

Healthcare resource utilization burden one year post continuous positive airway pressure initiation among adults with excessive daytime sleepiness in obstructive sleep apnea in the United Kingdom

S. Floam[1], I. Abeynayake[1], P. O'Donohoe[2], M. McCormack[3], G. Parks[1]
[1]Axsome Therapeutics, New York, United States, [2]Jazz Pharmaceuticals, Palo Alto, United States, [3]Open Health Communications LLP, London, United Kingdom

Introduction: Obstructive Sleep Apnea (OSA) is a chronic condition characterized by repetitive episodes of upper airway collapse during sleep. Despite standard treatment with continuous positive airway pressure (CPAP), some patients continue to experience residual excessive daytime sleepiness (rEDS). Pharmacotherapy use for rEDS is low in Europe and some wake-promoting agents are no longer allowed as treatments by the European Medicines Agency. The objective of this study was to characterize the patient demographics, comorbidities, medications, and healthcare resource utilization (HCRU) in a population of OSA patients with and without rEDS after CPAP initiation.

Methods: The retrospective observational cohort study used the Clinical Practice Research Datalink (CPRD) AURUM, a primary care database, linked at the patient level to the Hospital Episode Statistics (HES) database, which covers secondary care for all of England. The population included 10,746 adult OSA patients with a first record of CPAP treatment during the eligibility period (Jan 1, 2009-Mar 21, 2018). rEDS patients were identified 6 months after initiating CPAP treatment.

Results: Among all eligible OSA patients in the AURUM database, 596 (5.6%) had rEDS; 80.5% of rEDS patients were identified using recorded diagnosis code of daytime fatigue, and 21.7% using ESS score ≥11 (13 patients had both measures). A greater percentage of patients had a history of psychiatric (21.5%; $p < 0.0001$), gastrointestinal (7.7%; $p < 0.0001$), and neurodegenerative (13.6%; $p = 0.003$) disorders in the rEDS group, compared with the non-rEDS group, while the prevalence of obesity, cardiovascular, and sleep disorders did not significantly differ between groups. Across all patients, rates of prescription for stimulants or modafinil were low during the 12 months prior to CPAP initiation. Patients with rEDS had significantly higher HCRU compared to non-rEDS patients in the first and second years after CPAP initiation.

Conclusions: Despite low rates of rEDS identified in this study, the clinical needs of patients with rEDS are significant, as evidenced by the volume of HCRU, low use of pharmacotherapy, and high comorbidity rates, highlighting the need to improve patient care in rEDS.

Support: Axsome Therapeutics and Jazz Pharmaceuticals

Investigating daytime sleepiness, psychological distress, and the mediating role of sleep quality: an institutional based study among young adults

A. Nogdalla[1,2], A. Abdelghyoum[1,2], S. Algam[1,2], F. Fathelrahman[2], M. Omer[1,2], A. Eltayeb[1,2], A. Abdullah[2,2], R. Abdelmoneim[1,2], A. Izzaldin[1,2], A. Jafar[1,2], M. Osama[1,2]
[1]Al Neelain University, Faculty of Medicine, Khartoum, Sudan, [2]Al Neelain Institute for Medical Research, Khartoum, Sudan

Introduction: Daytime sleepiness is defined as the uncontrollable drowsiness during daytime that can interfere with performing daily activities and psychomotor performance. Poor sleep quality and bad sleep behaviors have a large contribution to the prevalence of daytime sleepiness.
A number of studies have assessed the prevalence of excessive daytime sleepiness (EDS) . But none was performed in Sudan, or was directed to evaluate its correlation using mediation analysis.
Therefore, the aim of this study was to evaluate the prevalence of EDS among young adults and investigate its relationship with psychological distress (PD) and sleep quality using mediation analysis.
Materials and Methods: A cross-sectional study was carried out between April and August 2022 among young adults attending of Al-Neelain University in Khartoum state, Sudan. participants were selected using a systematic simple random sampling.
The Epworth Sleepiness Scale, Kessler Psychological Distress Scale and Pittsburgh Sleep Quality Index (PSQI) were completed to determine EDS, PD, and sleep quality, respectively. Mediation analysis was performed to evaluate the effect of sleep quality and other co-variates on EDS.
Results: A total of 303 young adult participated in the study. Mean age was 22.71 ($\pm$2.5) years, about two thirds were females (67%).
The prevalence of EDS was 9.2%. Almost half of the participants (42.2%) had severe psychological distress. The majority of excessive daytime sleepers were severely psychologically distressed (14.8%, $p=0.018$).
Multiple regression analysis was used to assess the mediating role of sleep disturbances (a component of sleep quality index) on the relationship between EDS and PD. The results revealed that PD was positively associated with EDS (B=.0634, $p<0.05$). While controlling for age, and PD, sleep disturbances also revealed a positive association with EDS (B=1.3067, $p<0.05$). Lastly, the results for bias-corrected percentile bootstrap method showed that the total effect was positively significant (B=.0634, $p<0.05$, SE=.0297, 95% CI [0.005 – 0.1218]) through full complimentary mediation. Also assessing the role of sleep onset latency (another component of PSQI) on the relationship between EDS and PD, the results revealed a significant total effect (B=0.0312, $p<0.05$, SE=0.0310, 95% CI [0.0061 – 0.1280]) only through a direct effect.
Conclusions: The study results revealed an association between EDS and PD among young adults. these findings advice to direct more attention towards the psychological health of young adults, and emphasize the need develop a better preventive approach to deal with pressure and distress.

Mapping neuroimaging using artificial intelligence to detect hypersomnia and its neurobiological correlates

D. Carvalho[1], N. Gunter[1], R. Gebre[1], M. Stuart[1], E. St Louis[1], M. Silber[1], S. Przybelski[1], B. Boeve[1], J. Graff-Redford[1], C. Jack Jr[1], R. Peterson[1], P. Vemuri[1]
[1]Mayo Clinic, Rochester, United States

Introduction: Despite progress in the understanding of the circadian and sleep-wake neurobiology, the neural substrates of excessive daytime sleepiness (EDS) have remained elusive, limiting development of novel diagnostic tools and targeted therapies for hypersomnia. We hypothesized that EDS may be associated with subtle brain abnormalities detectable by artificial intelligence.

Materials and methods: We applied supervised machine learning methods to detect hypersomnia as measured by an Epworth Sleepiness Scale (ESS) score ≥ 13 using neuroimaging datasets drawn from a large population-based cohort of cognitively unimpaired older adults from Olmsted County, MN USA (Mayo Clinic Study of Aging), who completed the ESS and underwent brain MRI and FDG-PET scans. We divided our sample in training and testing datasets in a ratio of 80/20. Training data sets had n=750 to 888 (depending on available neuroimaging biomarkers) and testing datasets included n=99 to 116. We separated the classifiers based on regional imaging features (grey matter volume, cortical thickness, fractional anisotropy, and FDG-PET metabolism). Due to class imbalance between cases and controls, a synthetic majority oversampling technique (SMOTE) was utilized.

Results: Using a stacked model, FDG-PET features ranked highest for classification of hypersomnia with AUC of 0.793 in the testing dataset (Sensitivity=57%; Specificity=90.8%). Metabolic changes in the cingulate cortex, followed by cerebellum, pallidum, frontal (supplementary motor area), parietal, and thalamus were the most important features associated with hypersomnia classification. Other models using fractional anisotropy (AUC 0.781) and grey matter volume (AUC 0.767) features also showed satisfactory performance.

Conclusions: Our findings suggest that EDS may be associated with a detectable neurobiological signature using neuroimaging. Further work is needed to learn the most sensitive and specific neuroimaging biomarkers of hypersomnia, while combining features from different imaging modalities to improve classification models. These methods could advance the understanding of the neurological underpinnings of hypersomnia symptoms and should also be explored in clinical populations to analyze possible neurobiological substrates of hypersomnia disorders.

Neck circumference, epworth sleepiness scale, and their relation with falling in robust older adults aged ≥ 65 years

C.M. Guimarães[1], A.L.L. Noronha Filho[1], F. Perrucho[1], C. Dias[1], C. Aguiar[1], M. Meira e Cruz[2,3,4], C. Salles[1,5,6]
[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]European Sleep Center, Lisbon, Portugal, [3]University of Lisbon, Sleep Unit, Cardiovascular Center, Faculty of Medicine in Lisbon, Lisbon, Portugal, [4]College Sao Leopoldo Mandic, Campinas, Brazil, [5]Federal University of Bahia, University Hospital Professor Edgard Santos, Salvador, Brazil, [6]Jorge Amado University Center, Salvador, Brazil

Introduction: Fat deposition around the neck depicts the subcutaneous adipose tissue of the upper body. Neck circumference measurement has been identified as a surrogate marker for determining the distribution of subcutaneous fat in the upper body. The decline in skeletal muscle mass associated with aging is often associated with reductions in energy (calorie) intake, denervation of muscle fibers, and oxidative stress. On the other hand, falls are a leading cause of disability, injury, and death among older adults. Falls occur in more than 30% of people over 65 years old and in more than 50% of the population over 80 years old. Therefore, the objective of this study was to conduct an evaluation of neck circumference with anthropometric measurements, Epworth Sleepiness Scale, and their relationship with falls in robust older adults aged ≥ 65 years.

Materials and methods: This study is part of the "Sleep disorders and metabolomic profile related to the occurrence of falls in community-dwelling older adults: a prospective longitudinal study". This is a cross-sectional study involving individuals ≥ 65 years, non-institutionalized. Inclusion criteria: robust older adults after screening with the Clinical-Functional Vulnerability Index (CFVI-20). Exclusion criteria: older adults diagnosed with a stroke, dementia, vestibulopathies, and osteoarticular disorders. As instruments, anthropometric measurements were obtained, sociodemographic and clinical questionnaires (Epworth Sleepiness Scale) were applied, and the occurrence and number of falls in the previous 12 months were questioned. *Neck circumference* was defined as the measurement located in the neck region, around the midline, using a flexible tape measure. *Waist circumference* was defined as the measurement taken in the waist region, at the midpoint between the lower edge of the ribs and the iliac crest. *Calf circumference* was measured at the thickest part of the muscle on the lower leg. Neck, waist, and calf circumference measurements were obtained following standardized protocols from the scientific literature.

Results: Of the total 103 elderly, 77 were robust older adults, it was found that: mean age 71.0±5.0 years; brown race=50.6%(n=39); female sex=68.8%(n=53); in professional activity=28.6%(n=22); live alone=35.1%(n=27); retired=90.9% (n=70); mean BMI=26.3±4.1 Kg/m^2; mean neck circumference=35.8±3.6 cm; mean waist circumference=92.9±11.0cm; mean calf circumference=33.5±3.1cm occurrence of falls=27.3%(n=21). There was statistical significance between neck circumference and the following variables: total value of the Epworth Sleepiness Scale (R^2=0.303; p=0.007); the number of falls of the older adults (R^2=0.236; p=0.040); BMI (R^2=0.395; p=0.000); waist circumference (R^2=0.528; p=0.000); calf circumference (R^2=0.486; p=0.000).

Conclusions: This study showed that neck circumference is a measurement significantly related to relevant risk factors for older adults, including excessive daytime sleepiness and episodes of falling in robust older adults aged ≥ 65 years.

Neurofeedback training to improve wakefulness maintenance ability: a pilot study to develop cognitive strategies to overcome Excessive Daytime Sleepiness

M. Pelou[1], P. Abi-Saab[1], T. Monseigne[1], C. Jeunet[2], F. Lotte[3], P. Philip[1], J. Taillard[1], J.-A. Micoulaud-Franchi[1]

[1]University of Bordeaux, UMR 6033 SANPSY, Bordeaux, France, [2]CNRS, Bordeaux, France, [3]INRIA, Talence, France

Introduction: Excessive Daytime Sleepiness (EDS) is a common symptom of sleep disorders, and is the consequence of reduced wakefulness maintenance ability. This reduced ability has an impact on quality of life and results in functional disturbances. The persistence of EDS in certain pathologies, such as Obstructive Sleep Apnea Hypopnea Syndrome (OSAHS), led to the development of new treatments, including non-pharmacological ones, such as neurofeedback (NFB) to improve wakefulness maintenance abilities. The effectiveness of NFB training seems to rely on the subject's ability to implement cognitive strategies to successfully complete the neuromodulation task. Yet the study of these cognitive strategies has often been neglected when it could be a good predictor of success.

Materials and Methods: The Wakefulness Maintenance Test (MWT), which assesses objective wakefulness maintenance abilities, and the Karolinska Sleepiness Scale (KSS), which assesses subjective wakefulness maintenance abilities, were administered to a group of healthy sleep-deprived subjects (n = 8) before (V1) and after (V2) the 8 neurofeedback sessions on $\beta/(\theta-\alpha)$ target. During both visits (V1 and V2), subjects are deprived of a full night's sleep in a controlled manner according to an acute sleep deprivation model, inducing behavioral EDS (intense sleep debt). We use as an EEG target the combination of a marker of homeostatic sleep pressure (power of the spectral band $\theta-\alpha$ (6.25-9Hz) in Cz) and a marker of vigilance (power of the spectral band β, which decrease with sleepiness). Cognitive strategies learned during NFB were evaluated with an open-ended question. Objective and subjective sleepiness measures obtained during the two visits (before, V1 and after, V2) are compared using a Student's t test and a repeated-measures ANOVA. Cognitive strategies were analyzed using a Chi-squared test in relation to MWT results.

Results: Mean sleep latency on the MWT and mean KSS scores increased significantly between V2 and V1. Average latencies increase from 15.1 min (V1) to 23.8 min (V2) on the MWT with a p-value of 0,018. Also, the mean KSS score increase from 6,7 (V1) to 5,5 (V2) with a p-value of 0.006. Certain types of cognitive strategies, such as focused attention, self-encouragement and visual mental imagery, appeared to be more effective than others in improving wakefulness maintenance abilities, even though the results are not significant.

Conclusions: A neurofeedback training targeting EEG $\beta/(\theta-\alpha)$ activities seems to be of interest to improve objective and subjective wakefulness maintenance abilities and decrease EDS. Further research is needed to confirm the efficacy and benefits of this type of non-pharmacological therapy for subjects suffering from EDS in the context of sleep disorders. In addition, exploring the role of cognitive strategies in the NFB learning process would increase the number of subjects responding to this type of intervention.

Prediction of driving performance on simulator using clinical and sleep parameters: The PANDORE-IA project

M. Benballa[1], M. Berger[2], A. Aloulou[2], F. Crosbie[2], H. Lerogeron[1], M. Guillard[2], F. Sauvet[2], P. Bouchequet[2], R. Picot-Clemente[1], D. Léger[2]
[1]Saagie, Rouen, France, [2]Université Paris Cité, VIFASOM (ERC 7330 Vigilance Fatigue Sommeil et santé publique), Paris, France

Introduction: While it is estimated that 20-30% of driving fatalities are due to driver sleepiness and fatigue, few studies have investigated the clinical and sleep parameters which may impact driving performance. Therefore, the aim of this study was to determine whether some clinical and sleep parameters may predict driving performance on a simulator the following day using a machine learning approach.

Materials and Methods: This study is an ancillary study from a previous randomized controlled crossover study evaluating the effects of caffeine on vigilance. Healthy participants performed an in-laboratory night electroencephalography (EEG) using the Dreem Headband. They also performed two 45-min driving simulator tests on a validated device (INRETS-MSIS SIM2) the following day at 10 p.m. and 4 a.m. (13 hours and 21 hours since wake up, respectively). Sleep features were extracted from the Dreem report while driving performance was assessed by the number of line crossings over the 45-min of the test. Poor driving performance was defined by being below the median of line crossing. Random forest (using a Stratified Random Split with 10 splits) was used to predict poor driving performance. A first model including only sleep features was built and a second model including also clinical characteristics (age, sex, BMI, marital status, number of children < 4 years old, chronotype, Epworth sleepiness score, caffeine consumption, genetic polymorphism of caffeine) was performed. To determine the most important features for the performance of the prediction model and the downgrading features, a feature selection step was performed using a drop column method.

Results: A total of 41 participants (33.2 ±7.8 y / 46.34 % males) were included. The first ML model using only previous night sleep EEG parameters reached a F1 score of 62.6 ± 9.1 for 10 p.m. and 59.2 ± 8.1 for 4 a.m. driving performance. The second ML model including both clinical and sleep parameters reached a F1 score of 73.3 ± 4.9 for 10 p.m. and 66.2 ± 7.6 for 4 a.m. driving performance, respectively. Five features were considered as downgrading the model for 10 p.m. driving prediction (ADORA2A and ADA (genetic polymorphism), sex, REM latency and number of children < 4 years old) whereas two downgrading features were identified for 4 a.m. driving prediction (REM latency and sleep efficiency the previous night). By contrast, the two most important features identified by drop column were the caffeine consumption and wake after sleep onset for 10 p.m. prediction, and age for 4 a.m.

Conclusions: ML approach using clinical characteristics and previous night sleep EEG allow to predict driving performance on a simulator with a pretty good accuracy. Caffeine consumption and age are the most important features to predict the driving performance on a simulator the following night. Further studies on real life driving are needed to confirm these findings.

Profiles of sleep-related outcomes in distinct sleepiness groups

G. Fernandes[1], S. Tufik[1,2], M. Andersen[1,2]
[1]Universidade Federal de Sao Paulo, Departamento de Psicobiologia, Sao Paulo, Brazil, [2]Sleep Institute, Sao Paulo, Brazil

Introduction: Recent studies have found that the Epworth Sleepiness Scale (ESS), which analyzes sleep propensity and is one of the most used tools for assessing sleepiness, was not associated with worsened sleep health outcomes. On the contrary, scales that measured sleepiness perception detected such impairments, corroborating the notion that sleepiness has multiple dimensions.

Materials and Methods: We analyzed data from the EPISONO study, which had a population-based sample of 1,042 participants from the general population of São Paulo. Participants answered the ESS, UNIFESP Sleep Questionnaire, Pittsburgh Sleep Quality Index, Insomnia Severity Index and underwent full-night polysomnography. The UNIFESP Sleep Questionnaire assessed sleepiness with the question: "How often do you feel excessively sleepy during the day, to the point of disturbing your daily activities?". Participants were distributed into 4 excessive daytime sleepiness (EDS) groups: 1) ESS group (ESS>10). 2) Frequent EDS (reporting feeling sleepy ≥3 times per week). 3) Combined EDS (combining both EDS criteria). 4) No EDS (participants without evidence of EDS). Participants with missing data were removed from the analysis. Differences between groups were assessed with generalized linear models, and the statistical significance threshold was defined as p<0.05.

Results: The following group distributions were observed: 620 participants in the no EDS group, 68 participants had Frequent EDS, 255 individuals were in the ESS group, and 73 had Combined EDS. The groups with increased sleep propensity, the ESS and Combined EDS groups, presented significant increases in sleep efficiency, diminished sleep latency, wake after sleep onset, and self-reported weekly sleep duration compared to the no EDS group. The groups with increased sleepiness perception, Frequent and Combined EDS, had significantly increased scores in the Pittsburgh Sleep Quality Index and Insomnia Severity Index.

Conclusions: The groups with EDS due to high sleep propensity showed a profile of differences indicating sleep loss. On the other hand, EDS with high sleepiness perception was associated with worsened subjective sleep quality. Groups defined by the ESS or the UNIFESP Sleep Questionnaire had distinct profiles of sleep outcomes, even though they measured the same construct, sleepiness.

Psychometric evaluation of the Brazilian-Portuguese version of the Functional Outcome of Sleep Questionnaire 10 (FOSQ10) in patients with obstructive apnea

A.P. Sereni Manfredi Moreira[1], E.R.R.d. Oliveira[1], R. Colacioppo[2], E. Zancanella[1], A. Crespo[3]
[1]University of Campinas / Institute of Otorhinolaryngology - Unicamp, Sleep Division, Campinas, Brazil, [2]University of Campinas, Campinas, Brazil, [3]University of Campinas / Institute of Otorhinolaryngology - Unicamp, Campinas, Brazil

Introduction: The Health-Related Quality of Life (HRQoL) - tools that provide complementary information to those obtained through conventional clinical practice methods - measure how a disease, disability, or disorder affects one's life over time. To assess the difficulty in performing daily tasks and functions due the Excessive Daytime Sleepiness (EDS), several scales have been developed specifically to evaluate the impact of obstructive sleep apnea (OSA) on HRQoL, including the Functional Outcome of Sleep Questionnaire – FOSQ 30 - a specific self-report scale designed to evaluate the impact of sleep-related dysfunction on daily activities. In an effort to obtain a shorter and more user-friendly instrument, Weaver et al. (2009) reduced the scale to 10 questions, the FOSQ10, which has been employed in large-scale studies, monitoring efforts, and clinical practice. Our objective was to perform the validation and psychometric evaluation of the Brazilian-Portuguese translation of the Functional Outcome of Sleep Questionnaire (FOSQ10);

Materials and methods: 182 patients (65 females 48.3±14.4 years and 117 males 46.9±12.4 years), were evaluated by sleep physicians and suspected of having Obstructive Sleep Apnea (OSA). Patients underwent polysomnography and completed the FOSQ10 and the Epworth Sleepiness Scale (ESS). APA & NCME, 2014 was used to validate the data as recommended by the American Educational Research Association.

Results: Quality indicators such as Bartlett's test of sphericity ($\chi2=1108.2$; gl =45; P = 0.000010) and KMO (0.83), as well as data adherence measures, attest to the quality of the model. The indicators TLI (0.97), CFI (0.98), and RMSEA (0.04) fall within the expected values. Using the Eigenvalue >1 technique, we found two factors that explain 53% and 13.3% of the variances. Through the Parallel Analysis technique, a single factor explained 59.4653% of the random variance, and the Unidimensionality indicators, such as UniCo = 0.921, ECV= 0.822, and MIREAL= 0.253, were supported, adhering to the principle of scale unidimensionality. Construct Validity: the reliability coefficients Cronbach's α 0.87, McDonald's ordinal Omega index 0.9, and the Composite Reliability 0.913 were satisfactory. Convergent validity: there was a significant Spearman correlation between FOSQ and ESS (r=0.364 [-0.487; -0.226]). Criterion Validity: A Stepwise modeling procedure was performed in Logistic Regression of polysomnographic parameters, revealing a relationship between FOSQ10 and the variables age, sex, and Oximetry Time below 90% (T90) ($R^2aj=10.32$ and $R^2pred=7.48\%$). However, the Spearman correlation between the Apnea-hypopnea Index (AHI) and FOSQ10-P was not significant (r= 0.026[-0.120; 0.170]).

Conclusions: The Brazilian translation of FOSQ10 is valid and reliable for identifying significant effects of EDS in patients with OSA.

Sleepiness and mood swings in adolescents: a pilot study

L. Guedes de Lima Júnior[1], R. Kaynan Leite Gomes[2], S.S.d. Silva[1], J. Fernanda de Oliveira Lima Batista[1], M. Carla Pereira do Nascimento[1], S. Conceição Maria Vieira[1], M. Vilela Heimer[1]
[1]Universidade de Pernambuco, Hebiatria, Recife, Brazil, [2]Universidade de Pernambuco, Odontologia, Recife, Brazil

Introduction: Adolescence is marked by the beginning of puberty, when biopsychosocial changes occur and start to define certain behaviours and bodily functions. Sleep deprivation is one of the predetermining factors for mood alterations (anxiety, depression, among others), as neurobiological processes act on both emotion and sleep, leading to a deficient functioning of this mechanism, which may harm and/or weaken the emotional control of individuals. This study aimed to analyse the association between excessive daytime sleepiness and mood swings in adolescents.

Materials and methods: an observational and cross-sectional study was carried out in a public school in the Brazilian city of Recife (PE), with a sample of 97 adolescents of both genders, aged between 15 and 17 years old. The instruments used for data collection were: the Sociodemographic; Pittsburgh Sleep Quality Index (PSQI); the Affective Reactivity Index (ARI); the Epworth Sleepiness Scale (ESS) and the Generalized Anxiety Disorder (GAD -7).

Results: The majority of adolescents were female (62.5%), aged between 15 and 17 years old (87.5%), showing poor sleep quality (91.7%), excessive daytime sleepiness (62.5%), affective reactivity (76.0%) and moderate/severe anxiety (52.1%). The prevalence of excessive daytime sleepiness was higher among female adolescents, who presented poor sleep quality (64.8%), affective reactivity (67.1%), and moderate/severe anxiety (68.0%).

Conclusions: No association was observed between excessive daytime sleepiness and mood swings (anxiety and affective reactivity). However, moderate/severe anxiety and affective reactivity were more prevalent in adolescents with excessive daytime sleepiness.

Solriamfetol for excessive sleepiness in narcolepsy and obstructive sleep apnea: effect sizes and numbers needed to treat or harm

C. Chepke[1,2], A.J. Cutler[3], S. Floam[4], G. Parks[4], R. Rosenberg[5]
[1]Excel Psychiatric Associates, Huntersville, United States, [2]Atrium Health, Charlotte, United States, [3]SUNY Upstate Medical University; Neuroscience Education Institute, Syracuse, United States, [4]Axsome Therapeutics, New York, United States, [5]NeuroTrials Research, Atlanta, United States

Introduction: Solriamfetol (Sunosi®), a dopamine/norepinephrine reuptake inhibitor that has been shown to activate TAAR1, is approved (US and EU) to treat excessive daytime sleepiness (EDS) in adults with narcolepsy (75-150 mg/day) or obstructive sleep apnea (OSA) (37.5-150 mg/day).Effect size, number needed to treat (NNT) and number needed to harm (NNH) are statistical representations of efficacy and tolerability that clinicians may find helpful in guiding treatment decisions. This analysis characterized these statistical parameters from two registrational studies.

Methods: Post-hoc analysis of data from two phase 3 studies in adults with excessive daytime sleepiness associated with narcolepsy (TONES 2) or obstructive sleep apnea (TONES 3). Effect size compared to placebo, NNT, and NNH were calculated based on previously published endpoints, post-hoc analyses, and adverse events.

Results: On the maintenance of wakefulness test (MWT), effect size compared to placebo (*Cohen's d*) was 0.29, 0.82, and 1.13 for 75mg, 150mg, and 300mg doses of solriamfetol in TONES 2 and 0.46, 0.89,1.08, and 1.28 for 37.5mg, 75mg, 150mg, and 300mg, respectively. On the Epworth sleepiness scale (ESS), *d* was 0.47, 0.80, and 1.02 for 75mg, 150mg, and 300mg doses in TONES 2, and 0.42, 0.37, 0.99, and 1.04 for 37.5mg, 75mg, 150mg, and 300mg doses in TONES 3. NNT for patients achieving an ESS ≤10 was 7, 5, and 3 for 75mg, 150mg, and 300mg doses in TONES 2 and 8, 6, 4, and 3 for 37.5mg, 75mg, 150mg, and 300mg doses in TONES 3. On the patient global impression of change (PGIc), NNT was 4, 3, and 3 for 75mg,150mg, and 300mg doses in TONES 2 and 16, 5, 3, and 3 for 37.5, 75mg, 150mg, and 300mg in TONES 3. Similar NNT were found for the clinician global impression of change (CGIc) as for the PGIc. In both TONES 2 and TONES 3, NNH pooled across doses for adverse events occurring in at least 5% of patients and greater than placebo were all >10, with the exception for headache in TONES 2 (NNH=6).

Conclusions: This post-hoc analysis demonstrates favorable effect size, NNT and NNH values for solriamfetol in the treatment of EDS associated with narcolepsy and OSA.

Support: Axsome Therapeutics

Solriamfetol improves cognitive performance in preclinical models of sleep apnea and in a randomized placebo-controlled study of sleep apnea participants (SHARP)

D. Gozal[1], H. Van Dongen[2], E.B. Leary[3], G. Parks[3], S. Floam[3], H. Tabuteau[3]
[1]Joan C. Edwards School of Medicine, Marshall University, Huntington, United States, [2]Washington State University, Translational Medicine and Physiology & Sleep and Performance Research Center, Spokane, United States, [3]Axsome Therapeutics, New York, United States

Introduction: Obstructive Sleep Apnea (OSA) is a common disorder characterized by repeated intermittent hypoxic and arousal events resulting in disrupted sleep and excessive daytime sleepiness (EDS). Positive Airway Pressure (PAP) reduces hypoxic events and mitigates sleep disruption, but EDS often persists. Cognitive impairment is a burdensome problem for many patients with EDS in OSA, which leads to occupational and social dysfunction and degrades quality of life. Solriamfetol (Sunosi®) is approved to improve wakefulness in adults with OSA and EDS. Solriamfetol is a dopamine-norepinephrine reuptake inhibitor (DNRI) that activates trace amine-associated receptor 1 (TAAR1). We hypothesized that Solriamfetol will benefit declarative memory performance in murine models and cognition in a randomized clinical trial of cognitive impairment associated with EDS in OSA.

Methods: *In vitro* binding and functional studies were conducted to measure the activity of solriamfetol. In preclinical studies, mice were exposed to long-term intermittent hypoxia (IH) or sleep fragmentation (SF) protocols that induce declarative memory deficits. Mice exposed to either protocol were administered equipotent doses of solriamfetol (200mg/kg), modafinil (200mg/kg), or vehicle, and cognitively assessed using the novel object recognition (NOR) task. SHARP (NCT04789174) was a randomized, double-blind, placebo-controlled, crossover trial in 59 human participants with OSA and EDS and demonstrated cognitive impairment. All patients received solriamfetol (75mg for 3 days followed by 150mg/day) for 2 weeks, and placebo for 2 weeks, with treatment periods separated by a 1-week washout. The primary endpoint was change from baseline in post-dose Coding Subtest (a variation of the Digit Symbol Substitution Test) of the Repeatable Battery for the Assessment of Neuropsychological Status (DSST RBANS) averaged across 2, 4, 6, and 8-hour time points; secondary endpoints included change from baseline on the British Columbia Cognitive Complaints Inventory (BC-CCI).

Results: *In vitro* experiments showed that solriamfetol inhibits dopamine and norepinephrine transporters (IC50=3.2μM and 14.4μM, respectively) and has agonist activity at TAAR1 (EC=10–16μM) and 5HT1a (EC50=25μM) receptors that were within the clinically observed therapeutic plasma concentration range. In mice exposed to IH or SF, solriamfetol significantly improved NOR performance, whereas modafinil did not. In the SHARP study, solriamfetol improved performance on the DSST-RBANS compared to placebo (6.49 vs. 4.75, p=0.009), with an effect size (Cohen's d) of 0.36, and also yielded improvements on the BC-CCI (-4.70 vs -3.11, p=0.002; d =0.43). The most common adverse events with solriamfetol treatment (incidence 3%) were nausea (6.9%) and anxiety (3.4%).

Conclusions: Solriamfetol is a DNRI with TAAR1 and 5HT1a agonist activity. Solriamfetol improved declarative memory performance in two mouse models of OSA. Furthermore, solriamfetol improved objective and subjective cognition in a randomized, double-blind, placebo-controlled, crossover study of patients with cognitive impairment associated with EDS in OSA. These lines of evidence indicate that solriamfetol may be an effective treatment option for managing cognitive impairment in patients with OSA and EDS.

Support: Axsome Therapeutics and Jazz Pharmaceuticals

SURWEY study of solriamfetol: initiation, titration, safety, efficacy, and follow-up experience for patients with OSA in Germany

Y. Winter[1], G. Mayer[2,3], S. Kotterba[4], H. Benes[5], L. Burghaus[6], I. Abeynayake[7], S. Floam[7], H. Kwak[7], G. Parks[7], U. Kallweit[8]
[1]Johannes Gutenberg-University, Mainz Comprehensive Epilepsy and Sleep Medicine Center, Department of Neurology, Mainz, Germany, [2]Hephata Klinik, Schwalmstadt, Germany, [3]Philipps University Marburg, Marburg, Germany, [4]Klinikum Leer gGmbH, Klinik für Geriatrie und Neurologie, Leer, Germany, [5]Somni bene GmbH Institut für Medizinische Forschung und Schlafmedizin Schwerin GmbH, Schwerin, Germany, [6]Heilig Geist-Hospital, Department of Neurology, Cologne, Germany, [7]Axsome Therapeutics, New York, United States, [8]University Witten/Herdecke, Center for Biomedical Education and Research and Professorship for Narcolepsy and Hypersomnolence Research, Witten, Germany

Introduction: Excessive daytime sleepiness (EDS) is a symptom of Obstructive Sleep Apnea (OSA) that can persist despite efficacious suppression of apnoea via primary airway therapy and can be managed with wake-promoting agents. Solriamfetol (Sunosi®) is a wake-promoting agent approved to treat EDS associated with OSA (37.5–150 mg/day). This real-world study characterizes dosing/titration strategies among German physicians initiating solriamfetol and patient outcomes following initiation.
Materials and Methods: SURWEY was a retrospective chart review conducted by physicians in Germany. Data are presented from 83 German patients with OSA. Eligible patients (≥18 years old, diagnosed with EDS due to OSA, had reached a stable solriamfetol dose, and had completed ≥6 weeks of treatment) were classified into 1 of 3 groups based on solriamfetol initiation strategy: changeover (switched from existing EDS medication[s]), add-on (added to current EDS medication[s]), or new-to-therapy (no current EDS medication). Efficacy measures included the Epworth Sleepiness Scale (ESS; 2-3 points represents a minimally clinically important difference), as well as patient- and physician- reported perceptions of improvement.
Results: Patients' mean±SD age was 49±14 years; 65% were male. All patients used primary airway therapy. New-to-therapy was the most common initiation strategy (n=62), then add-on (n=12), and changeover (n=9). The most common starting doses of solriamfetol were 37.5 (n=57; 69%) and 75 mg/day (n=23; 28%). Solriamfetol was titrated in 53 patients (64%); the majority were titrated within 7 days. Mean±SD Epworth Sleepiness Scale (ESS) score was 16.0±3.2 (n=83) at initiation and 10.7±3.9 at follow-up (n=83), with a mean decrease of 5.4± 3.6 points. Across subgroups, mean ESS scores at initiation and follow-up ranged from 15.9–16.6 and 10.4-12.2, with mean decreases from 5.3–5.7 points. Improvements in EDS after solriamfetol initiation were reported for most patients (patient-reported, 90%; physician-reported, 89%). Most patients reported the effects of Solriamfetol to last ≥6 hours (74%) with no change in their night-time sleep quality (91%). Common adverse effects were headache, insomnia, and irritability.
Conclusions: These real-world data describe the use of solriamfetol in a cohort of German patients with OSA. Solriamfetol was typically initiated at 37.5 mg/day; titration was common. ESS improvements were greater than the minimum clinically important difference of 2-3, and most patients and physicians perceived improvement in EDS. Common adverse events were consistent with those previously reported for solriamfetol.

Utilizing commercial off-the-shelf smartwatches in a real-time drowsiness detection system

L. Pugliese[1], M. Violante[1], R. Groppo[2], S. Noce[3]
[1]Politecnico di Torino, DAUIN - Dept. of Control and Computer Engineering, Torino, Italy, [2]Sleep Advice Technologies, Torino, Italy, [3]Jmedical, Torino, Italy

Introduction: According to the American National Highway Traffic Safety Administration (NHTSA), sleep-related incidents are among the leading causes of fatal vehicle crashes, along with speeding and alcohol consumption. Physiologically, driving for over two hours in a low-light environment can result in impairment similar to a blood alcohol concentration of 0.05%. This study introduces a groundbreaking system that utilizes a patented sleep prediction method, analyzing the Autonomic Nervous System (ANS) and its subsystems, to monitor the actions during the transition from wakefulness to sleep onset.

Materials and Methods: The proposed system implements an algorithm that enables real-time estimation of Autonomic Nervous System (ANS) activity by analyzing Heart Rate (HR) and Heart Rate Variability (HRV). Notably, the algorithm is designed to be simple and does not require a high-performance computational platform. It has been successfully deployed on two types of devices: a Garmin smartwatch for on-device processing and an Android smartphone as an edge-device. The system provides local feedback based on a simplified Karolinska Sleepiness Scale (rKSS), which consists of five stages: Calibration, Awake, Low Drowsiness level, Medium Drowsiness level, and High Drowsiness level.

Results: The experimental validation of the prediction method was conducted in a realistic environment using an AVL dynamic car simulator in Graz (AT). Fifteen subjects participated in the experiments and underwent a round of Maintenance Wakefulness Tests (MWT). Each subject was equipped with a Garmin smartwatch and polysomnography (PSG) medical equipment. During the experimental validation, the Garmin smartwatch collected data processed by the proposed approach, while polysomnography (PSG) medical equipment recorded data used by the medical doctor to establish the ground truth. The output produced by the proposed method and the sleep expert medical doctor's sleep scoring during the first experimental section were compared. The first sleep onset event prediction showed an accuracy of 93.3%, a sensibility of 95%, and a sensitivity of 100%.

Conclusions: The primary objective of this research was to develop an algorithm capable of predicting the onset of sleep using data from commercial devices, without requiring access to raw sensor data such as photoplethysmography (PPG) or electroencephalogram (EEG). The initial experimental phase demonstrated the effectiveness of the method in accurately predicting both the first sleep onset event and subsequent sleep onset events, indicating a robust system performance. In an additional experimental phase, a collaboration was established with the Italian truck company Chrono Express, involving the utilization of the developed system by 15 different drivers for a distance exceeding 30,000 kilometers. This phase further improved the system's effectiveness by highlighting a significant alarm density distinction between night and diurnal time slots.

Validation of Day-time Electroencephalography (EEG) as a measure of day time alertness in university students – A pilot study

I. Gupta[1], N. Akhtar[2]
[1]All India Institute of Medical Sciences (AIIMS), Academic Section, New Delhi, India, [2]All India Institute of Medical Sciences (AIIMS), Department of Physiology, New Delhi, India

Introduction: The aim of the present study was to validate the Day-time Electroencephalography (EEG) as a measure of day time alertness with Karolinska Sleepiness Scale (KSS), a measure of situational sleepiness and Psychomotor Vigilance Test (PVT), a measure of alertness levels.

Materials and methods: Participants were administered the Karolinska Sleepiness Scale (KSS), a 9-point scale which reflects the psycho-physical state of the participants in the previous 10 minutes and the Psychomotor Vigilance Test (PVT), a computer-based test that measures the speed at which the participants react to a visual stimulus, in which the average response time (in milliseconds) in the second attempt was noted. Day-time Electroencephalography (EEG) was recorded using a 7-minute Karolinska Drowsiness Test (KDT) protocol and a 4-minute Alpha Attenuation Test (AAT) protocol, which was repeated five times. Absolute powers were calculated using Fast Fourier Transformation at 512 Hz sampling frequency. In the KDT, Alpha(α) and Theta(θ) powers were calculated for the respective periods on a single central derivation (C3-A2) for a timespan of every 15 seconds and averaged. In the Alpha Attenuation Test (AAT), Alpha(α) power was calculated for the respective periods on a single occipital derivation (O1-A2) for a timespan of every 5 seconds and averaged over the 5 tests. Alpha Attenuation coefficient was calculated as the ratio of mean alpha power during eyes closed conditions to mean alpha power during eyes open conditions.

Results: The participant population consisted of 7 males with a mean age of 19.7 ± 0.5 years. The average PVT response time in the second attempt was 413.6 ± 27.8 milliseconds. The KSS scores ranged from 3 to 6. A one-way ANOVA was performed to compare the effect of KSS on theta power during eyes open condition in KDT. It revealed that there was a statistically significant difference in theta power during eyes open condition in KDT between at least two groups ($F(2,2) = [15.42]$, $p = [0.0132(<0.05)]$). Correlation between alpha power during eyes closed condition in KDT and average PVT response time was statistically significant [correlation coefficient = -0.8846, $p=0.0082(<0.05)$].

Conclusions: The findings report a statistically significant association between theta power in KDT and higher sleepiness. Our findings also report a statistically significant correlation between alpha power in KDT and lower average response time. These findings are consistent with previous researches which show that in KDT, alpha rhythm is replaced by theta rhythm as the person tends to have decreased levels of alertness or more signs of sleepiness. The EEG associations which were found to be statistically significant may be an objective indicator of alertness levels. However, day-time EEG was done as a pilot study in a small number of volunteers and requires larger prospective studies for significant results.

Conflicts of interest: Nil

Sleep Health

Actigraphic sleep parameters and their relationship with laboratory metabolic profile and body composition in adults

T.L.G. Tavares[1], F.G. Stelzer[1], L.A.M.W. Machado[1], H.H. Sander[1], L.F.B. Aylon[1], M.P. Milhomem[1], S.H.A. Santos[1], P. Kageyama[1], V.C. Cardoso[2], R.d.C. Cavalli[3], A.L. Eckeli[1]
[1]Faculty of Medicine of Ribeirão Preto, University of São Paulo, Ribeirão Preto, Brazil, Department of Neuroscience and Behavioral Science, Division of Neurology, Ribeirão Preto, Brazil, [2]Faculty of Medicine of Ribeirão Preto, University of São Paulo, Ribeirão Preto, Brazil, Department of Childcare and Pediatrics, Ribeirão Preto, Brazil, [3]Faculty of Medicine of Ribeirão Preto, University of São Paulo, Ribeirão Preto, Brazil, Department of Gynecology and Obstetrics, Ribeirão Preto, Brazil

Introduction: Literature describes a bidirectional relationship between sleep and obesity. On one hand, insufficient or excessive sleep duration is associated with obesity, while on the other hand, obesity plays a significant role in sleep disorders, particularly in sleep-related respiratory disorders.
Materials and Methods: This study aims to compare actigraphic parameters (sleep onset latency [SL], total sleep time [TST], wake after sleep onset [WASO], sleep efficiency [SE], number of awakenings after sleep onset, and average wake duration) with body composition and metabolic profile (body weight, body mass index [BMI], body fat percentage, triglycerides, total cholesterol, LDL, HDL, glucose, C-reactive protein, and basal insulin) in adult individuals.
Results: This cross-sectional observational study, aligned with a Brazilian cohort (Ribeirao Preto/SP), collected sleep data using actigraph and sleep diaries. Fasting blood samples were collected in order to determine the following data: triglycerides, total cholesterol, LDL, HDL, blood glucose, C-reactive protein (mg/dL) and basal insulin. For obesity assessment, BMI and body fat percentage were measured. Obesity was inferred by a BMI ≥30kg/m². To evaluate body fat, Bod Pod Gold Standard equipment (COSMED®) was used.
The sample consisted of 980 individuals (median age 38 years interquartile range [IR] 37-39), with 53.8% being female and 36.2% classified as obese (median BMI 28,1 kg/m2 [IR 24,9-39,9]). In the bivariate analysis, significant positive associations were found: SL with triglycerides (p = 0.002) and cholesterol (p = 0.022); TST with body fat percentage (p = 0.003); WASO with weight (p = 0.004), BMI (p = .0.001), body fat percentage (p = 0.003), triglycerides (p = 0.001) and C-reactive protein (p = <0.001). Significant negative correlations were found between: TST and weight (p = 0.003); SE and weight (p = 0.001), BMI (p = 0.001), triglycerides (p = 0.002), blood glucose (p = 0.044) and C reactive protein (p = <0.001). In the final linear regression model, positive associations were found between cholesterol with SL (beta = 0.01; p = 0.024), BMI with WASO (beta = 0.88; p = 0.002) and negative associations were found between SE and BMI (beta = - 0.10; p = 0.006) and triglycerides (beta = -0.00523; p = 0.048).
Conclusions: Our findings point out that longer SL, lower SE and increased sleep fragmentation are associated with BMI and metabolic parameters in a large and representative adult Brazilian sample.

Adaptation of sleep in the extreme Antarctic conditions

N. Neykov[1], I. Staikov[1]
[1]Acibadem Cityclinic - UMHAT Tokuda Hospital, Neurology, Sofia, Bulgaria

Introduction: Most participants in polar expeditions report on a noticeable change in their sleep during their stay in Antarctica. The terms of life in polar conditions lead to a change in the physiology of sleep in a specific way for the place which gives the described personal experiences.A scientific project was carried out at the 30th Bulgarian Antarctic expedition with the aim of conducting polysomnographic records in the extreme Antarctic conditions, with a view to objectifying the occurring changes using modern methods of research, analysis and interpretation.

Materials and Methods: 10 volunteers were examined by polysomnography at the scientific base of St. Kliment Ohridski, Livingston Island, Antarctica (62°38′27″S 60°21′53″W). The examinations were carried out after history, somatic and neurological status, interview involving Pittsburgh Sleep Quality Index. The scientific project passed local and national committees; all subjects have given written consent. The polysomnographic studies were performed after a minimum of 4 days had passed after the arrival of the participants, to give enough time for sleep adaptation and rest after the long journey. Five of these volunteers are re-examined after returning to Bulgaria, in their usual sleeping conditions, after at least a month time had passed after their return to usual sleep and daily life. Assessment was performed with identical techniques, by the same investigator, and the same device. Results were assessed by the other members of the team until reaching inter-observer agreement.

Contingent: At the South Pole - 10 volunteers - 7 men and 3 women, 4 with previous Antarctic experience, mean age 39.9 years; in Bulgaria – 5 volunteers – 5 men, 2 with previous Antarctic experience, average age 39.4 years.

Results: A change in sleep architecture was noted in all subjects regardless of previous polar experience. A significant increase of N3 sleep stage was found (average 29.3%), at the expense of a reduction in N2 sleep stage (average 42%). The reduced latency of REM sleep was also noted - an average of 77 minutes. In the comparative study of the territory of Bulgaria, in usual conditions of sleep, a complete reverse development of changes in sleep architectonics is reported. The results are similar for the general population of Europe - mean duration of N2 stage - 50.1% of the track, N3 stage on average 16% of sleep, REM-latency - 100 min.

Conclusions: The polar sleep has excited scientists since the first expeditions to Antarctica. For the first time on the Bulgarian base, an objective, fundamental research was done on the sleep of expedition members using modern methodology and evaluation. Significant and reversible changes are observed in the architectonics of sleep - a sign of adaptation of the human organism to the specific extreme conditions at the South Pole.

Adding a course of digital Cognitive Behavior Therapy for Insomnia to a remotely delivered exercise intervention for adults with osteoarthritis-related pain: qualitative findings from the 'Move and Snooze' feasibility study

D. Whibley[1], C. Climent Sanz[2], R.S. Anderson[3], G.J. Macfarlane[3], A.L. Kratz[1], O. Martínez Navarro[2]
[1]University of Michigan, Department of Physical Medicine and Rehabilitation, Ann Arbor, United States, [2]University of Lleida, Department of Nursing and Physiotherapy, Lleida, Spain, [3]University of Aberdeen, Aberdeen Centre for Arthritis and Musculoskeletal Health (Epidemiology Group), Aberdeen, United Kingdom

Introduction: Symptoms of insomnia are very common among people living with osteoarthritis and may diminish therapeutic effects of exercise for osteoarthritis-related pain. The 'Move and Snooze' program was developed to address this, combining remote exercise coaching with a six-week course of automated digital cognitive behavioral therapy for insomnia (dCBTi) for osteoarthritis-related pain management. This qualitative study aimed to explore acceptability and experiences of the 'Move and Snooze' program.

Materials and Methods: After completing the 'Move and Snooze' feasibility study, participants were invited to take part in a one-to-one semi-structured zoom interview. Interviews followed a topic guide and were recorded, transcribed, and imported into Atlas.ti software. Two researchers analyzed the data, initially independently and then collaboratively, using thematic analysis, applying a deductive approach to explore specific areas outlined in the topic guide.

Results: Of 15 people recruited to the feasibility study (93% female, mean age 56), 14 completed the program and participated in an interview. Four themes were developed:

1. A general perception of benefit: Participants were generally positive about the program, describing it as helpful, beneficial, and enjoyable. The '*Move*' and '*Snooze*' components were perceived as being well integrated and provoked participants to think about links between sleep, activity, and pain. Program length and time commitment were agreed as manageable.

2. The '*Snooze*' component was challenging but worth it: Participants reported experiencing various sleep-related insights/issues. Positively, the *'Snooze'* component (dCBTi) was perceived as providing helpful tips, strategies, and activities/exercises. In contrast, more challenging experiences included making changes to sleep habits, particularly initially, and struggling with the sleep restriction therapy component of dCBTi. Regardless, participants agreed that persisting with the '*Snooze*' component was worth it for the benefit of the improved sleep that they experienced as a result.

3. Coaching as pivotal: Weekly online coaching sessions were recognized as the program's cornerstone, driving motivation to remain engaged. Participants believed this stemmed from feeling supported, setting realistic goals, receiving tailored delivery of *'Move'* components, and being held accountable to remain engaged with exercise and sleep-related content.

4. Lack of relevance as a reason for non-engagement: The dominant reason for non-adherence to aspects of the program was perceived lack of personal relevance. Those with more severe mobility restrictions felt the '*Move*' manual was not suitable for them, and there was a general perception that the '*Snooze*' component emphasized anxiety and depression as contributing to symptoms of insomnia but did not directly address the main perceived cause of their sleep disturbances – pain.

Conclusions: Findings from post-feasibility study interviews with '*Move and Snooze'* participants have provided general support for the acceptability of the program. In addition to positive feedback, areas for improvement have been identified. Specifically, time will be provided at weekly online coaching sessions for one-to-one support with sleep habit change/sleep restriction therapy, and greater emphasis and information will be provided regarding potential impacts of pain on sleep. Once these refinements have been made, the intervention will be tested in a suitably powered effectiveness trial.

Amplifying voices in Sjögrens and Lupus communities through social listening: real-world evidence from their sleep experiences

E. Zhang[1], M. Converse[1], M. Horsnell[1], A.M. Morse[2], C. Baldini[3], J. Gudeman[4], F. Ascencion[5], V. Moore[6], J.A. Neves[7], R. Smith[1], E.R. Wassman[1], C. DeFelice[1], M. Picone[1]
[1]TREND Community, Philadelphia, United States, [2]Geisinger, Janet Weis Children's Hospital, Geisinger Commonwealth School of Health Sciences, Danville, United States, [3]Department of Clinical and Experimental Medicine, Rheumatology Unit, University of Pisa, Pisa, Italy, [4]Avadel Pharmaceuticals plc, Chesterfield, United States, [5]PWN4PWN, Tampa, United States, [6]Horizon Therapeutics plc, Deerfield, United States, [7]Brazilian Association of Narcolepsy and Idiopathic Hypersomnia, Salvador, Bahia, Brazil

Introduction: Sjögrens and lupus are chronic autoimmune diseases that share symptoms such as joint pain, skin rashes, fatigue, and poor sleep quality. Clinical screenings and guidelines used in these communities lack a standard evaluation for sleep disorders. Unrecognized sleep disorders contribute to impaired quality of life and a proinflammatory state which can compromise optimal disease management. Characterizing these sleep symptoms through social listening may improve the understanding and ultimate development of effective sleep education, recognition, and management strategies for individuals with these disorders.

Materials and methods: Data were collected from 10 public subreddits: 9 subreddits were for lupus (including systemic lupus erythematosus, discoid lupus erythematosus), containing 212,060 posts/comments from 2010 to 2023; and 1 subreddit was for Sjögrens, containing 52,690 posts/comments from 2012 to 2023. We used an analytical engine leveraging natural language processing techniques and features a clinical entity recognition model designed to extract clinical terms from social media text. After extracting all clinical terms from the data, we computed normalized pointwise mutual information (NPMI) scores, which range from −1 to 1 for negative to positive correlations, for pairs of medical terms. These scores helped us identify any clinical findings correlated with sleep issues, defined as any conditions or disturbances that adversely affect sleep quality or duration.

Results: The top sleep issues reported in the Sjögrens community were insomnia (144 mentions), sleep apnea (66), narcolepsy (23), sleepiness (21), sleep disturbances (14), and cataplexy (7). In the lupus community, the top sleep issues reported were insomnia (642 mentions), sleepiness (157), narcolepsy (124), sleep apnea (106), sleep paralysis (37), sleep deprivation (29), idiopathic hypersomnia (29), sleep disturbance (18), hypersomnia (11), and cataplexy (10). In Sjögrens, the NPMI scores highlighted the correlation of 'insomnia' with 'anxiety', 'dizziness', 'depression', 'weakness', 'nausea', and 'brain fog'; NPMI scores were 0.289 down to 0.213; 'sleep apnea' was correlated with 'fibromyalgia' and 'anxiety'. For the lupus community, 'insomnia' was correlated with 'moon face', 'anxiety', 'depression', 'weight gain', 'migraine', 'brain fog', and 'headache'; NPMI scores were 0.27 down to 0.203; 'sleep apnea' was correlated with 'fatigue', with an NPMI score of 0.259.

Conclusions: The results showed that insomnia, sleepiness, sleep apnea, and narcolepsy are commonly reported sleep issues among individuals living with Sjögrens and lupus, highlighting the complexity of sleep-related burdens. NPMI scores emphasized the numerous connections between sleep issues and other symptoms. These findings further underscore the need to better understand this relationship as a mitigating factor in the optimal management of these disorders. Addressing sleep issues will improve quality of life for those living with Sjögrens and lupus. This study also demonstrates the potential of social media to provide real-world evidence to inform clinical practices, monitor change, and drive research for those living with rheumatic diseases.

A night sleep at the medical ward

F. Nieto Guimarães[1], J. Canadas[1], R. Armindo[1], M. Cunha[1], V. Durão[1], J. Carvalho[1], C. Pissarra[1], N. Serrano Marçal[1], P. Rosa[1]
[1]Hospital Vila Franca de Xira, Vila Franca de Xira, Portugal

Introduction: Sleep quality is a vital aspect of health and is often compromised during hospitalization. This study aimed to assess the inpatient sleep quality and causes of poor sleep in medical wards.
Materials and Methods: Variables evaluated: demographics, job, shift work, medication, smoking and drug addiction, inwards allocation, home and hospital sleep hours. Sleep quality was assessed using the Richards-Campbell Sleep Questionnaire (RCSQ) and an open survey of sleep disturbance causes. Participants were inpatient adults and needed to be able to answer the questionnaire. The t-test was used to compare means between groups and the chi-square or fisher's exact tests were performed to compare proportions. Spearman's test was performed for linear correlations and linear regression was performed where appropriate. A p-value<0.05 was set as the lower threshold of significance.
Results: Total sample of 83 patients with a mean age of 65.8 years. The majority were males (61.4%; n=51) and retired (55.4%; n=46). A quarter of the patients were smokers and 32.5% were former smokers. Overall, mean RCSQ score was 63.5. Thirty-five percent had high quality of sleep (RCSQ≥76) and 7.2% had very poor quality (RCSQ≤25). Patients allocated to emergency room (ER) (n=12) had significantly lower mean RSCQ scores compared to patients allocated to other departments (50.97 vs 65.56, p=0.028). Patients allocated to Cardiology (n=5) and Gastroenterology (n=4) departments scored significantly higher than the ones allocated to Internal Medicine wards (n=60) (84 vs 62, p=0.02 and 83 vs 62, p=0.039, respectively). Patients at Neurology department (n=2) scored the lowest (RCSQ mean=45.83). Older patients tended to have more awakenings and more difficulty to return to sleep. Overall, the average sleep hours at the hospital were significantly lower than the average sleep hours at home (6.04 vs 7.27, p<0.001, respectively). No significant correlation was found between sleep-affecting medication and the mean RCSQ score. Main causes of poor sleep were environmental (n=35, 42.2%) and mixed factors (n=23, 27.7%).
Conclusions: Patients slept significantly less hours at the hospital. Inwards allocation significantly impacted the quality of sleep. Older patients seem to require more careful attention regarding sleep quality during hospital admission. Environmental factors were the main cause of sleep disturbance.

Applying non-invasive technology to characterize and improve sleep in U.S. warfighters

K. Werner[1], E. Metzger[2], A. Lee[1], W. Coon[3], F. Amyot[4], A. Penafiel[2], J. Anders[1], S. Simons[5], S. Schelp[6], S. Skeete[2], C. Dawkins[2], C. Scholl[3]
[1]Uniformed Services University, Bethesda, United States, [2]The Geneva Foundation, Tacoma, United States, [3]Johns Hopkins University, Laurel, United States, [4]Walter Reed National Military Medical Center, Bethesda, United States, [5]Teledyne Technologies, Thousand Oaks, United States, [6]Odyssey, Wakefield, United States

Introduction: Insomnia is a common sleep disorder and is 2-3 times more prevalent in military/veteran warfighters than civilians. Additionally, over two-thirds of military personnel endorse getting less than the recommended seven hours of sleep per night. Sleep deficits decrease reaction times, memory performance, attention, verbal fluency, and other information processing; they exacerbate mood disorders and increase risk of injury, impulsivity, suicidality, cardiovascular disease, cancer, and dementia later in life. Although extensive amounts of cerebral, cardiovascular, and pulmonary physiology data have been collected via the polysomnogram (PSG) for several decades, sleep physiology is complex and remains poorly understood. Furthermore, interventions remain limited. Increasing evidence supports a role for longitudinal at-home monitoring/intervention. Novel aspects of insomnia pathophysiology and endophenotypes may involve autonomic and glymphatic physiology, possible novel targets. Therefore, we have embarked on a multi-phase observational and interventional program using wearables to capture new longitudinal data and deliver biofeedback-based interventions. Glymphatic biomarker correlates will also be studied with novel MRI sequences, wearable near-infrared-based devices, and corresponding biomarkers.

Materials and Methods: Our program includes three phases focused on characterizing and modulating sleep physiology in the United States (U.S.) warfighter populations:
1. Glymphatics physiology measurement: measuring brain interstitial fluid, cerebrospinal fluid, and cerebral blood flow changes during wake and sleep via a) an ultra-high-performance head-only MRI (modified phase contrast, diffusion, and fMRI sequences) and b) a wearable functional near-infrared spectroscopy (fNIRS) headband.
2. Multimodal autonomics physiology measurement in healthy and insomnia participants: comprehensive measurements in laboratory (PSG, MRI and fNIRS for glymphatics, urine for autonomic neurotransmitter measurements) will be compared to multimodal wearables worn longitudinally to include EEG, blood pressure, electrocardiogram (ECG), actigraphy, body temperature, and electrodermal activity.
3. Sham-controlled wearable interventions to enhance sleep: using a) a wearable transcranial direct current stimulation (tDCS) headband to enhance slow oscillations, b) a smartwatch using haptic biofeedback to intervene on sympathetic activity surges, and c) whole-body and transcranial photobiomodulation – with EEG readouts.
A total of 463 participants are projected to be enrolled across the program.

Results: Preliminary data showcasing the measurement of brain interstitial, cerebrospinal fluid, and cerebral blood flow will be presented, demonstrating how water oscillations change as depth of sleep increases. Preliminary results including cognitive function, EEG, activity/heart rate, wearable measured and self-reported sleep duration and quality, and psychological state (e.g., PCL-5) will be presented.
Preliminary assessment of wearable devices: EEG headsets (SOMNOMedics, Dreem3 Headsets), and rings (OURA Ring, and Happy Ring) – will also be presented.

Conclusions: Sleep physiology remains inadequately characterized and treated. Wearables offer an exciting multimodal approach to better characterize, subclassify insomnia endophenotypes, and even deliver therapy longitudinally in the comfort of home.

A prospective study of sleep duration irregularity and risk of cardiovascular disease in the UK Biobank

T. Huang[1], S. Kianersi[1], H. Wang[1], R. Noordham[2], T. Sofer[3], A. Phillips[4], M. Rutter[5], S. Redline[1]
[1]Brigham and Women's Hospital and Harvard Medical School, Medicine, Boston, United States, [2]Leiden University Medical Center, Leiden, Netherlands, [3]Beth Israel Deaconess Medical Center, Boston, United States, [4]Monash University, Melbourne, Australia, [5]Manchester University, Manchester, United Kingdom

Introduction: Emerging evidence supports a link between circadian disruption as measured by higher night-to-night variation in sleep duration and increased risk of cardiovascular disease (CVD). It remains unclear whether this association varies by CVD types or by genetic risk for CVD.

Materials and Methods: In the UK Biobank, 89,581 participants who provided valid 7-day accelerometer data in 2013-2016 and were free of CVD at the time of accelerometer measurement were prospectively followed until September 2021. Incidence of CVD events, defined as first occurrence of myocardial infarction (MI), stroke, or cardiovascular death, was identified through linkage to Hospital Episode Statistics data using the ICD-10 codes. Sleep irregularity was evaluated by the standard deviation (SD) of accelerometer-measured sleep duration over 7 days. We used multivariable Cox proportional hazard models to estimate hazard ratios (HRs) and 95% CIs for incident CVD events across categories of the 7-day sleep duration SD. Genetic susceptibility to CVD was modeled by weighted polygenic risk scores (PRS). Gene-sleep interaction was assessed by the likelihood ratio test of the multiplicative interaction term between continuous sleep duration SD and PRS tertiles.

Results: We documented 2,604 incident cases of total CVD events (MI: 1,015, stroke: 1,047, cardiovascular death: 894) over 587,459 person-years of follow-up. After adjusting for age, sex, race, Townsend deprivation index, work schedules (including shift work status), and family history of CVD, the HR (95% CI) for total CVD events was 1.10 (0.97, 1.24) for those with a sleep duration SD of 30-44 minutes, 1.22 (1.08, 1.39) for 45-59 minutes, 1.39 (1.22, 1.59) for 60-89 minutes, and 1.46 (1.25, 1.71) for ≥90 minutes, compared with participants with a sleep duration SD <30 minutes (p for trend<0.0001). This linear positive association was consistently observed for different CVD types. The HR (95% CI) associated with a 1-hour increase in sleep duration SD was 1.21 (1.13, 1.29) for total CVD, 1.23 (1.11, 1.36) for MI, 1.21 (1.09, 1.35) for stroke, and 1.20 (1.07, 1.34) for cardiovascular death. Additional adjustment for lifestyle factors (smoking status, alcohol consumption, diet quality, physical activity, and BMI) and co-morbidities (hypertension, hyperlipidemia, diabetes, and depression) only modestly attenuated the association (HR for total CVD per 1-hour increment in sleep duration SD: 1.17; 95% CI: 1.09, 1.25; p for trend<0.0001). Higher sleep irregularity was associated with increased CVD risk irrespective of genetic risk (p for interaction>0.55).

Conclusions: Higher night-to-night variation in accelerometer-measured sleep duration was associated with consistent increases in the risk of MI, stroke, and cardiovascular death, and these associations did not seem to be modified by genetic risk for CVD.

Aromatherapy and herbal medicine and their effects on sleep and anxiety during the perioperative period: a systematic review

C. Linh[1], G. Taylor[1], A. Kowdley[2], R. Mahmud[3], J. Buzalewski[2], R. Joyner[4], G. Kowdley[2]
[1]Philadelphia College of Osteopathic Medicine, Philadelphia, United States, [2]TidalHealth Hospital Peninsula Regional, Surgery, Salisbury, United States, [3]Cooper Medical School of Rowan University, Camden, United States, [4]TidalHealth Richard A. Henson Research Institute, Salisbury, United States

Introduction: Surgeries can result in sleep disturbances and disorders, which increase mortality and morbidity. Pharmacological and non-pharmacological interventions are used to promote sleep quality in patients. However, pharmacological methods may lead to complications, such as cognitive impairment, suppression of the respiratory system, and risk of tolerance and dependence. Complementary therapies, including aromatherapy and herbal medicine, can relieve stress and anxiety and improve sleep quality. Our aim was to conduct a systematic review looking at the effects of non-pharmacological therapies, especially non-regulated drugs, on improving sleep in patients during the perioperative period. We intend to apply the knowledge described here as an intervention to promote higher quality sleep and to reduce anxiety for patients undergoing surgery.

Materials and methods: A systematic review was conducted utilizing the PRISMA 2020 guidelines to explore non-pharmaceutical modalities to improve sleep and recovery in post-operative patients. English articles that were published within the past 10 years were identified through keyword searches. Keywords included: perioperative AND surgery AND sleep NOT (sleep apnea); postoperative sleep disturbances NOT (sleep apnea); surgery AND sleep NOT (sleep apnea). Searches provided 2678 articles from each of the following databases: 843 – Embase; 623 – PubMed; 568- Scopus; 394 – Web of Science; 250 – CINAHL. Duplicates were removed (928), leaving 1750 studies to screen. Inclusion and exclusion criteria were determined by investigators' consensus. Criteria included requiring a focus on sleep disturbance in the post-operative period with non-pharmacological interventions, and excluding a focus on sleep apnea or a diagnosis of delirium/dementia. Two independent reviewers voted on inclusion of an article used in data extraction or exclusion from the review, and in cases of conflict between reviewer votes, consensus during a group meeting was obtained by all reviewers. Articles focusing on non-regulated drugs were selected. Seven articles were used in this study; all of which were randomized controlled studies.

Results: Multiple sleep parameters were measured in the identified studies using scales, such as the Pittsburgh Sleep Quality Index (PSQI), the St. Mary's Hospital Sleep Inventory, the Vernan and Snyder-Halpern (VSH) Sleep Scale, the Subjective Sleep Quality Index, the Visual Analog Sleep Scale (VASS), the Richard Campbell Sleep Questionnaire (RCSQ), and self-reported evaluations. Data from the 7 articles identified showed some beneficial effects of aromatherapy and herbal medicine on improving sleep quality and reducing anxiety. Five of these articles noted improvements in sleep quality, where 2 articles demonstrated better sleep efficiency, shortened sleep latency, longer sleep duration, and decreased daytime dysfunction. Two of the articles noted reduction in anxiety.

Conclusions: These data suggest aromatherapy and herbal medicine are safe, effective, non-pharmacological interventions that promote sleep quality and reduce anxiety. Further prospective studies are needed to look at these interventions on sleep.

Assessing sleep quality of professional drivers: an analysis based on self-perceived and sleep companions' feedback

T. Lopes[1], B.M. Faria[1,2], A. Oliveira[1,2], R. Pimenta[1,3], L.P. Reis[4,2]
[1]Escola Superior de Saúde - P.PORTO, Porto, Portugal, [2]LIACC - Laboratório de Inteligência Artificial e Ciência de Computadores, Porto, Portugal, [3]CEISUC - Centro de Estudos e Investigação em Saúde da Universidade de Coimbra / CIBB, Coimbra, Portugal, [4]University of Porto, Porto, Portugal

Introduction: Portugal has been ranked as the fourth European country with the highest incidence of falling asleep while driving. The quality of sleep comprises both quantitative aspects, such as sleep duration and sleep latency, and qualitative aspects, such as mood and health status. Neglecting the quality and quantity of sleep can result in fatigue, affecting multiple aspects of safe driving, such as attentiveness to the road. Although quantitative measures of sleep are easy to assess, evaluating subjective aspects of sleep is more challenging. Poor sleep quality and habits were the most commonly cited reasons for falling asleep at the wheel. Given the high prevalence of road accidents in Portugal and the significant impact of sleep quality on driving safety, there is a need for comprehensive research on the sleep quality of professional drivers. Adult sleep is often a shared activity between sleep companions, making it a crucial aspect to investigate for a better understanding of sleep perceptions. The main objective of this study is to analyze the sleep quality of a population of Portuguese professional drivers and compare it with the responses given by their sleep companions.
Materials and Methods: This observational study is of transversal nature meaning that data collection was performed individually at a single point in time. The target population was Portuguese professional drivers and if applicable their sleep companions. The validated and translated version of the Portuguese Pittsburgh Sleep Index and the complementary questionnaire was applied to 43 Portuguese drivers between 23 and 63 years old. Fisher exact tests were used to evaluate the variables' association. The level of significance was 0.05. SPSS 28 version was used for data analysis.
Results: Having into consideration the global score of the PSQI instrument (7.41±5.15), 13 subjects (30.24%) had a score lower than 5 points, therefore, considered with good sleep quality, and 30 drivers (69.76%) had a score higher or equal to 5 points, thus considered to have poor bad sleep quality. The partner's questionnaire was answered by the driver's partner regarding the driver's sleep, and the PSQI was answered by the drivers regarding their own sleep quality. The majority of the subjects replied that during the last month, the drivers did not snore during the night. The analysis of the answers revealed that, according to sleep companions, drivers experience drowsiness more frequently than what the drivers themselves perceive (p-value < 0.05).
Conclusions: This analysis revealed that regarding sleep quality, the majority of the drivers were classified with poor sleep quality. It was possible to infer an association between the self-perceived sleep of the drivers, and their sleep partners regarding drivers' sleeping and snoring habits and the excessive sleepiness that drivers have while driving.

Assessing subjective sleep quality using the Pittsburgh Sleep Quality Index among homeless individuals in São Paulo, Brazil

R. Benavides-Gelvez[1], A. Rosa[1], D. Hipolide[1], J. Cespedes[1], J. Ribeiro da Silva Vallim[1]
[1]Universidade Federal de São Paulo, Sao Paulo, Brazil

Introduction: Sleep quality is essential for overall well-being, and sleep loss is associated with a range of physical and mental health consequences. This study sought to assess the subjective sleep quality of individuals experiencing homelessness in São Paulo city, exploring different aspects of sleep quality, substance use and sociodemographic factors.

Materials and Methods: Participants were recruited from the homeless population (convenience sample) in São Paulo, Brazil through the services of Consultório na Rua, which provides medical, psychological, and social assistance to this population. A trained healthcare professional applied the Pittsburgh Sleep Quality Index (PSQI) and Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) tests individually. For the analyzes, we used a Generalized Linear Model (GzLM) and the dependent variable was the overall score on the PSQI and its sub-components. Independent variables considered were place of sleep, gender, and substance use as well as their interaction. Age-related time on the streets was included as a covariate. The post hoc test applied was the Bonferroni test.

Results: In geThe final sample consisted of 177 participants (39 female, of which 7 identified as transgender), with a mean age of 42.8±11.4 years (range: 20-71) and 10.5±8.4 years (range: 1-40) being homeless. Sixty-seven percent of the subjects had good subjective sleep quality (mean PSQI score: 4.9±2.7), 33% slept in shelters, 83% used depressants drugs, 83% stimulants and 59% hallucinogens. Regarding the global score, individuals that used depressants (p=0.019 MD=1.2) and stimulants (p=0.007 (MD=1.5) had poorer subjective sleep quality. Taking into account PSQI components, individuals who slept at the shelters had higher scores (p=0.026 MD=0.6), and the longer they live on the streets, lower the score for sleep latency (β=-0.01). We also observed that individuals that used depressants took more time to fall asleep (p=0.031 MD=0.4) and the ones that used this substance and slept in the shelter slept more (p=0.047 MD=0.7). Individuals that used stimulants had more sleep disturbances (p=0.039 MD=0.3). Women took more time to fall asleep (p=0.003 MD=0.9) and had more daytime dysfunctions than men (p=0.013 MD=0.7).

Conclusions: While most individuals showed good subjective sleep quality, the unstable and hazardous living conditions of homelessness affect their sleep in several dimensions. We found that sleep latency tends to be more prolonged in homeless people, likely due to the stringent admission and sleep schedules in shelters; however, latency decreases as individuals spend more time homeless. Likewise, women tend to have worse quality of sleep than men, whether they are sleeping on the street or in shelters. The use of psychoactive substances negatively influences sleep quality. These results emphasize the necessity of addressing the living conditions of these vulnerable populations.

Assessment of ultra-short term heart rate variability indices in Obstructive Sleep Apnea

K. Nagaraju[1], R. Venugopal[2], U.M. Krishnaswamy[1], R.P. Nagendra[2], K. Venkatnarayan[1], C. Veluthat[1], P. Ramachandran[1], U. Devaraj[1]
[1]St. John's National Academy of Health Sciences, Pulmonary Medicine, Bengaluru, India, [2]National Institute of Mental Health and Neurosciences, Center for Consciousness Studies, Bengaluru, India

Introduction: Obstructive Sleep Apnea (OSA) is associated with intermittent episodes of hypoxia and arousals resulting in sympathetic overactivity, which is postulated to be one of the principal contributors for cardiometabolic consequences. Heart Rate Variability (HRV), which reflects the beat-to-beat variation in R-R intervals on electrocardiography (ECG) , helps assess changes in cardiac autonomic control. Although long term HRV has been reported to be decreased in OSA, studies on short term and ultra-short term HRV indices are limited. Our study aimed to assess ultra-short term HRV indices in patients with OSA.

Materials and Methods: This cross-sectional study was conducted between December 2021 and May 2023. Adults diagnosed with moderate and severe OSA on level 1 polysomnography were included. Stable, 30 second ECG segments were extracted using a dedicated algorithm during sleep stages (Non-Rapid Eye Movement; NREM; Rapid Eye Movement; REM) and respiratory events (Apnea and Hypopnea). These segments were assessed for ultra-short term HRV including time domain (mean NN, SDNN, RMSSD) and nonlinear indices (SD1/SD2, Shannon entropy).

Results: Forty-four patients each with moderate and severe OSA were included. Mean (SD) age was 49.7 (14) years with a predominance of males (n=57; 64.7%). Co-morbidities included hypertension (34.1%), diabetes mellitus (30.6%) and hypothyroidism (6.8%). Mean (SD) apnea hypopnea index (AHI) was 18.4 (3.07) for moderate and 61.5 (23) for severe OSA respectively. A total of 2549 ECG segments (moderate - 1159; severe - 1390) were analysed.
Time domain indices showed a significant difference between moderate and severe OSA. Median (IQR) SDNN was 42.33 (26.47 – 66.75) and 38.28 (23.86 – 69.08) (p=0.048); Median (IQR) RMSSD was 28.49 (18.18 – 48.70) and 26.77 (16.22 – 45.81) among moderate and severe OSA respectively (p=0.005) . Nonlinear indices showed a significantly higher median (IQR) SD1/SD2 of 0.46 (0.29 – 0.63) in moderate OSA; it was 0.42 (0.27 – 0.58)in severe OSA (p=0.001), while Shannon entropy was 4.10 (3.76 – 4.37) and 4.06 (3.64 – 4.40) in moderate and severe OSA respectively (p=0.258) .
Sleep stage HRV indices were significantly different between NREM and REM sleep . Median (IQR) values in NREM and REM were: Mean NN of 820.14(733.20 – 907.83) and 831.85 (763.29 – 24.19) (p<0.001); SDNN of 38.63(24.22 – 66.97) and 44.14 (27.05 – 69.97) (p=0.002); SD1/SD2 ratio of 0.45 (0.29 – 0.63) and 0.37 (0.25 – 0.56) (p<0.001); and Shannon entropy of 4.06 (3.67 – 4.37) and 4.12 (3.76 – 4.39) (p=0.025) respectively.
Event specific assessment showed a significant difference in HRV between hypopneas and apneas. Median (IQR) values during hypopneas and apneas were: SDNN 33.75 (21.93 – 54.79) and 65.51 (38.50 – 111.87) (p <0.001); RMSSD 25.86 (14.32 – 41.28) and 40.02 (24.03 – 89.77) (p<0.001); SD1/SD2 0.45 (0.29 – 0.63) and 0.41 (0.26 – 0.60) (p=0.024); Shannon entropy 3.93 (3.55 – 4.24) and 4.38 (4.06 – 4.55) (p<0.001) respectively.

Conclusions: Ultra-short term HRV indices, including time domain and nonlinear indices were significantly lower with hypopneas, during NREM sleep and in severe OSA indicating autonomic instability triggered by hypoxia, specific sleep stages and respiratory event frequency.

Association between craniofacial morphology and severity of obstructive sleep apnea in Korean middle-aged population: the Korean Genome and Epidemiology Study

J. Choi[1,2], S. Kim[1], A. Wiemken[3], B.J. Pae[1], S.K. Lee[1], B.T. Keenan[3], P.A. Cistulli[4], A.I. Pack[3], R.J. Schwab[3], C. Shin[1,5]
[1]Institute of Human Genomic Study, College of Medicine, Korea University, Seoul, Korea, Republic of, [2]Korea University, Department of Biomedical Sciences, College of Medicine, Seoul, Korea, Republic of, [3]University of Pennsylvania Perelman School of medicine, Division of Sleep Medicine, Department of Medicine, Philadelphia, United States, [4]University of Sydney, Sleep Research Group, Charles Perkins Centre, and Northern Clinical School, Faculty of Medicine and Health, Sydney, Australia, [5]Biomedical Research Center, Korea University Ansan Hospital, Ansan-si, Korea, Republic of

Introduction: Obstructive sleep apnea (OSA) is a multifactorial disease defined by recurring collapse of the upper airway during sleep that is caused by obesity, enlarged pharyngeal soft tissues and restricted craniofacial skeletal structures. This study aims to investigate the association of craniofacial morphology and severity of OSA (including positional OSA) in a population sample from Korea.
Materials and Methods: A total of 1,388 participants of the Korean Genome and Epidemiology Study, who collected both 2-D face photographs (frontal and profile views) and in-home polysomnography, were analyzed. Participants were classified into three groups based on the apnea–hypopnea index (AHI): no OSA (AHI<5 events/h), mild OSA (AHI 5–14.9 events/h), and moderate-to-severe OSA (AHI≥15 events/h). Positional OSA was defined as an AHI that was at least twice as high in the supine position than in the non-supine position when the AHI was ≥5 events/h. A total of 23 craniofacial features (including linear distance, angles and ratios) were measured in five categories: mandible, maxilla relationship, face, nose and eyes, and neck.
Results: Based on multinomial logistic regression analysis adjusted for age, sex, height, and neck circumference, multiple craniofacial features were associated with moderate-to-severe OSA, including the highest tertile of mandibular width (OR [95% CI] = 2.51 [1.53-4.10]), face width (1.84 [1.16-2.93]) and cervicomental angle (2.42 [1.50-3.90]), compared to the lowest tertile of each craniofacial features. In addition, smaller mandibular length/width ratio was associated with OSA severity (2.89 [1.86-4.49]). Meanwhile, larger mandibular width, face width and cervicomental angle and smaller mandibular length/width ratio and face width/height ratio were associated with positional OSA (all p <0.02).
Conclusions: In the present study, we found that multiple craniofacial features are independently associated with severity of OSA and/or positional OSA in the Korean population.

* Jisun Choi and Soriul Kim contributed equally to this work.
Correspondence to Chol Shin (chol-shin@korea.ac.kr)

Association between depression and sleep health in a nationwide survey: implications for depression therapy during the COVID-19 pandemic

M.J. Chery[1], A. Baral[1], L. Rolle[1], M. Bernard[2], A.G. Sanchez Alfonso[1], L.M. Duthely[1], G. Jean-Louis[1], A. Seixas[1], J. Blanc[1]
[1]University of Miami, Miami, United States, [2]Saint Leo University, St. Leo, United States

Introduction: Sleep disturbances are linked to detrimental health outcomes, including mental health and cardiovascular health. A bidirectional relationship between depression and sleep health is well documented in the literature. However, little is known regarding which sleep health dimensions are associated with depression. The purpose of this study is to investigate the relationship between depression and multiple sleep health dimensions; more specifically sleep duration and insomnia symptoms among US adults from January to December 2020

Materials and Methods: We analyzed data from the 2020 National Health Interview Survey (NHIS) conducted among a representative sample of 31, 568 adults. First, we used binary logistic regression models to examine the association between self-reported diagnosis of depression and insomnia variables. Then, a multinomial regression assessed the association between depression symptoms and sleep duration. Our models statistically adjusted for sociodemographic factors (age, sex, marital status), health risk behaviors (smoking and alcohol use status), race/ethnicity, general health condition.

Results: The mean age was 53.50 [±18.04] years. Women represented 54% of the sample and twice as likely to report depression symptoms (67.51 vs 32.49, $p<0.001$) relative to men. Binary logistic regression indicated that participants with symptoms of depression had higher odds of having difficulty staying asleep (aOR: 1.58; 95%CI: 1.43-1.74, $p<.0001$), difficulty falling asleep (aOR: 1.46; 95%CI: 1.30-1.62, $p<.0001$), and feeling unrested (aOR: 1.70; 95%CI: 1.50-1.93, $p<.0001$) respectively. Multinomial logistic regression showed that participants with symptoms of depression reported higher odds of having both short sleep (≤ 6 hours) (aOR: 1.10; 95% CI: 1.0-1.21, $p=0.0424$) and long sleep (> 9 hours) (aOR: 1.72; 95% CI: 1.50- 2.0, $p<.0001$).

Conclusions: Our research is among the first to confirm strong associations between depression and several dimensions of sleep in the US general population during US COVID-19 pandemic. Our findings underline the importance of a sleep health in treating depression as the nation battles the current mental health crisis

Association between multiple sleep dimensions in OSA and early sign of atherosclerosis: results from the SSHS

W. Huang[1], H. Yi[1], S. Yin[1]
[1]Shanghai Jiao Tong University, Shanghai Key Laboratory of Sleep Disordered Breathing, Shanghai, China

Background: We investigated the associations between multiple sleep dimensions in obstructive sleep apnea (OSA) and carotid intima-media thickness (CIMT), an early sign of atherosclerosis, in subjects from the Shanghai Sleep Health Study (SSHS).

Methods: In this retrospective, cross-sectional study, we performed secondary analysis of SSHS in a group of subjects performed the ultrasound evaluation since 2018. Demographic and biochemical data were collected. Multiple sleep dimensions were measured using standard polysomnography. CIMT was measured from ultrasound images as an early sign of atherosclerosis. Subjects with CIMT greater than the observed median of 0.62 mm were classified as having thick CIMT. Multivariable-adjusted linear regression and logistic regression analyses were performed to detect associations between sleep traits in OSA and CIMT.

Results: Sleep traits were assessed in a total of 1082 participants for whom CIMT measurements were available. CIMT was found to increase with increasing severity of OSA ($P < 0.001$). When adjusted for conventional risk factors, microarousal index (MAI) and hypoxic burden (HB) were positively correlated with CIMT while slow wave sleep (SWS) and mean apnea-hypopnea event duration (MAHD) showed negative correlation with CIMT (all $P < 0.01$). In binary logistic regression analysis, participants with high MAI (odds ratio [OR], 2.930; 95% confidence interval [CI], 1.374 to 5.506; $P < 0.001$), less SWS (OR, 0.553; 95% CI, 0.261 to 0.877; $P = 0.021$), higher HB (OR, 1.889; 95% CI, 1.416 to 2.519; $P < 0.001$) and shorter MAHD (OR, 0.353; 95% CI, 0.161 to 0.777; $P = 0.010$) showed a higher prevalence of thick CIMT with no evidence of interaction by age, sex, or body mass index (P-interaction > 0.05).

Conclusions: Relations between multiple sleep dimensions of OSA and increased CIMT was observed. Subjects with more severe sleep fragmentation, more severe hypoxemia and increased arousability were more likely to have increased CIMT after adjusting for potential confounders. Further studies are required to investigate this correlation prospectively to determine whether there is a causal relation and to explore the underlying biological mechanisms. Moreover, it is important to evaluate novel indices of sleep fragmentation, hypoxemia and arousability in OSA for early detection and prevention of cardiovascular disease, including stroke.

Association between psychophysical and cognitive aspects with sleep complaints in postmenopausal Colombian women

A. Monterrosa-Castro[1], A. Castilla-Casalins[1], C. Blanco-Teherán[1]
[1]Grupo de Investigación Salud de la Mujer. Universidad de Cartagena, Cartagena, Colombia

Introduction: Sleep is a physiological state essential for multiple brain processes and metabolic regulations. In posmenopause, the synthesis and release of ovarian estrogen is reduced, which is related to alteration in the quantity and quality of sleep. In postmenopausal Latin American women, there are few studies that evaluate sleep disorders in relation to psychophysical and cognitive situations that affect well-being. The objective to estimate the association between psychophysical and cognitive aspects with sleep complaints in Colombian postmenopausal women.

Methodology: Cross-sectional study that is part of the research project Quality of Life in Menopause and Colombian Ethnic Groups. Women between 50-75 years old who carried out their daily activities, roamed freely without the need for a caregiver and had not attended a medical consultation in a week, participated while at home, signed informed consent and voluntarily filled out a form. Women who had musculoskeletal diseases, mental disability or diagnosed neuropsychiatric disease and those who did not understand the instructions, were excluded. Sample size was established according to the Colombian Population Census. Cartagena, an urban city in the Caribbean, and rural municipalities of Guaviare, in the Amazon, were chosen at convenience. Sociodemographic characteristics were explored, and four scales were applied. First, the Jenkins Sleep Scale identifies complaints of sleep in the past month through four questions: difficulty falling asleep, waking up several times a night, difficulty staying asleep or waking up too early, and waking up exhausted the next morning after the usual amount of sleep. Three scales were used to identify psychophysical and cognitive aspects: Menopause Rating Scale [somatic-vegetative, psychological, urogenital and quality of life impairment], SARC-F [symptomatology related to sarcopenia] and Mini Mental State Examination [cognitive, attention and calculation, fixation, language, memory, spatial and temporal orientation impairment]. Bivariate and adjusted logistic regression was performed: sleep complaints [dependent variable] and psychophysical and cognitive aspects [independent variables].

Results: A total of 601 women were studied, 49.9% rural and 50.1% urban. Age: 60.6±7.3. They were 50-62y: 61.1% and 63-75y: 38.9%. The average age of menopause was 49.8±3.1. Were 0-5y postmenopausal: 29.9%, 6-10y: 27.2%, 11-15y: 17.3% and 16y or older: 25.4%. In 53 (8.8%) women sleep complaints were found. They had somatic impairment 9.8%, psychological: 17.9%, urogenital: 17.1% and quality of life impairment 18.1%. They had symptoms related to sarcopenia: 45.9% and cognitive impairment 31.2%. Impairment of attention and calculation was identified in 54.5%, fixation in 21.3%, language in 47.7%, memory in 33.2%, spatial orientation in 34.4% and temporal orientation in 19.3%. In the bivariate regression, the impairments explored, except attention and calculation, fixation, temporal orientation and symptoms related to sarcopenia, were related to sleep complaints ($p<0.05$). In the adjusted model [including significantly associated variables, age and postmenopausal years] it was found that somatic-vegetative, urogenital and language impairment were associated with sleep complaints, OR: 5.19 [95%CI:2.55-10.52], OR:3.15 [95%CI:1.63-6.11] and OR:3.11 [95%CI:1.52-6.35], respectively..

Conclusion: In a group of Colombian postmenopausal women, among several psychophysical and cognitive aspects explored, somatic-vegetative, urogenital and language impairment were associated with a greater presence of sleep complaints.

Association between sleep complaints with the presence and severity of hot flashes in Colombian postmenopausal women: assessment with the Jenkins Sleep Scale

A. Monterrosa-Castro[1], A. Monterrosa-Blanco[1], A. Castilla-Casalins[1]
[1]Grupo de Investigación Salud de la Mujer. Universidad de Cartagena, Cartagena, Colombia

Introduction: Hot Flashes (HF) are a symptom frequently reported by postmenopausal women. Its presence and severity are associated with reduced estradiol synthesis due to ovarian follicular depletion. HFs are related to dysfunction in some brain neurotransmitters, which are also involved in alterations in the sleep/wake cycle. In postmenopausal Latin American women, there are few studies that address the problem of sleep quality in relation to HF. The objective was to evaluate the association between sleep complaints and the presence and severity of HF in a group of Colombian postmenopausal women.

Methodology: Cross-sectional study that is part of the research project Quality of Life in Menopause and Colombian Ethnic Groups [CAVIMEC]. Postmenopausal women between 50-75 years old who fulfilled their daily activities, wandered without the need for a caregiver and had not attended a medical consultation in a week, participated while at home, signed informed consent and voluntarily filled out a form. Women who had musculoskeletal diseases, mental disability or diagnosed neuropsychiatric disease and those who did not understand the instructions were excluded. Sample size was established according to the Colombian Population Census. Two Colombian regions were chosen at convenience: the Caribbean and the Amazon. To establish sleep complaints, the Jenkins Sleep Scale was applied, which identifies four sleep problems and with the total score differentiates between little or very frequent sleep problems, in the last month. To learn about the presence and severity of HF, the first items of the Menopause Rating Scale were used. Bivariate and adjusted logistic regression was performed: presence of HF or severe HF [dependent variable] and sleep complaints [independent variables].

Results: A total of 601 women were studied. 61.1% were between 50-62y and the rest between 63-75y. Age: 60.6±7.3. The average age of menopause was 49.8±3.1. All of mestizo ethnicity. 22.1% reported having difficulty falling asleep, 25.1% woke up several times a night, 23.2% had difficulty staying asleep or woke up too early, 20.9% woke up exhausted the next morning after the usual amount of sleep, and 8.8% had very frequent sleep problems. 66.0% reported HF and 11.5% severe HF. They were associated with HF: difficulty falling asleep, waking up several times a night, and waking up exhausted the next morning after the usual amount of sleep, OR: 1.66 [95% CI:1.07-2.55], OR: 1.55 [95% CI:1.01-2.28], OR: 1.58 [95% CI:1.02-2.45], respectively. However, in the adjusted analysis, none retained statistical significance. Associated with severe HF: difficulty falling asleep OR: 2.93 [95 CI%:1.72-4.91], waking up several times a night OR: 3.18 [95% CI:1.89-5.36], difficulty staying asleep or waking up too early OR: 2.33 [95% CI:1.37-3.98], waking up exhausted the next morning after the usual amount of sleep OR: 2.75 [95% CI:1.60-4.71] and having very frequent sleep problems OR: 5.24 [95% CI:2.76-9.94]. In the adjusted analysis, only a high frequency of sleep problems was significantly associated with severe HF: OR: 3.19 [95%CI:1.36-7.48].

Conclusion: In a group of Colombian postmenopausal women, severity rather than presence of HF was associated with sleep complaints.

Association between sleep disorders and cancer using data from the National Health and Nutrition Examination Survey (NHANES) 2005-2014

A. Saj Porcacchia[1], G.N. Pires[1,2], M.L. Andersen[1,2], S. Tufik[1,2]
[1]Universidade Federal de São Paulo, Departamento de Psicobiologia, São Paulo, Brazil, [2]Sleep Institute, São Paulo, Brazil

Introduction: Sleep disorders, notably insomnia and obstructive sleep apnea (OSA), pose a significant public health concern, particularly in urban areas, whereas cancer stands as a leading global cause of mortality. Recent studies have indicated a potential link between sleep disorders and cancer. This study aims to assess the potential association between sleep disorders and the diagnosis of cancer.

Materials and methods: Data from 5 editions of the National Health and Nutrition Examination Surveys (NHANES) were used, spanning the years 2005 to 2014. Two primary sleep-related variables were evaluated: "having trouble sleeping" and/or "ever telling a doctor you had a sleep problem". The primary outcome was having been ever diagnosed with cancer, independently of tumor type or location. The data was analyzed through binary logistic regression models in Jamovi.

Results: A total of 26,823 participants were included in the final sample. Individuals who reported having trouble sleeping had an odds ratio of 1.48 (95%CI=[1.336-1.646]; $p<0.001$) for being diagnosed with cancer, while those already diagnosed with a sleep disorder had an OR of 1.21 (95%CI=[1.046-1.415]; $p=0.011$), indicating an increased chance of cancer diagnosis in both cases. In men, these values were even higher, with an OR of 1.56 (95%CI=[1.321-1.843]; $p<0.001$) for sleep difficulties and of 1.26 (95%CI=[1.013-1.582]; $p=0.037$) for a sleep disorder diagnosis.

Conclusions: The odds of individuals being diagnosed with cancer was higher if they had experienced sleep difficulties or had received a sleep disorder diagnosis at any point in their lifetime.

Association between sleep hygiene awareness and practice with sleep quality among medical students at University of Khartoum, 2022

M.A.M. Wageallah[1]
[1]University of Khartoum, Faculty of Medicine, Khartoum, Sudan

Introduction: Medical students are exposed to a significant level of pressure due to academic demands. Poor sleep quality has been highly hazardous for them. The goal of this study was to evaluate students' sleep hygiene awareness and practices, together with their sleep quality.

Materials and methods: This was a cross-sectional analytic study conducted at the Faculty of Medicine at the University of Khartoum from July to November 2022. A simple random sampling was applied and a three-part questionnaire was used, consisting of the socio demographic data, the second part was Sleep Hygiene Awareness and Practice (SHAPS) scale questionnaire and the third part was Pittsburgh Sleep Quality Index (PSQI) questionnaire.

Results: Total number of students was 384, in which 376 students have responded to the questionnaires.89.4% of students have good Sleep Hygiene Awareness in correspond to 10.6% which have Poor Sleep Hygiene Awareness. (58.8%) of students have poor Sleep Hygiene Practice. And (41.2%) have good Sleep Hygiene Practice. The total PSQI score: mean score [standard deviation, SD] was 14.9 [7.76]). The score of PSQI (> 5) is detected in 41 (11.9%) of medical school students which indicates good sleep quality while poor sleep quality with score less than 5 is detected in 303 (88.1%). There was significant association between sleep hygiene practice score and sleep quality (Mann-Whitney U test, P = 0.000088) (Spearman correlation= 0.211770, P=0.000075). There was no significant association between sleep hygiene awareness score and quality of sleep (Mann-Whitney U test, P =0.490332) (Spearman correlation = 0.037245, P = 0.491131).

Conclusions: A high majority of medical students at the University of Khartoum have poor sleep quality. As a result, developing sleep hygiene education programs as an intervention and prevention method is advised. This will increase students' understanding of the significance of adopting appropriate sleep hygiene habits for improved sleep quality and academic success.

Association between sleepiness after awakening and falls in robust older adults > 65 years

I.L.O. Silva[1], C.M. Guimarães[1], F. Perrucho[1], M. Meira e Cruz[2,3,4], E.B.C. Pinto[1], C. Dias[1], C. Salles[1,5,6]
[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]European Sleep Center, Lisbon, Portugal, [3]University of Lisbon, Sleep Unit, Cardiovascular Center, Faculty of Medicine in Lisbon, Lisbon, Portugal, [4]College Sao Leopoldo Mandic, Campinas, Brazil, [5]Federal University of Bahia, University Hospital Professor Edgard Santos, Salvador, Brazil, [6]Jorge Amado University Center, Salvador, Brazil

Introduction: Since it has been hypothesized that daytime sleepiness may be associated with the occurrence of falls in older adults, the objective of this study was to evaluate the association between sleepiness and falls in robust older adults > 65 years old.

Materials and methods: This study is part of "Sleep disorders and metabolomic profile related to the occurrence of falls in community-dwelling older adults: a prospective longitudinal study". This is a cross-sectional study by non-probability sequential sampling, using the Snowball method, comprising 103 older adults from a community in Salvador-Bahia. The screening of individuals was performed according to the criteria of the Clinical-Functional Vulnerability Index-20 (CFVI-20), an instrument for rapid assessment of vulnerability in older adults; thus, the study included only older adults classified as robust, which were those able to manage their lives independently and autonomously. A sociodemographic/clinical questionnaire was applied, and the participants were asked about their history of falls in the previous 12 months. The Epworth Sleepiness Scale was used to assess excessive daytime sleepiness (EDS) with the probability of falling asleep; its score ranges from 0 to 24, with scores greater than or equal to 10 suggestive of EDS. The participants were also asked whether they felt sleepy immediately after waking up, with the option to answer "yes" or "no".

Results: From the total sample of 103 older adults, it was observed: mean age of 71.0 ± 5.1 years; brown race=46.6% (n=48); female sex=70.9% (n=73); count on support if they need it=95.1%(n=98); in professional activity=26.2%(n=27); with married life=44.7%(n=46); live alone=36.9% (n=38); retired=89.3%(n=92). Among the 77 robust older adults, we found: a mean BMI of 26.3 ± 4.1 Kg/m^2; excessive daytime sleepiness (EDS)=37.7%(n=29); sleepiness after awakening=35.1%(n=27); occurrence of falls in the previous twelve months=27.3%(n=21). Within the group of 29 older adults with EDS, the following were found: a mean BMI of $27.8\pm4,8$ Kg/m^2; episodes of falls=34.5%(n=10). Among the 48 older adults without EDS, it was observed: a mean BMI of 25.4 Kg/m^2; episodes of falls=22.9%(n=11). A higher frequency was observed in older adults who fell when sleepy after awakening compared to those who were not sleepy after awakening (61.9% vs 38.1%; p=0.003), respectively. We observed a higher number of falls among the older adults who presented with sleepiness after awakening compared to those who did not present with sleepiness [p=0.012], respectively. There was no association between excessive daytime sleepiness and falls in robust older adults.

Conclusions: The present study observed an association between sleepiness after awakening and a higher frequency of robust older adults who fell. However, no association was found between episodes of falling and excessive daytime sleepiness assessed by the Epworth Scale, highlighting that sleepiness immediately after waking up may be more critical for episodes of falling in robust older adults than excessive sleepiness throughout the day.

Association between vitamin D deficiency and sleep quality in adults: the difference between sex

L. Menezes-Junior[1], G. Machado-Coelho[1], A. Meireles[1]
[1]Federal University of Ouro Preto, Ouro Preto, Brazil

Introduction: Vitamin D is essential for bone, immune, and neurological health. Sleep quality can be influenced by various factors, such as hormonal fluctuations, inflammatory responses, neurotransmitter levels, and brain activity. Some of these factors may be modulated by vitamin D or its metabolites. However, few studies have investigated the association between vitamin D deficiency and sleep quality in men and women, who may have different needs and responses to vitamin D. Moreover, sun exposure is the main source of vitamin D and one of the main factors for a good sleep quality, and it varies by sex. Therefore, the objective was to evaluate the association between vitamin D deficiency and sleep quality in men and women.

Methods: We conducted a cross-sectional population-based study in two cities of Minas Gerais, Brazil. We included 1,674 adults (48.2% men and 51.8% women). Vitamin D deficiency was classified as < 20 ng/mL. Sleep quality was measured by the PSQI, which was poor when > 5. Sun exposure was evaluated by self-report and classified as insufficient when < 30 min/day. We evaluated the association between vitamin D deficiency and sleep quality by a multivariate logistic model, adjusted for age, body mass index, income, and skin color. We used a directed acyclic graph to assist in the model adjustment.

Results: The prevalence of vitamin D deficiency was 19.9%, 20.2% in women, and 19.6% in men. The prevalence of poor sleep quality was 53.7%, higher in women (57.3%) than in men (48.1%). In multivariate analysis, vitamin D deficiency was associated with poor sleep quality in women (OR:1.91;95%CI:1.10-3.29), but not in men (OR:0.71;95%CI:0.31-1.64). Furthermore, women were less exposed to sunlight, being that 46.3% of women had insufficient sun exposure versus 23.5% of men.

Conclusion: Vitamin D deficiency is associated with poor sleep quality in Brazilian women, but not in men. This difference may be explained by biological and behavioral factors related to sex. One hypothesis is that lower sun exposure in women reduces vitamin D synthesis in the skin and affects the circadian rhythm, which regulates the sleep-wake cycle. Sun exposure can stimulate vitamin D production and modulate melatonin secretion, which are both involved in sleep regulation. Women may have lower sun exposure than men due to cultural or social factors, such as clothing preferences, cosmetic use or occupational activities. Vitamin D has anti-inflammatory and immunomodulatory properties and can modulate cytokine expression, which are inflammatory mediators that can affect sleep regulation. Women may have higher immune and inflammatory responses than men due to hormonal fluctuations, such as during the menstrual cycle or menopause. These hypotheses need to be confirmed by further studies that can elucidate the mechanisms involved in the association between vitamin D deficiency and sleep quality in men and women.

Association of nocturia with weight status by race and ethnicity in American women

G.S. Napoe[1,2], D. Kermah[3], N. Mitchell[4], K. Norris[5]
[1]University of Pittsburgh School of Medicine, Obstetrics, Gynecology and Reproductive Sciences, Pittsburgh, United States, [2]Magee-Womens Research Institute, Pittsburgh, United States, [3]Charles R. Drew University of Medicine and Science, Clinical Research Center, Los Angeles, United States, [4]Duke University School of Medicine, Division of General Internal Medicine, Durham, United States, [5]University of California Los Angeles, Division of General Internal Medicine and Health Services Research, Los Angeles, United States

Introduction: Nocturia is defined as the interruption of sleep due to the need to void. Nocturia is associated with poor sleep, daytime sleepiness and decreased work productivity. Increased frequency of nocturia has been associated with cardiovascular disease and premature mortality, with estimated cost of $62.5 billion in the United States (US). In the US, nocturia has been linked to obesity with higher body mass index (BMI) being linked to more severe nocturia. Black women have the highest prevalence of obesity and nocturia while Hispanic women had the second highest prevalence of obesity and nocturia. It is unclear if the frequency of nocturia among Black and Hispanic women is due to the higher rates of obesity in these populations. A study that included women across several continents did not show an association between obesity and nocturia. Given these conflicting findings, we sought to better understand the association of nocturia with weight status (underweight, normal, overweight and obesity) by race and ethnicity in US women.

Materials and Methods: Using National Health and Nutrition Examination Survey (NHANES) data from 2005 to 2018, we estimated the prevalence of moderate to severe nocturia (defined as 2 or more to the question "how many times do you urinate at night?") by weight status within each racial/ethnic (Black, White, Hispanic and Other) category. Logistic regression was performed to determine the odds ratio of nocturia by race.

Results: : In the underweight category, Black women had 36.6% moderate to severe nocturia compared to 23.3% in Hispanic, 20.8% in White and 9.8 % in Other women. In the obese category, Black women had 48.7% moderate to severe nocturia compared to 36.9% in Hispanic, 33.1% in White and 33.8 % in Other women. The odds of moderate to severe nocturia was 2.3 (2.07-2.55) for Black women, 1.16 (1.04-1.31) for Hispanic women and 1.03 (0.86-1.23) for Other women compared to White women after accounting for education, income and marital status.

Conclusions: The prevalence of moderate to severe nocturia was greater at each higher weight status within each racial/ethnic category. Moreover, Black women in the underweight category had higher prevalence of nocturia than White women in all weight categories. Black women were more than twice as likely to have nocturia than White women. Our study suggests that while increased weight is associated with increased prevalence of nocturia, there are other factors leading to increased prevalence of nocturia in Black and Hispanic women that require further investigation.

Association of sleep health domains and obesity: a nationwide survey on Iranian general population

S. Akbarpour[1], A. Behkar[2], R. Moradzadeh[3], Z.B. Alemohammad[1], R. Heidari[4], A.H. Mehrparver[5], K. Sadeghniiat-Haghighi[1], A. Najafi[2]
[1]Tehran University of Medical Sciences, Sleep Breathing Disorders Research Center and Occupational Sleep Research Center, Tehran, Iran, Islamic Republic of, [2]Tehran University of Medical Sciences, Occupational Sleep Research Center, Baharloo Hospital, Tehran, Iran, Islamic Republic of, [3]Arak University of Medical Sciences, Department of Epidemiology, School of Health, Arak, Iran, Islamic Republic of, [4]Tehran University of Medical Sciences, Otolaryngology Research Center, Tehran, Iran, Islamic Republic of, [5]Shahid Sadoughi University of Medical Sciences, Industrial Diseases Research Center, Yazd, Iran, Islamic Republic of

Introduction: By 2030, it is predicted that over 1 billion people globally will be obese. Sleep duration was found to be associated with obesity. However, investigating sleep health and obesity by focusing on a single domain of sleep health has been challenged recently. Operationalizing sleep as a multidimensional concept can better assess sleep health's impact on obesity than isolated sleep features. This study aimed to investigate the relationship between obesity and sleep health as an ignored pillar of health and the role of gender in mediating this relationship.

Materials and methods: A nationally representative cross-sectional survey was conducted using multi-stage random cluster sampling. We used STOP-BANG, ISI, and self-report questions to define six sleep health domains: alertness, sleep satisfaction, timing, efficiency, regularity, and duration. We enrolled 3198 people; complex sample survey analyses were performed to extrapolate the results to the Iranian population. Logistic regression models were used to study the best model for predicting obesity after controlling for confounding factors.

Results: We included 3198 participants, with a mean age of 39.7 years and a mean body mass index of 26.5. In the total population, 62.4%, 55.2%, 52.5%, 52.3%, and 49.2% had unhealthy traits of sleep satisfaction, alertness, sleep regularity, sleep timing, and sleep efficiency, respectively. Adjusted regression models revealed that obesity in women was associated with unhealthy daytime alertness (OR: 1.30, p: 0.013), unhealthy sleep regularity (OR: 1.23, p:0.016), and surprisingly healthy sleep efficiency (OR:0.80, p:0.019). Obesity in men was associated with unhealthy sleep satisfaction (OR:1.26, p:0.001) and healthy daytime alertness (OR: 0.61, p:0.001).

Conclusions: Sleep regularity, satisfaction, and daytime alertness can be associated with obesity regardless of sleep duration or timing. It implies that other aspects of sleep health besides sleep duration may have a role in maintaining a healthy weight.

Association of sleep quality and use of social networks by adolescents

S.S.D. Silva[1], L.G.d. Lima Júnior[1], M.C.P.D. Nascimento[1], J.F.D.O.L. Batista[1], H.C.R.D. Almeida[2], M.G.M.e Cruz[3], A.F. Arantes Júnior[1], M.V. Heimer[1]
[1]University of Pernambuco, HEBIATRIA, Recife, Brazil, [2]University of Federal Pernambuco, Recife, Brazil, [3]Universidade de Lisboa, Sleep Center, Lisboa, Portugal

Introduction: The excessive use of social media by adolescents has been associated with negative side-effects, such as sleep disorders, which are internationally recognized as a major health concern. This study aims to evaluate the association between sleep quality and the use of social media by adolescent students in the city of Recife, Pernambuco, Brazil.

Materials and methods: SocA cross-sectional study was carried out with adolescents between 15 and 19 years old, from a public high school in the city of Recife (Brazil). Data were collected through a digital questionnaire using the *Google Forms tool*, taking into account the following questionnaires: Sociodemographic; Pittsburgh Sleep Quality Index (PSQI) and the Electronic Media Questionnaire. Pearson's chi-squared statistical test or Fisher's exact test were used, with a confidence interval of 95% and a significance level of 5%.

Results: Poor sleep quality was reported by 37.5% of adolescents and 34.4% slept less than 8 hours a night. There was an association between poor sleep quality and cell phone screen time of ≥4 hours/day (p The sample consisted of 128 adolescents, mostly aged between 15 and 16 years old (63.3%), female (62.5%), who started using social media between 10 and 15 years old (62.5%), with the cell phone as the main access device (96.1%), tending to access social media after 10 pm (81.3%) and more than 80% use the cell phone for 4 or more hours every day. = 0.002) and with access to social media after 10 pm (p < 0.001).

Conclusions: Nocturnal access to social media and cell phone of ≥4 hours/day was a risk factor for poor sleep quality in adolescents.

Acknowledgments: This article was produced with the support of the Graduate Coordination (CAPES).

Association of socioeconomic deprivation with sleep health in patients with type 2 diabetes

P. Xue[1], X. Tan[2,3], C. Benedict[1]
[1]Uppsala University, Department of Pharmaceutical Biosciences, Uppsala, Sweden, [2]Zhejiang University School of Medicine, Sir Run Run Shaw Hospital, Department of Big Data in Health Science, Zhejiang University School of Public Health and Department of Psychiatry, Hangzhou, China, [3]Uppsala University, Department of Medical Sciences, Uppsala, Sweden

Introduction: To investigate the association between socioeconomic deprivation and indicators of sleep health among patients with type 2 diabetes mellitus (T2DM), and additionally, to examine whether socioeconomic deprivation is associated with higher glycated haemoglobin (HbA1c) levels in these patients.

Materials and Methods: We analysed data from the UK Biobank, consisting of 17 206 participants with T2DM, to explore the relationship between socioeconomic deprivation, self-reported indicators of sleep health, and HbA1c levels. Socioeconomic deprivation was assessed using the Townsend deprivation index. Participants were divided into two groups: low socioeconomic deprivation (n = 8604; reference group) and high socioeconomic deprivation (n = 8602). Logistic regression models were employed, adjusting for covariates such as body mass index (BMI), age, and biological sex.

Results: Patients with high socioeconomic deprivation had higher odds of reporting usual difficulties falling asleep or sleeping through the night (adjusted odds ratio 1.20, 95% confidence interval [CI] 1.12, 1.28), and they were more likely to use at least one hypnotic medication (adjusted odds ratio 1.41, 95% CI 1.09, 1.84). They also had higher odds of reporting snoring and difficulties staying awake during the daytime (adjusted odds ratio 1.09, 95% CI 1.01, 1.18), as well as experiencing short sleep duration (defined as <6 hours of sleep per day; adjusted odds ratio 1.69, 95% CI 1.50, 1.91). Moreover, patients with high socioeconomic deprivation had increased odds of experiencing comorbid sleep problems ($P \leq 0.001$). Finally, high socioeconomic deprivation was associated with a 0.1% higher HbA1c level ($P < 0.001$). Controlling for indicators of poor sleep health did not alter the strength of this association.

Conclusions: Socioeconomic deprivation may represent a risk factor for poor sleep health in patients with T2DM.

Associations between multimorbidity burden and objective and patient-reported sleep outcomes among people living with HIV

L. Sukumaran[1], K.M. Kunisaki[2], A. Winston[3], P.W. Mallon[4], N. Doyle[3], J. Anderson[5], M. Boffito[6], I. Williams[1], F.A. Post[7], J.H. Vera[8], M. Sachikonye[9], C.A. Sabin[1]
[1]Institute for Global Health, University College London, London, United Kingdom, [2]Minneapolis Veterans Affairs Healthcare System, University of Minnesota, Minneapolis, United States, [3]Department of Infectious Disease, Imperial College London, London, United Kingdom, [4]School of Medicine, University College Dublin, Dublin, Ireland, [5]Homerton University Hospital NHS Foundation Trust, London, United Kingdom, [6]Chelsea and Westminster Healthcare NHS Foundation Trust, London, United Kingdom, [7]King's College Hospital NHS Foundation Trust, London, United Kingdom, [8]Brighton and Sussex Medical School, Brighton, United Kingdom, [9]UK Community Advisory Board (UK-CAB), London, United Kingdom

Introduction: With the prevalence of multimorbidity rising among people with HIV as the population ages, its impact on sleep health remains unclear. We investigated the associations between morbidity burden and a range of sleep outcomes in the 8-site Pharmacokinetic and clinical Observations in PeoPle over fiftY (POPPY) Sleep sub-study in the UK and Ireland.

Materials and methods: Six categories of morbidity were identified in POPPY participants with HIV (n=1073) at baseline using principal component analysis: *Cardiovascular diseases (CVDs), Sexually transmitted infections (STIs), Metabolic, Mental/Joint, Neurological and Cancer/Other*. Individuals were then assigned a burden z-score for each morbidity category, with scores ≥ 0 reflecting higher morbidity burden relative to the study sample mean. A subset of 478 participants completed sleep assessments at a follow-up visit, including questionnaires (Insomnia Severity Index [ISI], Patient-Reported Outcomes Measurement Information System [PROMIS] Sleep Disturbance [SD], and Sleep Related Impairment [SRI]) and overnight oximetry (4% oxygen desaturation index [ODI] and percentage of time with oxygen saturation [SpO2] below 90%). Logistic/linear regression (depending on outcome) assessed associations between baseline morbidity burden z-scores (as the primary explanatory variables) and sleep measures (as the outcome), adjusting for age, sex, race, obesity (BMI $\geq 30 kg/m^2$), sex between men, smoking status, alcohol use, history of injection drug use and recreational drug use, with estimates expressed as adjusted odds ratios [aOR] or adjusted beta estimates with 95% confidence intervals [95%CI].

Results: Amongst 315 participants included (median [interquartile range; IQR] age 53 [47–59] years, 86% males, and 97% on ART), 22% had insomnia (ISI$\geq$15). Median scores for ISI, PROMIS-SRI and PROMIS-SD were 8 [4-14], 50.3 [43.6–58.2], and 51.2 [45.5–57.3], respectively. Median ODI and percentage of time with SpO2 below 90% were 3.1 [1.3-6.4] and 0.3 [0.0-2.5], respectively. Median morbidity burden z-scores (in decreasing order) were -0.02 [-0.89, -0.49], -0.09 [-0.99, 0.69], -0.30 [-0.97, 0.70], -0.56 [-0.56, 0.32], -0.62 [-0.62, 0.56] and -0.62 [-0.62, 0.29] for the *Metabolic, STDs, Mental/Joint, Neurological, CVDs and Cancer/Other* morbidity categories z-scores, respectively. After adjustment, higher *Mental/Joint* z-scores were significantly associated with increased odds of insomnia (aOR 1.78 [95%CI 1.33, 2.38]), as well as worse scores in ISI (b 1.77 [1.04, 2.51]), PROMIS-SRI (2.76 [1.74, 3.77]) and PROMIS-SD (2.41 [1.44, 3.37]) (Figure). Higher *Neurological* and *Metabolic* z-scores were also associated with worse PROMIS-SRI and PROMIS-SD scores (p<0.01). Higher *CVDs* and *Metabolic* z-scores were associated with higher ODI (*CVDs*: 1.11 [0.30, 1.92]; *Metabolic*: 1.33 [0.57, 2.08]) and higher percentage of time with SpO2 below 90% (*CVDs*: 1.81 [0.06, 3.56]; *Metabolic*: 2.13 [0.50, 3.77]).

Conclusions: Specific morbidity burden scores were significantly associated with poorer sleep outcomes in people with HIV. Whilst we were unable to adjust for some confounders, such as physical activity status, our findings suggest that further work is needed to determine directionality and the potential of sleep interventions to preserve cardiac, metabolic and mental health in people with HIV.

Associations between sleep and cardiovascular health among adults who experienced foster care as children

D. Rojo-Wissar[1,2], R. Davidson[3,4], E. Zhou[3,4], T. Baka[5], S. Parade[1,2], A. Spira[6,7,8]
[1]Alpert Medical School of Brown University, Psychiatry and Human Behavior, Providence, United States, [2]E.P. Bradley Hospital, Bradley/Hasbro Children's Research Center, Providence, United States, [3]Boston Children's Hospital, Boston, United States, [4]Harvard Medical School, Boston, United States, [5]Institute of Pathophysiology, Faculty of Medicine, Comenius University, Bratislava, Slovakia, [6]Johns Hopkins Bloomberg School of Public Health, Mental Health, Baltimore, United States, [7]Johns Hopkins School of Medicine, Psychiatry and Behavioral Sciences, Baltimore, United States, [8]Johns Hopkins University, Center on Aging and Health, Baltimore, United States

Introduction: Children in foster care (FC) often experience substantial compounded early-life stress. In the general population, early-life stress has been linked to the development of cardiovascular disease (CVD), the leading cause of death in the United States. Disturbed sleep has been identified as one potential modifiable risk factor for CVD risk. Research on sleep and health among individuals who experienced FC is scarce. We examined associations between sleep and later indicators of cardiovascular health among adults who experienced FC in childhood and investigated maltreatment while in FC and multiple FC placements as moderators.

Materials and methods: We studied 107 adults, between the ages of 25-32 years who retrospectively reported living in FC at some point during their childhood, using data from the nationally representative National Longitudinal Study of Adolescent to Adult Health study. Participants were considered positive for insomnia symptoms if they reported trouble falling asleep or staying asleep ≥3 days per week. Total sleep time (TST) was computed from participant-reported bed/wake times on work and free days. Our cardiovascular outcomes were collected approximately 7 years after sleep was assessed and consisted of the 4 health factors from the American Heart Association's (AHA's) "Life's Essential 8" (BMI, blood lipids, blood glucose, and blood pressure). Each cardiovascular health factor was scored on a scale of 0 to 100 using AHA criteria. Scores on the 4 factors were averaged to create a total cardiovascular health score, with higher scores indicating better cardiovascular health across all factors.

Results: The presence of insomnia symptoms was significantly associated with poorer scores on the blood pressure metric, even when controlling for age, sex, race/ethnicity, depression symptoms, maltreatment while in FC, and multiple FC placements (B=-22.54, 95% CI=-38.04, -7.04). Longer TST was associated with better scores on the blood pressure metric only among those who experienced maltreatment in FC, controlling for age, sex, race/ethnicity, depression symptoms, and multiple FC placements (B=23.36, 95% CI=1.30, 45.41). There were no significant associations with the other cardiovascular health factors.

Conclusions: The absence of insomnia symptoms is associated with healthier scores on the blood pressure metric in adults who were in FC as children. Similarly, among those exposed to maltreatment in FC, longer sleep duration is associated with blood pressure scores. High blood pressure is an early and robust cardiovascular risk factor. Thus, findings raise the question of whether improving sleep may help mitigate stress-related cardiovascular risk in this highly stressed population at increased risk for CVD.

Associations of mental resilience with the elevated NREM beta power and the enhanced sleep spindle characteristics in healthy adolescents

C.X. Chen[1], S.X. Li[2,3], C.S. Ho[4], J.W.Y. Chan[1], Y.K. Wing[1], N.Y. Chan[1]
[1]The Chinese University of Hong Kong, Department of Psychiatry, Li Chiu Kong Sleep Assessment Unit, Hong Kong, Hong Kong, SAR of China, [2]The University of Hong Kong, Sleep Research Clinic and Laboratory, Department of Psychology, Hong Kong, Hong Kong, SAR of China, [3]The University of Hong Kong, The State Key Laboratory of Brain and Cognitive Sciences, Hong Kong, Hong Kong, SAR of China, [4]The Chinese University of Hong Kong, Department of Chemical Pathology, Hong Kong, Hong Kong, SAR of China

Introduction: Sleep is theorized as a "restorative" process that will facilitate stress adaptation and development of resilience. However, current evidence on how sleep microstructures will be linked to resilience in adolescents remained unclear. This study aimed to examine the associations between sleep macro and microstructures and resilience in healthy adolescents.

Materials and Methods: Participants were invited to undergo one-night ambulatory polysomnography assessment at home and complete a set of online questionnaire. Resilience capacity was measured by the Resilience Scale for Chinese Adolescents (RSCA), which included subscales of emotional regulation, goal planning and positive thinking that measured adaptive coping, and subscales of family support and interpersonal support that measured social support. Resilience outcome was generated by residual values in the linear model with the score of quality of life as measured by KIDSCREEN-27 regressing on the count of childhood trauma events (measured by the Childhood Trauma Questionnaire). Mood problems were measured by the Generalized Anxiety Disorder-7 item (GAD7), and the Patient Health Questionnaire-9 item (PHQ9). Subjective sleep quality was measured by the Insomnia Severity Index (ISI). Sleep macrostructures were scored according to the American Academy of Sleep medicine (AASM) guidelines, and sleep microstructures were analyzed by the autodetection of spindles, slow wave sleep characteristics and power spectral analysis, with the open accessed sleep analysis toolbox in Python (Yet Another Spindle Algorithm, YASA).

Results: 43 adolescents [Age: Mean (SD): 15.98 (2.09) years, Range: 12-18 years; Sex: Female: n (%): 27 (62.8)] with valid data on sleep macro- and microstructures were included in this study. Among them, 60.9% have experienced childhood trauma. The resilience outcome was correlated to resilience capacity as defined by RSCA (r= 0.44, p=0.004). Sleep macrostructures did not differ across resilience groups. Results of the partial correlation analyses found that both resilience capacity and resilience outcome were associated with longer spindle duration, greater spindle oscillations and higher absolute power of Beta band in NREM stage 2, after adjusting for age and sex. Notably, the increase in beta power was not related to poor sleep quality because we did not find any parallel increase in NREM stage 2 beta power and insomnia severity (ISI). Upon controlling for age, sex, educational level, sleep efficiency and mood problem covariates, the higher scores of resilience capacity and resilience outcome were both associated with higher beta power activity in NREM stage 2. Resilience capacity remained associated with longer duration and greater oscillations of both fast and slow spindles. Whereas, the associations of resilience outcome with spindles were attenuated, largely due to the confounding effect of mood problem.

Conclusions: Mental resilience was associated with elevated beta power in NREM sleep, and such associations were not affected by the level of sleep quality. This suggested a potentially higher cortical activation during sleep that may confer resilience. Sleep spindles activity may also be an important biomarker for resilience capacity. Further studies are needed to explore the underlying mechanism.

Associations of sleep pattern with survival and life expectancy of cancer patients

S. Tian[1], L. Huangfu[2], J. Deng[1], L. Shi[1], L. Lu[1,3]
[1]Peking University, Sixth Hospital, Beijing, China, [2]Peking University, Cancer Hospital & Institute, Beijing, China, [3]Peking University, National Institute on Drug Dependence and Beijing Key Laboratory of Drug Dependence, Beijing, China

Introduction: Cancer is the leading cause of death in many countries. Although the survival rate of cancer has increased due to the development of comprehensive treatment measures, cancer patients still experience higher mortality and shorter life expectancy compared to healthy individuals. In addition to improving treatments, it is important to promote other efforts to reduce cancer mortality among cancer survivors, such as adopting healthy sleep behaviors. However, it remains unclear whether and to what extent having a healthy sleep pattern can increase the survival rate and prolong the life expectancy of cancer survivors. In this study, we aimed to investigate the associations between sleep patterns and the survival rate among cancer patients. We also estimated the life expectancy of cancer patients based on their sleep scores and distinct sleep behaviors. These findings can serve as valuable metrics for healthcare professionals, and offering health promotion information tailored to cancer patients' needs.

Materials and Methods: This prospective cohort study included 20,517 cancer patients from UK Biobank. We developed a comprehensive sleep score by combining five individual sleep behaviors: chronotype, sleep duration, insomnia symptoms, snoring and daytime sleepiness. Kaplan–Meier estimation was employed to generate survival curves, and the log-rank test was used to compare the survival probability among different groups based on the number of low-risk sleep factors and sleep scores. The life table method was utilized to calculate participant's life expectancy based on the increasing number of low risk sleep factors and sleep scores.

Results: Of 20,517 cancer patients, those with higher number of low-risk sleep factors exhibited a significantly higher survival probability ($P<0.001$). Additionally, individuals with healthy sleep pattern demonstrated the highest survival probability across different sleep score groups ($P<0.001$). The average life expectancy at age 50 increased with an increasing number of low-risk sleep factors among cancer survivors, ranging from 6.8 years to 9.9 years. Cancer patients with poor sleep, intermediate sleep and healthy sleep patterns had estimated life expectancies at age 50 of 6.8 years, 7.8 years, and 8.8 years, respectively. Among cancer patients aged 50, those with low risk for individual sleep behavior, such as early chronotype, 7–8 hours of sleep duration, no or rare insomnia symptoms and infrequent daytime sleepiness, had longer life expectancies than those with high risk. However, this study did not observe a difference in life expectancy between low-risk and high-risk groups for snoring. Healthy sleepers had longer life expectancies than poor sleepers within each age group ranging from 45 to 70 years. However, the gap in life expectancy between different sleep score groups decreased after the age of 60.

Conclusions: Adopting a healthy sleep was associated with a higher survival rate among cancer patients, and those who maintained a healthy sleep pattern had a longer life expectancy than poor sleepers. These findings contribute to the development of evidence-based prevention strategies for policymakers and healthcare professionals aimed at improving the survival outcomes of cancer patients.

Associations of sleep with psychological health and alertness: a national survey of Japanese physician duty hours

H. Wada[1], M. Basner[2], M. Cordoza[3], D. Dinges[2], T. Tanigawa[1]
[1]Juntendo University, Tokyo, Japan, [2]University of Pennsylvania Perelman School of Medicine, Philadelphia, United States, [3]University of Pennsylvania, Philadelphia, United States

Background: Approximately 40% of Japanese physicians report working greater than 960 hours of overtime annually, with 10% exceeding 1860 hours. To protect their health, annual overtime caps will take effect in 2024. Physician work hours are often demanding and can contribute to poor health and performance. There is a need for rapid objective assessment of the increased likelihood of these risks in physicians. In this study, a brief psychomotor vigilance test (PVT-B), an objective measure of alertness, was used. The aim of the present study is to investigate association of self-reported sleep duration with psychological health and objective alertness.

Methods: This cross-sectional study was the national survey for the work style reform of long working physicians from Japan in 2019. Main outcome measures were physicians' self-reported daily sleep duration, burnout (Abbreviated Maslach Burnout Inventory), depression (Centre for Epidemiologic Studies Depression Scale) and self-reported traffic accidents. Alertness was objectively assessed, using a brief 3-minute Psychomotor Vigilance Test (PVT-B).

Results: Of 20,382 physicians invited, 1,226 completed the survey and PVT-B. Sleep duration was inversely associated with work hours, and working ≥ 80h per week was associated with sleeping <6h per day (both p<0.0001). Sleep duration <6h and ≥8h hours per day was associated with slower responses on the PVT-B (adjusted p<.05). Additional 10 hours worked per week was associated with a 0.40 (95%CI 0.08 to 0.72) point increased burnout severity and a 1.7% (95%CI: 0.1 to 3.3%) increased odds of reporting a traffic accident. Increased PVT-B lapses indicating lower alertness was associated with symptoms of depression (β=0.23; 95% CI 0.14 to 0.31, p<.0001) and burnout (β=0.25; 95% CI 0.13 to 0.36, p<.0001), but not traffic accidents.

Conclusions: This study emphasizes the importance of sufficient sleep to maintain alertness, and limiting work hours to protect psychological health. Findings support the proposed limits of 960 annual hours of overtime for Japanese physicians, which approximates a 60-hour work week. Future studies should prospectively assess PVT-B utility to identify physicians at risk for reduced alertness, depression and burnout.

A systematic review investigating the associations between prenatal sleep health and child outcomes

M. Nevarez-Brewster[1], D. Han[1], E.L. Todd[1], P. Keim[1], J.R. Doom[1], E.P. Davis[1,2]
[1]University of Denver, Psychology, Denver, United States, [2]University of California, Irvine, Pediatrics, Irvine, United States

Introduction: Sleep is an integral component of health and development across the lifespan. During pregnancy, eight in ten pregnant individuals will report decrease in sleep duration or sleep quality. However, poor sleep health during pregnancy remains severely understudied. Sleep health during pregnancy can inform the growth of the developing fetus, making sleep a critical process implicated in fetal programming and a plausible biopsychosocial mechanism linking prenatal maternal health and stress and offspring development. Poor prenatal sleep has been previously implicated with poor birth outcomes including preterm birth and low birth weight. However, much less is known about the long-lasting impact of poor prenatal maternal sleep on infant, child, and adolescent health. The purpose of this systematic review is to synthesize the findings linking prenatal maternal sleep health and offspring health and development after birth and to highlight important directions for future research.
Materials and methods: Using comprehensive key terms related to prenatal sleep health and infant, child, and adolescent outcomes, 4367 non-duplicate articles were identified via scientific databases (PsycInfo and PubMed) and screened by two independent raters. Data screening took place from April to June 2023. Seventy full text studies were screened by two independent raters, of which 30 met inclusion criteria for this review.
Results: Most studies (n = 18; 60%) examining the links between poor sleep during pregnancy and child outcomes focused on offspring physical health, such as body-mass index and adiposity (n = 8), sleep health (n = 8), and hospitalizations and allergies (n = 2) in the first years of life (i.e., prior to middle childhood). Fewer studies (n = 11; 37%) exist examining sleep during pregnancy as a predictor of infant and child socioemotional health and neurodevelopment. Further, more than half of the studies examined prenatal sleep only once during pregnancy despite evidence showing robust changes in sleep quality across pregnancy. A very small number of studies (n = 2) explored placental and postnatal processes as potential mechanisms linking poor prenatal sleep health and offspring outcomes. Overall, these studies suggest that maternal sleep health during gestation is associated with child outcomes with most studies focusing on physical health. Gaps in the literature highlighting future directions include 1) robust assessments of sleep at multiple timepoints using both objective (e.g., actigraphy) and subjective measures, 2) understanding physiological mechanisms, 3) longer-term follow up of offspring and 4) consideration of a broader range of child outcomes.
Conclusions: Evidence exists to suggest that poor prenatal maternal sleep health is an environmental signal that informs health in the offspring. However, future studies are needed to fully understand the pervasive and long-lasting effects of poor sleep across pregnancy.

Automatic sleep scoring via deep learning: do it at home!

L. Fiorillo[1], G. Monachino[1], M. Bechny[1], G. Palo[2], K. Samaras-Tsakiris[3], W. du Toit[3], E. Meier[3], M. Melnykowycz[3], V. Agostini[2], F.D. Faraci[1]

[1]University of Applied Sciences and Arts of Southern Switzerland (SUPSI), Department of Innovative Technologies, MeDiTech, Lugano, Switzerland, [2]Polytechnic University of Turin, Department of Electronics and Telecommunications, Torino, Italy, [3]IDUN Technologies, Opfikon, Switzerland

Introduction: The gold standard for evaluating possible sleep disorders is the Polysomnography (PSG): the patient spends a whole night in the hospital while continuously supervised by a sleep technician. Then whole-night electrophysiological signals are analyzed to extract sleep cycle information. Sleep recordings are usually scored by human sleep experts according to the American Academy of Sleep Medicine (AASM) manual, requiring up to two hours of work per whole-night. PSG results suffer both from bias related to an uncomfortable setting - patients sleep with many electrodes and cables - and from biases related to an often high inter- and intra- scorer variability.

To date, a wide variety of deep learning based algorithms have been proposed to automatize the sleep scoring task, reaching very good results. We aim to exploit existing large-scale scoring algorithms, by transferring their knowledge to single-channel solutions. Our ultimate goal is to facilitate the adoption of single-channel portable solutions.

In the present work we test our approach with recordings obtained from a commercially available home-based comfortable solution, e.g., the IDUN Guardian in-ear EEG earbuds [1].

Materials and Methods: We exploit a state-of-the-art deep learning based sleep scoring algorithm, recently proposed in [2] and further investigated in [3].

We pre-train the sleep scoring architecture on 19'578 PSG recordings from 15'322 subjects of 12 publicly available clinical studies worldwide. Thus, exploiting the sleep scoring knowledge from different large-scale-heterogeneous data cohorts. The algorithm addresses both the two-states (awake, asleep) and three-states (awake, NREM, REM) sleep scoring classification tasks. We pre-train the algorithm in a single-channel configuration, i.e., randomly sampling during the training procedure recordings from single-channel EEG and/or EOG derivations. This results in a better generalization versus any combination of single-channel derivation - as long as the electrodes are placed on the scalp area. We then directly evaluate the scoring architecture on never-seen home-based PSG and in-ear-EEG synchronized recordings on ten healthy subjects. The home-based recordings have been manually annotated by multiple-scorer-experts, to further evaluate the algorithm on the scorer-consensus [4].

Results: The algorithm shows scorer-expert-level performance on the never-seen home-based averaged single-channel PSG setting and in-ear-EEG recordings in both the two-states (weighted F1-score 97.6%±0.8%~PSG and 94.0%±5.3%~in-ear-EEG) and the three-states (weighted F1-score 92.7%±1.2%~PSG and 80.9%±8.5%~in-ear-EEG) classification tasks. The performance is clearly always higher in a multi-channel evaluation procedure (majority vote, i.e., ensemble of predictions given by the multiple combination of single-channels in a PSG setting) compared to the single-channel evaluation procedure (up to 98.2%±1.3%~two-states, 93.9%±2.7%~three-states in weighted F1-score). Through the hypnodensity-graph analysis [5] we also show that the automatic solution is even encoding the complexity of the scorers' consensus, whose importance is often underestimated.

Conclusions: Deep learning based solutions are ready to be implemented in a home-monitoring setting. We only need to further validate them on heterogeneous and a higher number of recordings - eventually involving subjects affected by different sleep disorders.

References:

[1] https://iduntechnologies.com/.
[2] https://doi.org/10.1038/s41746-021-00440-5.
[3] https://doi.org/10.1038/s41746-023-00784-0.
[4] https://doi.org/10.1038/s41467-018-07229-3.
[5] https://doi.org/10.1093/sleep/zsad028.

Bidirectional associations between the duration and timing of nocturnal sleep and naps in adolescents differ from weekdays to weekends

R. Leong[1], T. Liang[1], N. Yu[1], T.B. Teo[1], J. Ong[1], M. Chee[1]
[1]Yong Loo Lin School of Medicine, National University of Singapore, Medicine, Centre for Sleep and Cognition, Singapore, Singapore

Introduction: Previous studies have found that short nocturnal sleep duration predicts next-day napping in teens, and that long naps decrease same-day nocturnal sleep duration. Apart from duration, the relationships between the timing of nocturnal sleep and naps, as well as their occurrence, has not been examined. Here, we investigated bidirectional associations between the duration and timing of nocturnal sleep and naps, as well as whether or not these associations differed from weekdays to weekends.

Materials and methods: We analysed sleep diary and actigraphic data from 99 teens (males = 47, mean age = 16.6 years) who reported napping at least once over 7-10 days during the school term. Relationships between nocturnal sleep parameters (bedtime, wake time, duration, sleep onset latency) and nap sleep parameters (nap duration, nap start time, nap end time) were studied using logistic and linear regression models controlling for age and gender. We examined these nocturnal-nap sleep relationships separately for weekdays and weekends.

Results: 83.8% of our initial sample reported napping at least once during the period of assessment. Naps were similar in length on weekdays (mean = 88.6 min, SD = 49.9 min) compared to weekends (mean = 85.6 min, SD = 46.9). On weekdays, average nocturnal sleep was short (mean = 5.7 h) due to early wake times (mean = 06:29). Neither the duration nor timing of nocturnal sleep predicted what time and how long naps were the next day, suggesting that students obtained compensatory sleep as and when the opportunity arose. Naps that were later and longer delayed same-night bedtimes, increased time taken to fall asleep, and shortened night sleep duration. On weekends, teens were able to wake on average 2.2 hours later, and the longer sleep at night (mean = 7.8 h) was associated with lower likelihood of napping the next day. At both the within- and between-individual levels, waking later than average was also associated with napping later, which delayed bedtimes but did not curtail sleep duration.

Conclusions: When nocturnal sleep is insufficient and academic schedules constrain nap opportunity, naps appear to be taken at any opportunity to compensate for sleep deprivation. As seen on weekends, obtaining more sleep at night reduces the likelihood of next-day napping. As our findings suggest that long and late naps can delay bedtimes, appropriate scheduling of the duration and timing of napping should be emphasized when providing sleep hygiene recommendations.

Causal relationship between snoring and Alzheimer's disease: Longitudinal cohort and Mendelian Randomization study

Y. Gao[1], S. Andrews[2], K. Yaffe[2,3,4,5], Y. Leng[2]
[1]University of Oxford, Nuffield Department of Population Health, Oxford, United Kingdom, [2]University of California San Francisco, Department of Psychiatry & Behavioral Sciences, San Francisco, United States, [3]University of California San Francisco, Department of Epidemiology and Biostatistics, San Francisco, United States, [4]San Francisco Veterans Affairs Health System, San Francisco, United States, [5]University of California San Francisco, Department of Neurology, San Francisco, United States

Introduction: Loud snoring is a symptom commonly associated with obstructive sleep apnoea (OSA), which has been suggested as a risk factor for dementia. Notably, snoring is often associated with high Body Mass Index (BMI), which has been associated with a lower risk of Alzheimer's disease (AD), possibly due to metabolic changes in early AD. The causal relationship between snoring and AD, and the role of BMI in this relationship, therefore, is of particular interest. Here we use a prospective cohort design and Mendelian randomization (MR) analysis to investigate the causal relationship between snoring and AD, and the involvement of BMI.

Materials and Methods: We first examined the association between self-reported snoring and incident dementia as defined by hospital inpatient and death registry data among 450,027 dementia-free participants aged 39-73 years in the UK Biobank study. We performed bidirectional two-sample MR analyses using summary statistics for genome-wide association studies of AD (n = 94,437; cases = 35,274) and snoring (n = 408,317; snorers = 151,011). Genetic instruments were obtained by selecting independent genome-wide significant SNPs ($p < 5 * 10^{-8}$, $r^2 = 0.001$, window = 10Mb) for each exposure and harmonizing their effects with each outcome. We used fixed-effects inverse-variance weighted (IVW) method for primary analysis, and MR-Egger, Weighted mode, and Weighted median as sensitivity analyses. We assessed heterogeneity using Cochran's Q test, outliers using Radial-MR, and pleiotropy using the MR-Egger intercept. We used multivariable MR to estimate the direct effects of AD on snoring independent from BMI.

Results: During a median follow-up of 13.5 years, 7,937 participants developed dementia. Snoring was associated with an 8% lower risk of incident dementia (hazard ratio = 0.92, 95% confidence interval (CI) 0.88–0.97), adjusting for demographic, socioeconomic, lifestyle factors, BMI, daytime dozing, and history of comorbidities. This association was more pronounced in older individuals and *APOE* ε4 allele carriers, and was attenuated with longer follow-up periods. MR analyses suggested no causal effect of snoring (odds ratio (OR) [95%CI] = 0.838 [0.387, 1.817], p = 0.655) on AD. In the reverse direction, suggestive causal effects were observed in the MR-Egger (OR [95%CI] = 0.994 [0.990, 0.998], p = 0.004), Weighted median (OR [95%CI] = 0.995 [0.991, 0.999], p = 0.013), and Weighted mode (OR [95%CI] = 0.996 [0.992, 0.999], p = 0.031) analyses. However, IVW analysis found no significant effects of AD on snoring (OR [95%CI] = 0.998 [0.995, 1.001], p = 0.114), possibly due to horizontal pleiotropy bias towards null (p = 0.009). Multivariable MR indicated that the effect of AD on snoring was likely driven by BMI.

Conclusions: The phenotypic association between snoring and lower dementia risk likely stems from reverse causation, with genetic predisposition to AD reducing snoring. This may be explained by lower BMI during the AD prodromal stage. Further analyses are required to differentiate between benign habitual snoring and OSA, explore their distinct causal links with AD, and identify potential mechanisms.

Characteristics of long and short sleepers that may be relevant to the cardiovascular risk: insights from the ELSA-Brasil study

A. Aielo[1], R. Santos[1], S. Giatti[1], B. Parise[1], W. Silva[1], L. Cunha[1], S. Souza[1], N. Lapi-Ferreira[1], P. Lotufo[1], I. Bensenor[1], L. Drager[1]
[1]University of Sao Paulo, Sao Paulo, Brazil

Introduction: Extremes of sleep duration (SDUR), including short and long SDUR has been consistently associated with several consequences, including increased cardiovascular risk and mortality. While the biological plausibility linking short SDUR seems to be well explored, it is intriguing the potential reasons by which long sleepers are exposed to increased risk. This study was aimed to explore independent variables related to long (primary aim) and short SDUR (secondary aim) using objective measurements in a large sample of adults.

Materials and methods: The ELSA-Brasil study is a large ongoing cohort of civil servants. After a standard and comprehensive clinical evaluation, the participants were invited to perform a 1-week wrist actigraphy (Actiwatch 2™) during a typical week to determine SDUR. We defined short SDUR when the mean SDUR was <6h. Long SDUR was set at ≥8h. Therefore, SDUR 6 to <8 h was considered the reference group. In addition, an overnight home sleep study was performed using the Embletta Gold™ to investigate the presence of obstructive sleep apnea, OSA (using the cut-off of ≥15 events/hour). A logistic regression analysis was used to detect the predictors of long and short SDUR [adjusted for age, sex, race, income, education level, physical activity level, active or retired status, hypertension, diabetes, depressive symptoms, OSA, excessive daytime sleepiness (EDS) and insomnia. For all statistical tests, a significance level of 5% was adopted.

Results: A total of 2,063 participants were included in the analysis (age: 49±8 years; 57.3% women; 33% with OSA). The mean SDUR was 6.55±0.49 hours. Long and short SDUR were observed in 6.5 and 26.9%, respectively. In the logistic regression analysis, female sex (OR=1.52; 95% CI: 1.01-2.29), older individuals (OR=1.4; 95% CI 1.09-1.78), depressive symptoms (OR=2.77; 95% CI: 1.37-5.6) and OSA (OR=2.29; 95% CI 1.04-4.87) were independently associated with long SDUR. In contrast, the independent variables associated with short SDUR were male sex (OR=2.13; 95% CI 1.71-2.65), Blacks (OR=1.73; 95% CI 1.29-2.33) and EDS (OR=1.6; 95% CI 1.29-1.93).

Conclusion: We observed significant differences in the independent characteristics of long and short sleepers. Considering the potential cardiovascular relevance of some characteristics associated with long SDUR, future studies addressing their long-term cardiovascular impact may shadow lights to explain the curious higher rate of cardiovascular events associated with long SDUR.

Children's sleep patterns in an inner city urban environment: does race-ethnicity matter

T. Thompson[1]
[1]Icahn School of Medicine at Mount Sinai, Department of Environmental Medicine & Public Health, New York City, United States

Introduction: Children living in urban disadvantaged neighborhoods in the United States often sleep less as a result of neighborhood environmental disruptors. Numerous studies have documented racial and ethnic sleep differences, with recent literature having shown that children of Latin decent, experience shorter sleep duration than their white counterparts at similar ages. This study had two aims. First, we administered the Children's Sleep Habits Questionnaire to caregivers to assess sleep disruptions in the study participants sleep environment over a seven-day (weekday/weekend) period. Our second aim we administered the Children's Sleep Hygiene Scale, that assessed whether poorer sleep outcomes were moderated by racial/ethnic differences in residential environments. Both the questionnaire and the sleep hygiene scale were assessed using a 5-point Likert scale. The authors hypothesized that higher scores on both items indicate greater sleep disruptions, a priori boys sleep less than girls regardless of race ethnicity.

Methods: Convenience sampling was used to recruit study participants. This study consisted of a qualitative methods approach utilizing two qualitative instruments, Children's Sleep Habits Questionnaire and the Children's Sleep Hygiene Scale. The study population (N=25) consisted of Latino children, 6 - 8 years old (14 boys, 11 girls), recruited from an inner-city urban population, 67% Latino. 5 point- Likert scales were used to assess study instruments. Covariates included age, sex, shared bedroom status, and poverty income ratio of family residence.

Results: The study sample mean (SD) age was 6.7 years. During the seven-day study research period 72% of the sample achieved the age specific sleep guidelines of the American Academy of Sleep Medicine (9 -12 hours sleep duration) for children 6 - 8 years. However, 61% of the boys compared to 37% of the girls had difficulty falling asleep. Such results have been documented in previous literature highlighting duration and fragmentation differences by sex. Moderating role of the sleep hygiene subscales demonstrated a moderate interaction between race/ethnicity on sleep outcomes. With Latinos having less sleep duration than whites at all ages, and sex. With a significant difference ($p<.05$) demonstrated in boys when comparing race/ethnicity. The race/ethnicity effect was not present in girls.

Conclusion: The overall findings support the author's hypothesis that individual differences in sleep duration and quality can be attributed to potential differences in gender, and racial ethnicity. The authors further posit that gendered patterns in questionnaire reporting, and sleep efficiency in residential urban environments can attenuate sleep outcomes in boys, not seen in girls. Such results highlight the need for more sleep hygiene studies in children, targeting urban residential areas often plagued by environmental inequities.

Cognitive approach to managing derangements in sleep in post-operative patients: a systematic review

R. Mahmud[1], G. Taylor[2], A. Kowdley[3], C. Linh[2], J. Buzalewski[3], R. Joyner[4], G. Kowdley[3]
[1]Cooper Medical School of Rowan University, Camden, United States, [2]Philadelphia College of Osteopathic Medicine, Philadelphia, United States, [3]TidalHealth Hospital Peninsula Regional, Surgery, Salisbury, United States, [4]TidalHealth Richard A. Henson Research Institute, Salisbury, United States

Introduction: Sleep disturbance is a common problem among patients undergoing surgery. Although pharmacological interventions are commonly applied to improve sleep quality, non-pharmacologic interventions are available as well. Referred to by these authors as the cognitive approach, these interventions include hypnosis, mindfulness, music therapy, guided imagery and psychological nursing. Our aim with this systematic review was to illuminate known effects of cognitive therapeutic approaches to improving sleep quality in post-operative patients.

Materials and Methods: A systematic review was conducted utilizing the PRISMA 2020 guidelines to explore non-pharmaceutical modalities to improve sleep and recovery in post-operative patients. English articles published withing the past 10 years were identified through key word searches. Keywords included: perioperative AND Surgery AND Sleep NOT (sleep apnea); postoperative sleep disturbances NOT (sleep apnea); Surgery AND Sleep NOT (sleep apnea); Surgery AND Sleep NOT (sleep apnea); "postoperative" AND "sleep quality" NOT (apnea); . Searches provided 2678 articles from each of the following databases: 843 – Embase; 623 – PubMed; 568- Scopus; 394 – Web of Science; 250 – CINAHL. Duplicates were removed (928) leaving 1750 studies to screen. Inclusion and exclusion criteria were determined by investigator consensus. Inclusion required a focus on sleep disturbance in the post-operative period with non-pharmacologic interventions. Articles with a focus on sleep apnea or diagnosis of delirium/dementia were excluded. Articles focusing on cognitive interventions were selected. This identified 15 relevant articles reviewed in this study. There were 14 randomized controlled trials and 1 non-randomized control trial.

Results: Multiple sleep parameters were measured in the identified studies using scales such as the Pittsburgh Sleep Quality Index (PSQI), the St. Mary's Hospital Sleep Inventory, the Vernan and Snyder-Halpern (VSH) Sleep Scale, the Subjective Sleep Quality Index, the Visual Analog Sleep Scale (VASS), the Richard Campbell Sleep Questionnaire (RCSQ), and self-reported evaluations. Of the 15 articles, 14 noted improvements in sleep with the use of cognitive treatment modalities and 1 displayed no improvement in the treatment group compared to control. Of the 14 that noted improvement, 8 articles showed statistically significant ($p < 0.05$) improvements in sleep within the treatment group versus control (mindfulness, guided imagery, and psychological nursing interventions); 6 did not show statistical significance, however, the trends in data showed the treatment group had improvement in sleep compared with control (hypnosis and music therapy intervention).

Conclusions: Published data suggest cognitive non-pharmacologic therapeutic approaches for managing sleep derangements in post-operative patients are promising. Further research utilizing cognitive approaches should be conducted to elucidate best practices for improving the operative experience and outcomes.

"Comforts me and allows me to sleep better and longer:" The impact of dogs on sleep among U.S. Military veterans

C. Spadola[1], C. Krause-Parello[2], D. Schuman[1], M. Raval[1], J. Baldwin[2]
[1]The University of Texas at Arlington, School of Social Work, Arlington, United States, [2]Florida Atlantic University, Boca Raton, United States

Introduction: Dog ownership and sharing a bed with a dog is common practice, especially in the United States (U.S.). Dog ownership might be particularly prevalent among U.S. Military veterans, as dogs can assist with service-related trauma. Limited research has investigated the impact of dogs on sleep in this population. The existing literature is mixed, with some research suggesting that dog ownership and sharing a bed with a dog can positively impact sleep. In contrast, other research suggests that dogs have a negative impact on sleep. Qualitative research investigating the effect of dogs on sleep is also lacking. This study contributes to the empirical literature by quantitatively and qualitatively assessing perceptions of dogs on sleep among U.S. military veterans.

Materials and Methods: We recruited U.S. military veterans via veteran organizations and social media to participate in a nationwide online survey. SPSS version 29.0 was used to calculate descriptive statistics for quantitative data. For the qualitative data, two of the authors conducted thematic analysis using QDA Miner.

Results: One hundred and fourteen (114) U.S. military veterans, who were part of a larger study investigating the association between dog ownership and mental health, completed quantitative and qualitative (open-ended) questions investigating the perceived impact of dogs on sleep. Over 60 percent of the sample was male (60.5%, n=69), followed by female (38.6% n=44), and other/non-binary (0.9% n=1). Most of the sample identified as White (74.6%, n=85), followed by Black/African American (9.6%, n=11), Native American/American Indian, Alaska Native (n=8, 7%), Hispanic/Latinx (5.3%, n=6), and Asian (3.5% n= 4).

Participants were asked to rate the overall impact of their dog on their sleep (1= disrupts my sleep to 5=benefits my sleep). The mean response was 4.5 (SD=0.9), with the majority of the sample (85.0% n= 97) indicating that their dog benefitted or mildly benefitted their sleep. Major themes revealed that dogs improved veterans' sleep with nightmares (e.g., waking up during a nightmare or providing a comforting presence), relaxation, and safety. Exemplar quotes include: "I feel secure. He provides deep pressure therapy while I sleep and wakes me from night terrors;" and "Petting her allows me to slow down and rest. As she goes to sleep, it helps me to trigger my own sleepiness."

Themes surrounding why the dog was perceived to be disruptive for sleep included the dog's movement: "She hogs the bed, she kicks, she snores and steals the blankets."

Conclusions: Our results support the extant research indicating that dogs can help promote sleep among their owners. Mechanisms in which sleep promotion benefits might occur include stress reduction, increasing feelings of safety, and assistance with nightmares. Dog ownership and dog bed-sharing might be helpful to include in sleep health recommendations for individuals dealing with nightmares, stress, and lack of a sense of safety in veterans and other populations.

Comparative analysis of 11 Consumer Sleep Trackers with polysomnography

T. Lee[1], Y. Cho[2], K.S. Cha[1], J. Jung[1], J. Cho[1], H. Kim[1], D. Kim[1], J. Hong[1], D. Lee[1], M. Keum[2], C. Kushida[3], I.-Y. Yoon[4], J.-W. Kim[4]
[1]ASLEEP CO., LTD, Seoul, Korea, Republic of, [2]Clionic Lifecare Clinic, Seoul, Korea, Republic of, [3]Stanford Sleep Medicine, Redwood City, United States, [4]Seoul National University Bundang Hospital, Seoul, Korea, Republic of

Introduction: Consumer sleep trackers (CSTs) have emerged as affordable alternatives to polysomnography (PSG) for monitoring sleep patterns, addressing the time-intensive and expensive constraints of PSG. However, limited studies have comprehensively validated the performance of different CSTs, particularly when conducted in the same environment with the same participants. This study aims to fill this research gap by validating the accuracy of various types of CSTs through a comparison with PSG. Additionally, by including widely-used CSTs and conducting a multicenter study with a large sample size, the research seeks to provide comprehensive insights into the performance and suitability of these CSTs in different scenarios.

Materials and Methods: We recruited 75 participants, from a tertiary hospital (Seoul National University Bundang Hospital, SNUBH) and a primary sleep-specialized clinic (Clionic Lifecare Clinic, CLC) in Korea. The study analyzed 11 CSTs, including five wearables (Google Pixel Watch, Galaxy Watch 5, Fitbit Sense 2, Apple Watch 8 and, Oura Ring 3), three nearables (Withings Sleep Tracking Mat, Google Nest Hub 2, and Amazon Halo Rise), and three airables (SleepRoutine, SleepScore, and Pillow), which are commercially available. Participants were randomly divided into two groups and while undergoing PSG wore a total of eight out of the 11 CSTs simultaneously. CSTs that could potentially interfere with each other were not simultaneously worn. Each CST's results were compared and analyzed against the results of PSG.

Results: In terms of 4-sleep stage estimation performance, the airable SleepRoutine demonstrated the highest Macro F1 score of 0.6863 in estimating sleep stages, followed by the nearable Amazon Halo Rise with a macro F1 score of 0.6242. Wearable CSTs, such as the Google Pixel Watch performed well in the deep stage estimation.

For sleep measure estimation performance, including sleep efficiency, sleep latency, and REM latency, the wearable Galaxy Watch 5 and the airable SleepRoutine showed smaller biases, while the SleepRoutine and the wearable Oura Ring 3 had no proportional bias. The SleepRoutine provided accurate and consistent sleep measure estimates with minimal bias.

In subgroup analyses based on gender, BMI, and sleep efficiency, the SleepRoutine consistently outperformed other devices across all subgroups. Differences in macro F1 scores between the tertiary hospital SNUBH and the primary clinic CLC were observed for certain devices, potentially due to variations in recruitment methods or population characteristics.

Conclusions: Our research has revealed significant variation in the accuracy of estimating sleep stages among the 11 commercially available CSTs compared to PSG. Additionally, we have identified significant performance differences for specific sleep measures or subgroups among each CST. These findings highlight the need for comprehensive validation and transparency in the AI, data, and algorithms used by CSTs ensuring reliable sleep analysis for consumers in diverse situations. Overall, this research provides valuable insights for consumers seeking trustworthy CSTs, emphasizing the importance of future studies prioritizing international comparisons and the inclusion of diverse populations to enhance the generalizability of the findings.

Comparison of sleep by wristwatch actigraphy and sleep diary in Portuguese football players, aged 8 to 10: a descriptive study

D. Ferreira[1], A. Santos Costa[1], J. Da Silva Ferreira[2]
[1]Hospital Senhora da Oliveira, Guimarães, Respiratory/Sleep Department, Guimarães, Portugal,
[2]Hospital Senhora da Oliveira, Guimarães, Neonatology Department, Guimarães, Portugal

Sleep is a core behavior of young children. Ensuring well-timed, adequate, and restorative sleep is important for optimal maturation. Young football players have demands in training and academic schedules that can lead to sleep restriction. Studies have shown that youth athletes obtain less than 8 h of sleep regularly. As part of this special issue, this study aimed to compare sleep by using wristwatch actigraphy and sleep diaries in 32 young male football players, aged 8 to 10 years old.

Introduction: Sleep plays a crucial role in the development of young children. In addition, sleep impacts alertness and attention, cognitive performance, mood, learning and memory.

Youth athletes today have significant time requirements for not only school and homework but also training schedules and social interactions. To meet these time requirements, sleep tends to be put off in favor of other activities. American Academy of Pediatrics and American Academy of Sleep Medicine recommends children from 6 to 12 years of age, to get approximately 9 to 12 hours of sleep per day.

Materials and Methods: We selected a convenience sample of young football players from U-10 and U-9, from a Portuguese 1st League Team where actigraphic measures were performed during June 2022. Written informed consent was obtained from parents to wear actiwatch. Participants were instructed to wear the device on the non-dominant wrist during 14 consecutive days. Parents had to complete a sleep diary each morning. They also fulfilled the Children's Sleep Habits Questionnaire, Prof. Owens, 2000 (Portuguese Adapted).

Results: Thirty-two children were included. The mean age was 8,9 years. Measures of sleep data were collected. Normality of distribution was tested using the Shapiro-Wilk test *and* statistical analyses were performed using *t Test*.

In case of the variables "Hours of Sleep" and "Bed Time", with a significance level of 5%, there were differences between the means of the two groups (p-value<0.05). Regarding the variable "Get Up Time", with a significance level of 5%, it was concluded that there were no significant differences between the two groups (p-value>0.05).

According with data obtained by actigraphy, the average of sleep was 7h48m and by sleep diary was 9h27m. Comparing sleep duration in these two measures, there was an overestimation of sleep duration reported by parents of 99 min.

Conclusions: In this research, actigraphy and sleep diaries, both valid methods for measuring sleep duration, demonstrated that parents may overestimate the amount of sleep their child is receiving, leading to an overestimation of sleep duration reported by parents. The results also indicated that young players from U-10 and U-9, have significantly lower hours of sleep and a later bedtime compared to the recommended age range of 9 to 12 hours. As such, further interventions should be considered in order to ensure healthy sleep habits.

Consider the context: understanding how individual, interpersonal, and environmental stress exposures impact sleep

J. Silva-Jones[1], L. Whitehurst[1]
[1]University of Kentucky, Psychology, Lexington, United States

Introduction: Stress exposures impact how long we sleep (duration) and how we feel about the sleep we receive (sleep quality). Interpersonal (daily hassles) and environmental (area deprivation) stress exposures can impact acute sleep disturbance and long-term sleep dysfunction. Individual factors, like racial background and education, can increase vulnerability to stress exposures. Most studies fail to examine how complex stress exposures impact daily sleep health. Here, using a 21-day ecological momentary assessment approach in a large, community-based cohort of mid-life adults, we captured the impact of individual, interpersonal, and environmental stress exposures on daily sleep durations and quality.

Methods: Participants (N=6287, Mean age=48; 36% Male, 62% Female 0.4% self-reported as Other) were instructed to complete up to three daily check-ins during set time windows via a phone application. Each morning participants reported their bedtimes and wake times, sleep duration, and rated their feelings of refresh on a scale of 1=not at all refreshed to 5=extremely refreshed (sleep quality). All participants reported their perceived stress intensity (Likert Scale 1 (*not at all*) – 5 (*extremely*) three times per day. Participant-provided zip codes were used to extract environmental factors of interest including urbanicity and area deprivation (based on population-level resource need and accessibility). Mixed effect linear regressions were used to examine statistical dependence between variables of interest.

Results: On average, this sample reported 6 hours of sleep per night (SD=1.54) and felt "somewhat refreshed" (M =3.13, SD =1.01) upon waking. Participants who identified as Black American (N =568) had shorter (ß=-.42, p<.001) and more variable (ß=.12, p=.004) sleep durations, but higher sleep quality, (ß=.10, p=.03). Older adults (ß=-.05, p<.001) and males (ß=-.08, p<.001) had less variable sleep durations and sleep quality respectively, (ß=-.08, p<.001), (ß=-.04, p<.001). Having some college education (ß=-.22, p<.001), a high school diploma (ß=-.29, p<.001), or less than a high school diploma (ß=-.50, p<.001) was associated with shorter sleep durations and poorer sleep quality, respectively (ß=-.13, p<.001), (ß=-.17, p<.001), (ß=-.18, p=.005). Additionally, participants who endorsed having less than a high school diploma (ß=.25, p<.001), a high school diploma (ß=.10, p=.001), or some college education (ß=.09, p<.001) also experienced more variable sleep durations. Living in more deprived environments was associated with shorter (ß=-.06, p<.001) and more variable (ß=.02, p=.02) sleep durations as well as poorer (ß=-.03, p=.001) and more variable sleep quality (ß=.01, p=.04). However, living in more urban environments was associated with less variable sleep durations (ß=-.03, p=.001). On days when participants reported high stress intensity ratings, they also had shorter (ß=-.14, p<.001) and more variable (ß=.02, p=.02) sleep durations, and poorer sleep quality, (ß=-.20, p<.001). Additionally, a significant three-way interaction between daily stress, urbanicity, and area deprivation revealed that individuals living in less urban environments with higher levels of deprivation, experienced shorter sleep durations as perceived stress intensity increased (ß=.15, p=.02).

Conclusions: Comprehensive approaches to sleep health are required as interventions that focus solely on individual or interpersonal level influences will likely not be sufficient in improving sleep health outcomes.

Correlates and mediational role of subjective sleep among a national community sample of Asian American women in the United States

S. Lim[1], J. Cao[1]
[1]NYU Grossman School of Medicine, New York, United States

Introduction: The COVID-19 pandemic has intensified the ongoing discrimination experienced by Asian Americans in the United States. Asian women, in particular, reported this violence at increased rates compared to Asian men. Asian women experience double marginalization as a racial/ethnic minority and as women. Studies have documented the role of discrimination and other psychosocial factors on mental health outcomes among Asian Americans, but few studies have examined their impact on sleep, especially among Asian American women. Accordingly, the objective of this study is to comprehensively understand sleep quality and disturbance among Asian American women as well as its mediational role in the relationship between discrimination and mental health disorders.

Materials and Methods: A national self-administered anonymous survey is being conducted online in the United States. Participants are eligible if they identify as an Asian adult (18 years and older) woman residing in the United States and can read and write in English. Recruitment flyers are distributed primarily through social media sites (e.g., Facebook) and a network of Asian-serving community-based organizations. Subjective sleep is measured through the Pittsburg Sleep Quality Index (PSQI). A global PSQI score and sleep components (i.e., quality, latency, duration, efficiency, disturbance, and daytime dysfunction) were calculated. Additional survey measures include discrimination, violence victimization, stress, resilience, social support, mental health outcomes, and perceived safety. Data collection started in August 2022 and is currently ongoing until June 2023 (target n=400). Using preliminary data (n=139), Pearson's chi-square tests were run to assess bivariable associations between poor sleep quality and disturbance with various health outcomes and psychosocial factors. Given the high proportion of those reporting poor sleep in our sample, we used a global PSQI score cut off of 10.

Results: The average age of the sample was 34 years. The sample was comprised of 30% foreign-born individuals and 22% of sexual minority individuals. 70% of the sample reported poor sleep based on the global PSQI score, which was significantly associated with the following factors: sexual minority status, childhood violence, gendered racial microaggressions, loneliness, lower resilience, stress, depressive symptoms, anxiety, and post-traumatic stress disorder. Loneliness, lower resilience, stress, depressive symptoms, and anxiety were consistently associated with nearly all of the sleep components. We will report on multivariable logistic regression models assessing correlates of poor sleep as well as on results from analyses assessing the role of sleep as a mediator between psychosocial factors (e.g., discrimination and perceived safety) and mental health outcomes.

Conclusions: Our study demonstrates that a high proportion of Asian women experience sleep disturbance and quality issues, which are associated with a wide range of psychosocial and adverse health outcomes. Addressing sleep may be particularly important in the context of increasing discrimination and violence against Asian American women in the United States – an under-researched and underserved population.

Correlation between positive airway pressure and medication adherence – the healthy user effect

M. Lettieri[1], W. Warren[2], R. Walter[2], C. Lettieri[3]
[1]University of Pittsburgh, Department of Bioengineering, Swanson School of Engineering, Pittsburgh, United States, [2]San Antonio Military Medical Center, Department of Pulmonary, Critical Care and Sleep Medicine, San Antonio, United States, [3]Uniformed Services University of the Health Sciences, Pulmonary, Critical Care and Sleep Medicine, Department of Medicine, Bethesda, United States

Introduction: Despite the efficacy of positive airway pressure (PAP) for the treatment of obstructive sleep apnea (OSA), adherence remains challenging and negatively impacts both therapeutic effectiveness and assessments of related outcomes. It is unclear if low adherence is solely due to intolerance of PAP, or if this reflects overall adherence with medical therapies. We sought to correlate PAP use with medication adherence to determine if poor adherence with PAP was specific to this treatment, or if it represented an overall global compliance with medical therapy.

Materials and Methods: We included 600 consecutive OSA patients treated with PAP. Objective measures of PAP use were correlated with medication adherence. We included all chronically used medications, defined as medications used daily for at least ninety days prior to PAP initiation. Medication use was verified using an electronic medical record. Regular use of PAP (PAP adherence) was defined as PAP use for ≥4 hours/night on ≥70% of nights. Medication adherence was defined as ≥70% of pills taken as prescribed.

Results: Complete records were available for 566 patients and 361 (63.8%) utilized chronic medications. The cohort was primarily men (90.3%, age 44.6±10.2 years), with moderate OSA (AHI 18.1±13.9/hr). Among patients on chronic medications, 76.7% were adherent with medications, and PAP was used on 55.8% of nights with 37.7% being regular users. Patients who were adherent with medications were also more likely to be adherent with PAP. Specifically, they used PAP more hours/night (5.4 vs. 4.6, p<0.001), for more nights (59.1% vs. 44.7%, p=0.04), and were more likely to have regular PAP use (44.7% vs. 25.1%, p-0.04) compared to those who were non-adherent with medications ($R2 = 0.5756$). Similarly, those adherent with PAP were more likely to be adherent with their prescribed medications. Specifically, PAP adherent patients used 88.8% of their medications, compared with only 74.2% among those non-adherent with PAP (p = 0.03).

Conclusions: Adherence with PAP correlated with adherence to chronic medications. Patients who were medication adherent were more likely to be PAP adherent. And, patients adherent with PAP were also more adherent with medications. Low PAP adherence may reflect an individual's global adherence to medical care. This association may lead to better identification of patients who could benefit from targeted therapy to improve overall healthcare adherence.

Current status and the influencing factors of sleep and circadian rhythms in postoperative cardiac children: a cross-sectional survey

B. Shen[1], J. Zhang[1], H. Wang[1], Q. Lin[1], S. Shi[1], Y. Xia[1], P. Fan[2], B. Zhang[1]
[1]Shanghai Children's Medical Center, Shanghai, China, [2]Shanghai Jiaotong University, Shanghai, China

Introduction: Sleep and circadian disruption (SCD) are common and severe in the ICU. SCD is likely to have a profound negative impact on patient outcomes. Thus, in this study, polysomnography (PSG) was used for the simultaneous monitoring of sleep in children after cardiac surgery to understand their sleep and circadian rhythm status and the factors affecting them.

Materials and methods: Ten postoperative cardiac patients admitted to the pediatric cardiac intensive care unit of a children's hospital in China from November 2022 to June 2023 were selected for this study. The children were continuously monitored with PSG for 24 hours before and after surgery to study the ratio of NREM stage 1, NREM stage 2, NREM stage 3, and REM stage sleep during the use of sedative and analgesic drugs and between 8 am and 8 pm on the day of discontinuation, and between 8 pm and 8 am on the next day of discontinuation.

Results: In this study, 10 children, 6 males, and 4 females, with a mean age of 5.7 years, 4 with ventricular septal defect, 5 with atrial septal defect, and 1 with pulmonary valve closure insufficiency, were investigated, and the proportion of NREM stage 2 sleep was significantly increased and REM stage sleep disappeared when sedative and analgesic drugs (midazolam and dexmedetomidine) were used. At 8 am-8 pm on the day of drug discontinuation, the average sleep duration was (209±170) minutes, and the REM phase disappeared, with N2 and N3 sleep predominating. However, from 8 pm to 8 am on the day of discontinuation, the average sleep duration was (391.3±130.97) minutes, with an overall lower sleep efficiency of (65±21)% and (23.4±19.1) natural awakenings, with shorter and more fragmented sleep duration, but the sleep structure was within the normal range: REM (7.26±6.57)%, N1 (5.27 ± 6.57)%, N2 (57.27 ± 1.37)% and N3 (29.5 ± 13.14)%.

Conclusions: After the sedative and analgesic drugs are stopped, the child regains sleep structure fairly quickly in the short postoperative period. ICU SCD is a complex and compelling potential factor for influencing ICU outcomes.

Differences in infant and parental sleep from 6 to 24 months postpartum in Australia, United States and South Korea

L. Astbury[1], S. Kyung[2], E. Jang[2], D.M. Pinnington[1,3], N. Barnett[4], B. Bei[1,5], S. Suh[2,6]
[1]Monash University, Faculty of Medicine, Turner Institute for Brain and Mental Health, School of Psychological Sciences, Nursing and Health Sciences, Melbourne, Australia, [2]Sungshin Women's University, Department of Psychology, Seoul, Korea, Republic of, [3]Royal Women's Hospital, Centre for Women's Mental Health, Melbourne, Australia, [4]Nanit Lab, New York, United States, [5]Royal Women's Hospital, Centre for Women's Mental Health, Melbourne, Australia, [6]Stanford University, Dept. of Psychiatry and Behavioral Sciences, Palo Alto, United States

Introduction: Infants undergo major changes in sleep wake patterns in the first 2 years of life. Sleep of the birthing parent is closely related to sleep of the infant and symptoms of insomnia are common during the postpartum period. Cross-cultural differences in the association between infant sleep and parental insomnia symptoms are poorly understood. This study aims to investigate cross-cultural differences in community samples of infant and parental sleep in South Korea, USA, and Australia.

Materials and Methods: Participants were 2005 infants and their parents from Australia ($n = 73$), South Korea ($n = 222$), and the USA ($n = 1710$) aged between 2.33 and 29.60 months (M_{age}= 13.82 months, $SD_{age} = 6.23$ months). Parents completed the Brief Infant Sleep Questionnaire - Revised, the Insomnia Severity Index (ISI), and the Dysfunctional Beliefs and Attitude about Sleep Scale (DBAS) at 6, 12, and 24 months postpartum. Data were analysed using multiple regressions, controlling for education level, ethnicity, and birthing parent age as covariates.

Results: Total ISI scores were 3.61 to 6.01 points higher for birthing parents from South Korea compared to those from Australia and USA at all timepoints (p's < .002). Similarly, mean DBAS scores were 0.75 to 1.27 points higher for the South Korean sample compared to the USA sample at all timepoints (p's < .007), and compared to the Australian sample at 12 and 24 months postpartum (mean scores between 0.88 and 0.95 units higher, p's < .006). Compared to the South Korean sample, infants in the US sample had significantly longer nighttime sleep duration at all timepoints (0.57 to 1.10 hours; p's < .04) and in the Australian sample at 12- (1.39 hours) and 24 (0.89 hours) months (p's < .003).The USA infants had significantly longer daytime sleep duration at 24 months postpartum compared to the South Korean infants (12 minutes, $p = 0.006$). Compared to South Korean infants, USA infants had significantly shorter sleep onset latency (SOL) at all timepoints (11.86 to 17.73 minutes, p's < .03), and Australian infants had significantly shorter SOL at 12 (14.28 minutes) and 24 (14.06 minutes) months (p's < .03).

Conclusions: Birthing parents from predominantly Asian backgrounds had higher symptoms of insomnia and dysfunctional beliefs about sleep; infants from predominantly Asian backgrounds had significantly shorter nighttime sleep and longer SOL consistent with Ahn et al. (2016) and suggests that sleep hygiene principles could be a possible explanation for these differences. Further exploration into the mechanisms of sleep changes is required to tailor future interventions for diverse backgrounds.

Different sleep problems among people living with HIV/AIDS in Iran

S. Akbarpour[1], S. Mohammad Nejad[2], A. Najafi[1]
[1]Occupational Sleep Research Center, Baharloo Hospital, Tehran University of Medical Sciences, Tehran, Iran, Islamic Republic of, [2]Department of Epidemiology, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran, Islamic Republic of

Introduction: Sleep is one of the most important around the clock cycles in the human body system, which plays an important role in physiological and psychological functions that plays a vital role in enhancing the quality of life of people living with HIV (PLWH). Although there are some studies on the prevalence of sleep problems in PLWH, no studies to date have evaluated different type of sleep patterns among a nationwide sample of PLWH in Iran.

Methods: The present study was a national cross-sectional study with 1185 people with confirmed HIV/AIDS aged ≥18 between April 2021 and March 2022. From 15 provinces in Iran. The Pittsburgh Sleep Quality Index, Berlin Obstructive Sleep Apnea (OSA) Questionnaire, Insomnia Severity Index and Epworth Sleepiness Scale were used.

Results: Overall, 1185 PLWH were included in the analysis. The average age of the participants was 35.36 (SE=0.062) years. Of these, 80.66% were men. According to the results, among 1185 participants 596 PLWH (49.63%) had poor sleep quality (score higher than 5). Also 513(42.71%) and 254 PLWH (21.15%) had insomnia and sleepiness respectively. However, 526 PLWH (44.38%) were suffering from OSA. PLWH with depression had 2.07 times and anxiety had 5.69 times more odds of being at risk for sleep problems.

Conclusion: Mental health problems such as anxiety and depression are mostly associated with sleep problems. Therefore, Policymakers, healthcare providers, and other stakeholders may seek ways to improve mental health interventions to improve sleep quality among PLWH.

Keywords: HIV/AIDS, human immunodeficiency virus, acquired immunodeficiency syndrome, sleep disorders, sleep pattern

Distal temperature and activity changes during sleep in liver transplant patients

L. Martínez-Alarcón[1], J.A. Madrid[2], M. Jover-Aguilar[3], P. Ramírez[3], G. Ramis[4]
[1]Hospital Clínico Universitario Virgen de la Arrixaca, UDICA, Murcia, Spain, [2]Universidad de Murcia. Facultad de Biología, Departamento de Fisiología, Murcia, Spain, [3]Hospital Clínico Universitario Virgen de la Arrixaca, Servicio de Cirugía, Murcia, Spain, [4]Universidad de Murcia. Facultad de Veterinaria, Departamento de Producción Animal, Murcia, Spain

Introduction: Core temperature usually drops during sleep, reaching its lowest point about 3-4 hours after the onset of sleep. Certain pathologies and climatic conditions can cause alterations in this temperature decrease and in some patients there is even a flattening of the temperature curve both distal and core. This paper provides results of temperature variation during sleep in patients who have undergone liver transplantation.

Materials and methods: Nine patients, with a mean age of 58 years; 5 men and 4 women, included in the waiting list for liver transplantation at the Hospital Clínico Universitario Virgen de la Arrixaca (Murcia, Spain) has been included in the study. Sleep-related parameters were monitored using a Kronowise K6 wrist device (Kronohealth, Murcia, Spain) and data were analysed using Kronowise 100 software (Kronohealth, Murcia, Spain). Patients wore the device on the non-dominant wrist for at least 7 days before transplantation and one year after transplantation. Data were recovered from the device and the following parameters were calculated: Temperature during sleep (^{o}C), Tª 2 hours before bedtime (^{o}C), Average activity during sleep (s), Acceleration during Sleep and Average activ. 2 H after sleep (s).

Results: The following results were obtained: 33.95 ± 0.2 and 33.54 ± 0.2 for temperature during sleep ($^{\circ}C$), 32.03 ± 0.3 and 31.27 ± 0.5 for mean temperature 2 hours before bedtime ($^{\circ}C$), 31.89 ± 0.4 and 30.48 ± 0.4 for temperature 2 hours after bedtime, 0.9 ± 0.1 and 1.34 ± 0.4 for mean activity during sleep (s), 2.46 ± 0.3 and 2.89 ± 0.3 for acceleration of movement during sleep and 13.16 ± 1.7 and 16.99 ± 2.6 for mean activity 2 hours after sleep (s).

There is a significant decrease in temperature compared to that measured before transplanting and that obtained one year after transplanting. This difference is $0.41^{o}C$ on average, being $0.71^{o}C$ 2 hours before sleep and up to $1.41^{o}C$ 2 hours after the start of sleep. On the other hand, differences in movement during sleep and the acceleration of these movements were also observed. These variations may be related to the improvement of the patients' general health and to the improvement of symptoms such as hepatic encephalopathy.

Conclusions: There is a very important impact of transplantation on the temperature decrease during sleep, notably increasing the minimum peak. This suggests that the liver may play an important role in circadian thermoregulation. Patients increase their activity during sleep one year after transplantation.

Does hospitalization for coronavirus increase the chance of severe sleep apnea?

Y. Beiriz[1], T. Pereira[1], R. Cabral[1], R. Borges[2], H. Lopes[2], M. Paixão[1], J. Gomes[1], N. Araújo[1], C. Grinfeld[1]

[1]Hospital Otorrinos de Feira de Santana, Feira de Santana, Brazil, [2]Universidade Estadual de Feira de Santana, Feira de Santana, Brazil

Introduction: Since the COVID-19 pandemic in 2020, the relationship between SARS-CoV-2 infection and its negative impacts on sleep and circadian rhythm has been investigated. Many patients infected with the COVID-19 virus present, after healing, the long COVID-19 syndrome, characterized by the appearance of several clinical alterations that persist for months after the infectious condition has remitted, such as chronic pain and cognitive impairment. Moderate to severe sleep disturbances affect about 40% of patients after COVID-19 infection. However, there are still few studies that evaluate the relationship between COVID-19 and sleep apnea.

Materials and Methods: A retrospective study was carried out with the analysis of 533 medical records of patients who underwent polysomnography at a sleep medicine reference center, and who were infected by COVID-19 at some point. Before performing the overnight polysomnography, all patients completed a questionnaire with questions about the need for hospitalization due to COVID-19, the need for orotracheal intubation, gender, age, and Body Mass Index (BMI). The polysomnography results of all patients were analyzed, and their complementary data were analyzed together using multinomial logistic regression. The study was previously approved by the Ethics Committee.

Results: the results of the regression analysis indicate that, for the evaluated sample, previous infection by COVID-19 was not associated with severe apnea. Factors such as age, sex and high BMI were identified as risk factors for sleep apnea.

Conclusions: In the present sample, the proximal factor of hospitalization due to COVID-19 was not associated with severe sleep apnea, while distal factors (age, gender and BMI) were predictors of a higher probability of hospitalization.

Acknowledgements: Thanks to the sleep medicine sector that contributed to the study

Does insufficient sleep modify the effect of uncontrolled eating on BMI? Results of a cross-sectional study with Brazilian young adults

P. de Souza Tavares[1], G. Weydmann[1], J. Ekhardt[1], R. Friedman[1], L. Bizarro[1]
[1]Federal University of Rio Grande (FURG), Human and Information Sciences Institute, Clinical and Health Psychology Laboratory, Rio Grande, Brazil

Introduction: Disordered eating behaviors and sleep patterns have been implicated in the development and maintenance of overweight and obesity among young adults. However, the role of insufficient sleep and its potential interaction with uncontrolled eating in the association with overweight and obesity remains underexplored.

Objective: The objective of this cross-sectional study was to investigate the potential interaction between insufficient sleep and uncontrolled eating behaviors in relation to Body Mass Index (BMI) categories among young adults aged 18-24 years.

Method: This cross-sectional study was performed with 334 participants aged 18-24 years (73.35% female; Mean age=20.84; SD=1.80), mostly white (89.44%), with normal body mass index (80.46%; Mean BMI= 23.85 kg/m²) and undergraduate students (88.97%). BMI was calculated from self-reported body weight and height, and participants were classified into normal and overweight/obese using the World Health Organization-BMI classification. Insufficient sleep was determined as sleeping less than 7h per day on any given week (mean duration of sleep during weekdays and weekends) assessed by the Munich Chronotype Questionnaire. Uncontrolled eating was assessed by the Three Factor Eating Questionnaire-21 and defined as extreme by scores above the 75th percentile. Logistic regression models were used for multivariate analysis. Gender, age, and minor psychiatric symptoms were included in the models as covariates. Effect modification was tested by an interaction term including uncontrolled eating and insufficient sleep.

Results: The odds of presenting BMI≥25 were 1.84 times higher between subjects who reported insufficient sleep when compared to those sleeping 7h or more (95%CI: 1.18; 3.11). Likewise, the odds of presenting overweight/obesity were 2.82 times higher in participants that were at the 75th percentile of uncontrolled eating, when compared with participants that were not (95% CI: 1.54; 5.16). Interestingly, the effect modification analysis revealed a significant interaction effect between insufficient sleep and uncontrolled eating behaviors on overweight/obesity (OR=7.68; 95%CI: 2.79; 21.07). All results were independent of gender, age and minor psychiatric symptoms.

Conclusion: Our results reveal a significant finding regarding the importance of disordered sleep in association with disordered eating and the latter's potential to lead to overweight or obesity. We observed that the interaction between insufficient sleep and uncontrolled eating has a synergistic effect on increasing the odds of being overweight or obese. This relationship suggests that insufficient sleep may act as a factor that reinforces the link between overweight and dysregulated eating behavior. It is important to acknowledge the limitations of our study: being cross-sectional in nature, it restricts our ability to establish causal relationships. To further elucidate these associations and establish causality, future research employing longitudinal designs is warranted.

Effect of antihypertensive drugs on sleep pattern and quality: A cross-sectional study

P. Gupta[1], E. Mutneja[1], R. Yadav[2]
[1]All India Institute of Medical Sciences, Pharmacology, New Delhi, India, [2]All India Institute of Medical Sciences, Cardiology, New Delhi, India

Introduction: Sleep disturbance has been linked with uncontrolled hypertension as well as with antihypertensive medicines. However, the effect of different classes of antihypertensives is not known. The present study aimed to study the effect of different classes of antihypertensive medicines on sleep quality and pattern.

Materials and methods: This present study was a cross-sectional observational study. Adults>18 years of age and either gender, taking antihypertensive medicines, were enrolled from outpatients visiting Cardiology and Geriatric departments at AIIMS, New Delhi. Sleep quality and pattern were assessed using Pittsburgh Sleep Quality Index (PSQI) scale.

Results: 1262 participants (mean age 58.1 ± 12.3 years, 64.2% males) were enrolled in the study and the overall PSQI score was 7.4±2.9. Poor sleep pattern; increased latency, disturbance, and day-time difficulty in awakening; and low sleep quality and duration were reported by 86.8% of participants. No significant association was noted with uncontrolled hypertension, but the quality of sleep was significantly poor in the geriatric age group (p=0.01). All antihypertensive medicines affected sleep quality but the difference in score was significantly high statistically for calcium channel blockers (CCB) vs. angiotensin-converting enzyme inhibitors (ACEI), angiotensin receptor blockers (ARB) and beta blockers, and diuretics versus ACEI (p-value = 0.001). The PSQI score was highest with CCBs (8±3.1) and least with ACEI (7±2.7).

Conclusions: Some classes of antihypertensive medicines affect the quality and pattern of sleep more than others, especially CCBs. To manage sleep quality and pattern effectively, it may be useful to monitor the use of different classes of antihypertensive medicines, especially among the elderly.

Acknowledgements: None

Effects of a work schedule with reduced quick returns on insomnia, sleepiness and work-related fatigue among healthcare workers: a large-scale cluster randomized controlled trial

I. Louise Rockwell Djupedal[1,2], A. Harris[1], E. Svensen[3], S. Pallesen[1,4], S. Waage[1,4], M. Birkeland[1,5], E. Sunde[1], Ø. Holmelid[1], B. Bjorvatn[4,6], Ø. Vedaa[1,2]
[1]University of Bergen, Department of Psychosocial Science, Bergen, Norway, [2]Norwegian Institute of Public Health, Department of Health Promotion, Bergen, Norway, [3]Haukeland University Hospital, Department of Human Resources, Bergen, Norway, [4]Haukeland University Hospital, Norwegian Competence Center for Sleep Disorders, Bergen, Norway, [5]National Institute of Occupational Health, Department of Work Psychology and Physiology, Oslo, Norway, [6]University of Bergen, Department of Global Public Health and Primary Care, Bergen, Norway

Introduction: In many countries the Working Environment Act entitle workers to have at least 11 hours of rest between two consecutive shifts. Despite this, 23% of European workers report having less than 11 hours off between shifts in their work schedule, which is referred to as "quick returns". Quick returns usually occur between an evening shift and a subsequent morning shift and seem particularly prevalent among healthcare workers. Although studies have shown that quick returns are associated with impaired sleep and fatigue, the causal relationship remains uncertain. We thus conducted the firs randomized controlled trial to investigate the effect of a work schedule abated of quick returns on symptoms of insomnia, sleepiness, and work-related fatigue, compared to a shift schedule that maintained quick returns.

Materials and Methods: A two-armed cluster randomized controlled trial including 66 hospital care units was conducted at a university hospital in Norway. Units with healthcare workers working rotating shifts were randomized in a 1:1 allocation ratio to a schedule abated of quick returns (intervention) or a schedule that maintained the usual number of quick returns (control) for six months. Questionnaire data was collected at baseline and towards end of the six-month intervention period and included measures of symptoms of insomnia (Bergen Insomnia Scale; BIS), sleepiness (Epworth Sleepiness Scale; ESS) and five dimensions of work-related perceived fatigue: lack of energy, physical exertion, physical discomfort, lack of motivation and sleepiness (Swedish Occupational Fatigue Inventory; SOFI). Data were analyzed using multilevel linear mixed effects models. Between-group effect sizes (Cohen's d) were calculated.

Results: In total, 1314 healthcare workers (85.2% female) from the included hospital units completed the questionnaires ($n_{intervention}$=647, $n_{control}$=667). Response rate at baseline and six-month follow-up was 49% and 42%, respectively. The intervention led to a halving of the number of quick returns from 12.97 to 6.7 per month, compared to 12.98 per month in the control group. Preliminary results show that reducing quick returns led to a small effect-size improvement on symptoms of insomnia (BIS; Cohen's d=-0.13, p=0.020) and daytime sleepiness (ESS; Cohen's d=-0.14, p=0.011), compared to the control group. In terms of work-related perceived fatigue, no effects were found.

Conclusions: Reducing quick returns in the work schedule of healthcare workers significantly alleviated symptoms of insomnia and sleepiness, compared to maintaining the usual number of quick returns. This is the first randomized trial to demonstrate a causal relationship between quick returns and sleep related outcomes. Facilitating sufficient rest time in the work schedule of healthcare workers and a stricter adherence to the Working Environment Act, can have positive effects on employees' sleep and well-being.

Effects of interventions to improve sleep for people with fibromyalgia: a network meta-analysis

J. Hudson[1], M. Imamura[1], C. Robertson[1], D. Whibley[2,3], L. Aucott[1], K. Gillies[1], P. Manson[1], D. Dulake[4], A. Abhishek[5], N. K Y Tang[6], G. J Macfarlane[2], M. Brazzelli[1]
[1]University of Aberdeen, Health Services Research Unit, Aberdeen, United Kingdom, [2]University of Aberdeen, Aberdeen Centre for Arthritis and Musculoskeletal Health (Epidemiology Group), Aberdeen, United Kingdom, [3]University of Michigan, Department of Physical Medicine and Rehabilitation, Michigan, United States, [4]University of Nottingham, Academic Rheumatology, School of Medicine, Nottingham, United Kingdom, [5]Versus Arthritis, UK, United Kingdom, [6]University of Warwick, Department of Psychology, Coventry, United Kingdom

Introduction: Fibromyalgia is a complex, chronic condition characterized by widespread musculoskeletal pain. While pain is the primary symptom, sleep problems are reported as frustrating and exhausting by people living with fibromyalgia and may worsen other symptoms. Wide-ranging treatment options are available to help promote sleep in fibromyalgia, but it remains unclear which are most effective. A network meta-analysis (NMA) comparing multiple treatments may help identify the best options to address fibromyalgia-related sleep problems.

Materials and Methods: We conducted a systematic review with NMA including randomised controlled trials of pharmacological and non-pharmacological interventions for adults, targeted to improve sleep or used for fibromyalgia pain management with potential effects on sleep. Seven databases were searched in November 2021 (Ovid Medline, Embase, PsycInfo, AMED, EBSCO CINAHL, Clarivate Science Citation Index, Cochrane Controlled Trials Register). The primary outcome was sleep quality assessed using patient-reported outcome measures validated in fibromyalgia. Secondary outcomes included: sleep efficiency, sleep duration, quality of life and adverse events. Treatments were categorised according to the mechanism of action and included four exercise categories (aerobic, strength, flexibility and mind-body; classified further into 'aquatic' or 'land-based'), and two psychological and behavioural therapy categories (PT/BT; 'sleep-focused' or 'generic'). Random-effect NMA models were fitted using WinBUGS to calculate standardised mean differences (SMD) with 95% credible intervals (CrI). Study quality was assessed using the Cochrane risk of bias tool. For the primary outcome, the certainty of evidence was assessed using the GRADE/CINeMA approach.

Results: Sixty-five studies (8247 participants, 35 intervention categories) provided data for the NMA assessing sleep quality. The majority (95%) of studies were judged at high overall risk of bias. Most (62%) compared active treatment with either placebo/sham or usual care, however not all sham interventions were adequate. Compared to placebo/sham, land-based aerobic and flexibility exercise (n=32 participants; SMD -4.69, CrI -8.14 to -1.28) and aquatic aerobic exercise (n=59; SMD -2.63, CrI -4.74 to -0.58) were likely to improve sleep quality. There was an indication that land-based strengthening exercise (n=56), sleep-focused PT/BT (n=94), electrotherapy (n=20), weight loss (n=41), dental splints (n=29), antipsychotics (n=53) and tricyclics (n=43) could improve sleep but estimates were imprecise and certainty of evidence low to very low. Improvement in QoL was observed for some form of exercise (land-based aerobic and flexibility, n=32; land-based mind-body, n=420), PT/BT (sleep-focused, n=77; generic with relaxation, n=29), multidisciplinary training (n=81), and pharmacological interventions (antioxidant, n=12; iron replacement, n=38; serotonin reuptake inhibitor, n=573; central nervous system depressant, n=881). Insufficient data assessing sleep efficiency/duration prevented meta-analysis for these outcomes. The most common adverse events after pharmacological interventions included dizziness, drowsiness, and dry mouth; adverse events after non-pharmacological interventions were trivial.

Conclusions: Specific forms of exercise may be effective for improving sleep quality in people with fibromyalgia. However, heterogeneity, imprecision, and low quality of the current evidence base preclude firm conclusions. Future studies should be properly designed and include an adequate comparator/control treatment.

Effects of REM Sleep and systolic blood pressure variability on five-year cardiovascular disease risk

M.-W. Sohn[1], J. Lobo[2], S. Ahn[3], S. Pasha[4], N. Farr[1], C.W. Kim[1], M. Goldman[5]
[1]University of Kentucky College of Public Health, Health Management and Policy, Lexington, United States, [2]University of Virginia School of Medicine, Public Health Sciences, Charlottesville, United States, [3]Vanderbilt University, School of Nursing, Nashville, United States, [4]University of Kentucky College of Medicine, Pulmonary Critical Care and Sleep Medicine, Lexington, United States, [5]Virginia Commonwealth University, Neurology, Richmond, United States

Introduction: Rapid eye movement (REM) sleep and systolic blood pressure (SBP) variability have both been linked to cardiovascular disease (CVD). During REM sleep, there is an increase blood pressure (BP) and heart rate which may share increased sympathetic activity as a common physiology with excessive SBP variability. Our objective is to examine how REM sleep and SBP variability interact in affecting CVD risks.

Materials and Methods: Data for adults aged ≥18 years who underwent In-lab polysomnography (PSG) studies at a large US academic medical center in 2010 – 2017 were used. All BP measures obtained within one year prior to the sleep study were used to compute SBP variability independent of the mean (VIM). Patients were followed for up to 5 years from the date of sleep study until October 31, 2021 to identify any CVD (ICD-10 I20 – I25, I50, I60 – I69). Studies whose duration was shorter than one hour and whose apnea-hypopnea index (AHI) was not counted by the American Academy of Sleep Medicine Rule 1.B were excluded. For patients with multiple PSG studies, the date of the first study was used as the baseline. Time to event data (the number of days from the baseline to the date of CVD incidence, death, or the end of follow-up) were modeled using Cox regression as a function of REM sleep duration and SBP variability, adjusting for patient age, sex, race and ethnicity, BMI, mean systolic BP, comorbidities, total sleep time, and AHI. Predicted hazards ratios for the 5-year CVD risk were computed for all patients and plotted against the REM sleep duration at different levels of SBP variability.

Results: We identified 2,884 patients who had 3 or more BP measures. They were 51±14 years old, 34% male, and had BMI 35.7±9.1 kg/m². On average, they slept 349±82 minutes with 61±37 minutes of REM sleep (17.7% of total sleep time). Mean SBP VIM was 0.41±0.18 with median = 0.39 (interquartile range [IQR], 0.29 – 0.50). When patients were divided into quartiles based on SBP VIM, Quartile 1 had the longest (65 minutes) and Quartile 4 had the shortest (57 minutes) time in REM sleep. The multivariable Cox model showed significant interaction between REM sleep duration and SBP VIM (p = 0.014). Increased REM sleep duration was associated with decreased CVD risk for all persons with SBP VIM ≤ 0.6. But it was associated with increased CVD risk for all persons with SBP VIM > 0.6. Only about 13% of all patients had SBP VIM > 0.6, whose SBP coefficient variation is 17.7 ± 3.2% compared to 8.9 ± 3.0% for those with SBP VIM ≤ 0.6.

Conclusions: Our results show that the association of REM sleep duration and CVD risk was significantly altered by SBP variability. Contrary to existing evidence, out data raises the possibility that longer REM sleep durations may be harmful for cardiovascular health in those with excessive SBP variability. More clinical studies are needed to better understand this complex relationship between REM sleep, SBP variability, and CVD health.

Effects of time restricted eating on sleep quality and body composition: a systematic review

B. Souza[1], A. Queiroz[1], G. Souza[1], C. de Melo[1]
[1]Federal University of Lavras, Department of Nutrition, Lavras, Brazil

Introduction: Time restricted eating (TRE) is a dietary approach that consolidates energy intake in a restricted period during the day. Is an alternative to weight loss and might be an important approach to sleep quality. In this sense, the present study aims to review the current literature related to the effects of time restricted eating (TRE) on sleep quality and body composition in adults.

Materials and Methods: Research question: "Does restricting feeding time have effects on sleep parameters and body composition in adults?", PICOS strategy was formulated: Population = adults; Intervention or Exposure = time restricted eating; Comparison = any comparator; Outcomes = sleep, body weight and body composition; Type of study = randomized or nonrandomized clinical control trials. The search was performed in Pubmed, Scopus, Web of Science (Clarivate) and BVS/Bireme databases and carried out until May 2023. The eligibility criteria were: Clinical interventions with controlled feeding time, with adults above 18 years, in the past 10 years, with any time and duration of the intervention, with or without a control group.

Results: The initial search resulted in 1685 publications. After initial screening by title and abstract only 31 studies were selected for a full reading. This step led to the exclusion of 20 studies. After double-checking our exclusion and inclusion criteria, eleven studies were included on the present systematic review. Study samples varied between 12 and 137 participants, with age between 18 and 71 years old, with predominance of female sex in nine studies. Seven studies were performed in the USA, two in Korea, one in Canada and one in China. Seven were randomized controlled trials and four were one arm clinical trials. Seven (63,6%) of the studies tested an intervention of 8h of TRE. The duration of intervention was between three days and 14 weeks, being four (36,3%) studies lasting 12 weeks. Five studies (45,5%) evaluated body composition by DXA and five by BIA, while one study used MRI. Seven studies (63,6%) used questionnaires for sleep evaluation PSQI, ISI, Munich Chronotype Questionnaire (MCTQ), Berlin questionnaire, two studies used questionnaires and actigraphy and other two used only actigraphy. All studies observed weight loss, except for one that didn't evaluate this variable. Eleven studies showed reductions in fat mass, including two studies that observed reductions in visceral fat mass. Most studies (eight) failed to find significant changes in sleep duration of quality after TRE, one found reduction in sleepiness, one study observed reduction in sleep duration (30+/-13 min) and increase in sleep latency in TRE group and, one study observed increased sleep duration after TRE.

Conclusions: TRE seems effective in weight loss and fat mass reduction but most studies found no effect in sleep parameters. Possibly these results regarding sleep might be related to the lack of standardized methods for sleep measurements.

Efficacy of Miniscrew-Assisted Rapid Palatal Expansor (MARPE) treatment to increase nasal cavity dimensions and redirect facial growth in conjunction with otorhinolaryngology and myofunctional therapy

D. Castro Poblette[1], I. Renteria[2], J. Nagore[2], N. Maya[2]
[1]Hospital Infantil Privado, Mexico City, Mexico, [2]Medica Sur, Mexico City, Mexico

Introduction: Rapid palatal expansion has been described to treat transverse maxillary deficiency with dental objectives. There is evidence who describe transitory changes on airway during the orthopedic treatment in childhood. The limitations for this treatment are the patient's age and bone maturation. Beyond midpalatine suture closure, there are surgical options to correct maxillary deficiencies, but not all patients are candidates for this type of treatment.
Miniscrew-Assisted rapid Palatal Expansion (MARPE) is a non-surgical treatment previously used for transverse maxillary deficiency. However, we study the increase of the nasal cavity on a tridimensional way, and its redirection of facial growth when obstructive respiratory problems are corrected and myofunctional therapy is provided, directly benefiting sleep quality.
Materials and methods: 7 patients (age range 9- 15 years) were studied with facial photographic profiles and
cone beam tomography. All of the patients completed the Pediatric Sleep Questionnaire (PSQ). before and after MARPE treatment. Multidisciplinary treatment included tonsillectomy, adenoidectomy and myofunctional therapy.
Results: All of the patients showed an increase in the size of the nasal cavity in a tridimensional way, projection of the middle facial third, better relationship between facial thirds and breath and sleep benefits.
Conclusions: MARPE is a treatment modality which gives a tridimensional increase of the nasal cavity and provide projection of the middle third of the face, increase the height of the nasal cavity and correct the maxillary transversal deficiency as well as redirect the mandibular body benefiting mandibular projection, balance of the facial thirds and nasal breathing when interlabial contact is achieved, the benefits and stability of the treatment it's a result of interdisciplinary work between otorhinolaryngology, maxillary orthopedics and myofunctional therapy.

Enhancing both sleep stage classification and obstructive sleep apnea event detection tasks with a unified sound-based multi-task model

V.L. Le[1], J. Kim[1], E. Cho[1], D. Lee[1], J. Hong[1], D. Kim[1], M. Lee[2], S.H. Moon[2], C. Kushida[3], J.-W. Kim[4], I.-Y. Yoon[2]
[1]ASLEEP CO., LTD, AI Core Unit, Seoul, Korea, Republic of, [2]Seoul National University Bundang Hospital, Psychiatry, Seongnam-si, Korea, Republic of, [3]Stanford University, Division of Sleep Medicine / Department of Psychiatry and Behavioral Sciences, Redwood City, United States, [4]Seoul National University Bundang Hospital, Department of Otorhinolaryngology, Seongnam-si, Korea, Republic of

Introduction: Sleep Stage Classification and Obstructive Sleep Apnea (OSA) Event Detection are two essential tasks in sleep analysis. These tasks have been approached using separate deep learning models, despite their strong correlation. In this study, we propose a unified sound-based multi-task AI model that enhances the performance of both tasks by leveraging shared information and reducing computation costs.

Materials and Methods: Our dataset comprises 2,048 recorded sleep sessions obtained from a university hospital, which were annotated using polysomnography (PSG). To facilitate analysis, we converted the audio data into mel-spectrograms representing 30-second epochs.

The proposed deep neural network model consisted of two components: a feature extractor and a transformer encoder. The feature extractor was responsible for capturing essential features required for classifying breathing patterns, and the extracted features were then fed into the transformer encoder. This transformer encoder, known for its effectiveness in handling sequential data, leveraged the relationships among consecutive epochs of the respiratory sound. In the multi-task model, both the sleep stage classification and OSA event detection tasks shared the same feature extractor, enabling them to learn valuable information from identical mel-spectrograms. However, to address the unique nuances and patterns relevant to each task, two separate transformer modules were employed as individual heads. To train the multi-task model, we initially trained two distinct teacher models individually, with each model dedicated to a specific task. Subsequently, the multi-task model was trained using both the observed labels from the PSG and the features generated by the well-trained single-task teacher models. This approach, known as distillation learning, allowed the multi-task model to learn from the collective knowledge of the teacher models and benefit from their specialized features.

Results: Our multi-task model exhibited superior performance in both tasks compared to the separately trained teachers. For the 3-class OSA detection task, we achieved a macro F1 score of 0.635, surpassing the teacher model's score of 0.633. Moreover, the sleep stage classification task demonstrated significant improvement, with a macro F1 score of 0.690 for the 4-class sleep stage classification task, compared to the teacher model's score of 0.683. Our model also achieved high agreement with the PSG golden standards, with 87.4% on OSA detection, and 71.0% on Sleep Stage classification.

Conclusions: By employing a unified sound-based multi-task model, we successfully enhanced the performance of both OSA detection and sleep stage classification tasks. Additionally, we achieved a reduction in the number of parameters in our model by nearly 50%, saving half the cost of storing and executing the tasks, thus making our solution more accessible to public healthcare. Further studies can explore the potential of this approach in other sleep-related tasks and datasets.

Enhancing robustness of a sound-based AI model for automated sleep staging: validating on unseen open dataset

J. Kim[1], K.S. Cha[1], E. Cho[1], D. Kim[1], D. Lee[2], K.-Y. Jung[3], I.-Y. Yoon[4], C. Kushida[5]
[1]ASLEEP CO., LTD, AI Core Unit, Seoul, Korea, Republic of, [2]ASLEEP CO., LTD, CEO, Seoul, Korea, Republic of, [3]Seoul National University College of Medicine, Seoul, Korea, Republic of, [4]Seoul National University Bundang Hospital, Psychiatry, Seongnam-si, Korea, Republic of, [5]Stanford University, Redwood City, California, United States

Introduction: The sound-based AI model for sleep staging has gained considerable attention as a potential solution for convenient sleep monitoring at home. To achieve its widespread adoption, it is crucial to ensure accurate performance for a diverse range of individuals. However, it requires a comprehensive training dataset that encompasses various individuals, which poses challenges in acquiring diverse sleep sound data. In this study, we addressed this challenge by introducing a training algorithm that improves the generalization capabilities of the AI model. To assess the model's robustness, specifically its generalization performance we test a model trained on data from Asian individuals using an open dataset composed of European individuals.

Materials and Methods: We trained the AI model with an additional objective, called consistency loss, to enhance the robustness of the model. This objective aimed to ensure consistent sleep stage predictions regardless of the data characteristics. By training the model with this objective, we achieved improved performance on unseen data.

We trained the model with a training dataset that consists of labeled 2574 pairs of polysomnography (PSG) and audio recordings in SNUBH. To validate the impact of different races on the model performance, the SNUBH dataset (N = 454) from Asian and PSG-Audio dataset (N = 282) from European are used as a test set (Korompili et al., 2021).

Results: For the baseline model, SNUBH dataset achieved 70.35% accuracy, while PSG-audio dataset achieved 64.96% accuracy, showing relatively low accuracy (5.39%). The proposed model showed 71.22% accuracy in SNUBH and 69.33% accuracy in the PSG-audio model, remarkably reducing the difference between the two datasets (1.89%). Weighted f1-score reveals that the proposed model (71.42% for SNUBH; 73.30% for PSG-audio) is more accurate than the baseline model (70.58% for SNUBH; 69.79 for PSG-audio) for both datasets. In subgroup analysis, a positive correlation between weighted f1-score and AHI severity was observed in both models (p < 0.01). Specifically, as compared to the baseline model (r = 0.40), the proposed model (r = 0.37) showed a relatively weak correlation. There was no significant difference by gender in both models.

Conclusions: Our study validated the performance and generalization capabilities of the model trained with the proposed objective. The model became more robust so that it maintained the performance advantage even on unseen public data. Our findings highlight the increased accuracy of the model for a wide range of individuals, providing valuable contributions to public healthcare by enhancing their overall comprehension of sleep and its impact on health and well-being.

Enhancing sleep stage prediction with breathing sound separation in home environments with sleep partners

S. Kim[1], D. Kim[1], S. Kim[1], H. Park[2], J. Hong[3], D. Lee[4]
[1]ASLEEP CO., LTD, AI Core Unit, Seoul, Korea, Republic of, [2]ASLEEP CO., LTD, Wellness Core Unit, Seoul, Korea, Republic of, [3]ASLEEP CO., LTD, CTO, Seoul, Korea, Republic of, [4]ASLEEP CO., LTD, CEO, Seoul, Korea, Republic of

Introduction: Current research on sleep stage prediction using smartphone audio data often overlooks the presence of sleep partners in home environments. Existing methods do not consider the overlap of the partner's breathing sound and the subject's breathing sound, which degrades the accuracy of sleep stage prediction. Our approach aims to improve the accuracy of predicting the sleep stage of a subject by effectively separating the breathing sound from that of the partner.

Materials and methods: We have developed a deep neural network model that separates a subject's breathing sound from a partner's. This model effectively isolates the subject's sound, and the segregated sounds are fed into our previously developed sound-based sleep stage model to obtain the results. We utilize the Sepformer, which is the state-of-the-art model for speech separation tasks, and train it by using our own datasets. We generated synthetic data by mixing breathing sound data from two people for training and testing. The separation model was trained by supervised learning with the pair of the mixed sound of two people and the sound of the subject which is the ground truth label of the separation results. We validated the model with synthetic data that have corresponding PSG results. We synthesized two-person data using sound recorded in hospital environment (N=10) with PSG and home environment (N=20) with level-2 PSG. The synthesized data (N=1000) was made by considering the diversity of distance and amplitude between subject and partner, of which 800 were used for training and 200 for testing.

Results: For the 4-class sleep stage classification task, the proposed method, which incorporates the separation model, achieved a macro F1 score of 0.592 in evaluation using synthesized data that simulates situations where two individuals sleep together in bed. A performance improvement of 6.7% was observed when compared to the result without applying separation. We conducted a further analysis with synthetic datasets generated across diverse scenarios. In situations where the sound amplitudes from both individuals were equal, the utilization of the separation model resulted in a macro F1 score of 0.468, compared to 0.43 without it. When the subject's amplitude was doubled relative to the partner's, the score increased from 0.51 to 0.559. This trend continued, with scores rising from 0.6 to 0.626 for four times the amplitude and from 0.65 to 0.669 for eight times the amplitude.

Conclusions: To enhance the Sleep Stage (SS) prediction model in home environments with a sleep partner, we used a separation model. Integrating sound separation into the SS prediction model not only provides the convenience of sleep quality measurements at home over multiple nights but also emphasizes cost-effectiveness compared to the expensive polysomnography. This will facilitate the public understanding of sleep and improve the quality of care for those with sleep disorders. Our future work will involve the collection of the real breathing sound data of two people with PSG and generate synthesized data that is as realistic as possible using virtual space and chronotype.

Evaluation of sleep habits and sleep architecture in children referred to the sleep ward of Qazvin children's hospital, Qazvin, Iran during 2016-2022

S. Jalilolghadr[1], Z. Soltantooyeh[2], A. Razzaghi[1], A. Moeeni[1], K. Khameneh Pour[1]
[1]Qazvin University of Medical Sciences, Qazvin, Iran, Islamic Republic of, [2]Shahid Beheshti University of Medical Sciences, Mofid childern s hospital, Terhran, Iran, Islamic Republic of

Introduction: sleep can serves many functions, some of which vary in importance across the human lifespan. Children sleep disorder (CSD) is one of the most common disorders in children.we aimed to determine sleep patterns and child s sleep habits among 3-10-year-old children.
Materials and Methods: The sample of this cross-sectional retrospective study included children aged 3-10 years who were referred to the sleep ward of Qazvin children's hospital due to sleep disorders. Children's sleep habits questionnaire (CSHQ) was used to investigate sleep patterns among the children.Eight main branches were also completed by the parents and compared with the results of polysomnography were identified.
Results: In this study, there were 163 children with an average age of 6.35 years (range: 3 to 10 years). 62.6% of them were male. In CHSQ subscales : mean "bedtime resistance" score was 2.08 ± 0.38 , maximum score was for "Falls asleep in own bed" and minimum score was for "Struggles at bedtime"($2.50 \pm 0.81 - 1.42 \pm 0.76$). In Sleep duration sub scale the higher score refer to "Sleeps same amount each day"(2.54 ± 0.75). the mean daytime sleepiness score was 1.60 ± 0.39 witch respectively the highest and lowest score related to "Wakes by himself" and "Riding in car" ($1.71 \pm .83 - 1.18 \pm .51$) the score for "Sleep onset delay" was $2.34 \pm .86$.
compared to the polysomnography finding children with higher score in the "bedtime resistance" subscale had lower sleep efficiency and increased N1 stage ($p < 0.05$) .
Conclusions: Considering the high prevalence CSD and its impact on children's behavioral disorders, it is recommended to conduct more studies to better understand children's sleep habits and examine its relationship with the objective findings of polysomnography and develop programs to increase parents' awareness.

Exploring the efficacy of the multi-theory model (MTM) in understanding the intention for PAP adherence among recently diagnosed sleep apnea patients

A. Chandra[1], M. Sharma[2], V. Nahar[3]
[1]Advanced Center for Sleep Disorders, Chattanooga, United States, [2]University of Nevada, Las Vegas, Las Vegas, United States, [3]University of Mississippi Medical Center, Jackson, United States

Introduction: This study aimed to evaluate the effectiveness of a fourth-generation multi-theory model (MTM) in elucidating the factors influencing the intention to initiate and maintain adherence to Positive Airway Pressure (PAP) therapy among recently diagnosed sleep apnea patients.

Materials and methods: Data were collected from 138 newly diagnosed sleep apnea patients who were prescribed PAP therapy at a private sleep center in the Southeastern United States. Participants completed a reliable and validated 41-item MTM instrument. Stepwise multiple regression analysis was conducted to assess the MTM constructs as explanatory variables for PAP adherence in the study sample.

Results: The results revealed that several MTM constructs significantly predicted the intention to initiate PAP therapy. These included participatory dialogue ($\beta = 0.17$, $p = 0.014$), behavioral confidence ($\beta = 0.48$, $p < 0.001$), and changes in the physical environment ($\beta = 0.26$, $p = 0.001$), accounting for 53.5% of the variance. Furthermore, emotional transformation ($\beta = 0.57$, $p < 0.001$), changes in the social environment ($\beta = 0.16$, $p = 0.016$), and practice for change ($\beta = 0.16$, $p = 0.047$) were significant predictors of the intention to maintain PAP therapy, explaining 60.6% of the variance.

Conclusions: The findings of this study support the utility of the MTM as a promising theoretical framework for understanding the factors influencing the intention to initiate and sustain adherence to PAP therapy among newly diagnosed sleep apnea patients.

Acknowledgements: We extend our gratitude to the study participants and the supporting institutions for their invaluable contributions to this research.

Extreme bedroom temperatures in relation to sleep health among United States women: differences by race/ethnicity and socioeconomic status

S.A. Gaston[1], D. Neo[2], W.B. Jackson II[2], D.P. Sandler[1], C.L. Jackson[1,3]
[1]National Institute of Environmental Health Sciences, Epidemiology Branch, Research Triangle Park, United States, [2]Social & Scientific Systems, Inc., a DLH Holdings Company, Durham, United States, [3]National Institute on Minority Health and Health Disparities, Division of Intramural Research, Bethesda, United States

Introduction: Temperature extremes are expected to increase due to climate change, which has implications for sleep environments – particularly those with inadequate temperature control. Both high and low temperature extremes during sleep have been associated with difficulty maintaining sleep. However, there are few empirical studies, and investigations of disparities are fewer despite the disproportionate impact of climate change and related socioeconomic burdens (e.g., limited ability to meet basic household energy needs) experienced by socially disadvantaged populations.

Materials and methods: To investigate bedroom temperature extremes in relation to multiple sleep dimensions and potential differences by race/ethnicity and socioeconomic status, we used cross-sectional data collected in 2017-2019 from eligible United States women enrolled in the Sister Study. Participants reported whether they had trouble sleeping during the past month due to feeling 'too hot' or 'too cold' as well as sleep dimensions (i.e., habitual short sleep duration [<7 hours], long sleep latency [>30 minutes to fall asleep], difficulty falling or staying asleep, sleep medication use, daytime dysfunction, and healthcare provider-diagnosed sleep apnea). Adjusting for sociodemographic and clinical characteristics, we used Poisson regression with robust variance estimation to determine prevalence ratios (PRs) and 95% confidence intervals (CIs) for each sleep dimension, overall and stratified by race/ethnicity as well as annual household income, separately.

Results: Among 34,453 women (mean±SD age=67±8.6 years), 4% self-identified as Latina, 6% as non-Hispanic Black (NHB), and 90% as non-Hispanic White (NHW), and most reported an annual household income <$100,000 USD (63%). Overall, 10% reported 'too hot' and 3% reported 'too cold' temperatures; 'too hot' was most prevalent among NHB women (16%); and 'too cold' was most prevalent among Latina women (6%). By income, 'too hot' was most frequently reported by women with an annual household income of ≥$100,000 USD (12%), and there was little variation in reporting 'too cold' temperatures. In adjusted models, women who reported either 'too hot' or 'too cold' temperatures had a higher prevalence of all sleep dimensions (PR range=1.16 [sleep apnea] – 4.57 [daytime dysfunction]). Moreover, associations between 'too hot' temperature and insomnia symptoms were strongest among Latina women (PR=2.18 [95% CI:1.91-2.50]) compared to NHB (PR=1.84 [1.66-2.03]) and NHW (PR=1.83 [1.78-1.88]) women. Associations between 'too cold' temperature and higher prevalence of both short sleep duration and sleep medication use were also strongest among Latina women. By income, associations between 'too hot' and a higher prevalence of sleep medication use were strongest among women with an annual household income ≤$49,999 USD (PR=1.52 [1.34-171]).

Conclusions: Bedroom temperature extremes were associated with a higher prevalence of all assessed poor sleep dimensions. Burden was higher among minoritized racial/ethnic groups, and certain associations were strongest among Latina women. Given potential same-source bias, objective data and additional studies are warranted. However, this cross-sectional analysis identified sleep disturbances related to bedroom temperature extremes and support temperature extremes potentially contributing to racial/ethnic and socioeconomic disparities in sleep health, especially with increasing climate change threats.

Feasibility of unobtrusively estimating blood pressure during sleep using ballistocardiography-based pulse transit times

G. Garcia Molina[1]
[1]Sleep Number, Sleep Number Labs, San Jose, United States

Introduction: Blood pressure (BP) decreases by ~20% during sleep, reaching a minimum in the first 2.5 hours after sleep onset. Decreases in BP exceeding 20% may be associated with higher risk for ischemic stroke and silent cerebral diseases. Decreases lower than 10% are associated with higher risk of myocardial infarction and stroke. To detect BP changes during sleep compared to waking hours, continuous and preferably cuffless BP monitoring is desired.

Carlson et al, 2021 made publicly available data from a bed equipped with four load-cells (LC0 to LC3) and electromechanical films (EMFit) to acquire ballistocardiography (BCG) signals from participants who also collected continuous BP using a Finometer, and electrocardiogram (ECG) signals. The goal of this research was to leverage these data to test feasibility of unobtrusively estimating BP using BCG signals from the four load-cells and one electromechanical film.

Materials and methods: The data from 40 participants (mean age: 33.9 years [SD: 14.4]; 17M/23F) consisting of individual time synchronized recordings (mean duration: 418.2 seconds [SD: 26.5 seconds]) of BCG and continuous BP signals were utilized in these analyses.

For each recording, peaks in the ECG signal (R-peaks) were detected using a wavelet algorithm. The period between two adjacent R-peaks is called interbeat interval (IBI).

Within each IBI, the time difference between the amplitude-peak locations detected in the BCGs from LC0 to LC3 with respect to the amplitude peak-location detected in the BCG from a reference EMFit were calculated in milliseconds. These four peak-location differences and the IBI duration were grouped into a five-component feature vector. These features are similar to pulse transit times which are useful in BP estimation.

The maximum BP value within an IBI is the systolic blood pressure (SBP) associated with that IBI. A boosted decision tree regression model was developed to estimate SBP based on the feature vector. The estimation of the instantaneous SBP (for each IBI) and mean SBP (across a sequence of IBIs were considered). Pearson correlation, coefficient of determination R^2, and Bland-Altman (BA) analyses were used to quantify accuracy.

Results: The entire dataset, across all 40 subjects, consisted of 18236 feature vectors (approximately 456 feature vectors per subject) each of them associated with an SBP value.

For instantaneous SBP, the Pearson correlation coefficient was 0.79 (SD: 0.04), the coefficient of determination R^2: 0.63 (SD: 0.06), BA-bias: 0.35 mmHg (SD:0.13 mmHg), BA-lower-limit: -18.9 mmHg (SD:2.37 mmHg), and BA-upper-limit: +19.6 mmHg (SD:2.36 mmHg).

For mean SBP, the Pearson correlation coefficient was 0.79 (SD: 0.008), the coefficient of determination R^2: 0.63 (SD: 0.007), BA-bias: 0.32 mmHg (SD:0.01 mmHg), BA-lower-limit: -8.79 mmHg (SD:2.23 mmHg), and BA-upper-limit: +9.45 mmHg (SD:2.22 mmHg).

Conclusions: The boosted decision tree estimates instantaneous and mean SBP with mean R^2 of 0.63. The BA limits of agreement are twice as narrow for the mean compared to the instantaneous SBP. Unobtrusively estimating mean SBP may be beneficial to detect cardiac risk which is characterized by absence of BP decrease during sleep which amounts to a change of ~20 mmHg which this algorithm can detect.

Feeling tired but not sleepy? An empirical investigation of the differentiation between fatigue and sleepiness in sleep disorder patients

S. Suh[1], R. Lok[2], L. Weed[3], A. Cho[1], E. Mignot[4], E. Leary[4,5], J. Zeitzer[2]
[1]Sungshin University, Department of Psychology, Seoul, Korea, Republic of, [2]Stanford University School of Medicine, Department of Psychiatry and Behavioral Sciences, Palo Alto, United States, [3]Stanford University, Palo Alto, United States, [4]Stanford University School of Medicine, Palo Alto, United States, [5]Axsome Therapeutics, Inc., San Francisco, United States

Introduction: Sleepiness and fatigue are common complaints among individuals with sleep disorders. The two concepts are often used interchangeably, which could cause difficulty with differential diagnosis and treatment decisions. The current study investigated the differentiation between sleepiness and fatigue in a sample of sleep disorder patients using a Random Forest (RF) machine learning approach to determine which factors best differentiated sleepiness from fatigue.

Materials and methods: The study used a subset of participants in the STAGES study (n=636), a multi-site study conducted in six sleep centers across the USA and Canada. Among 453 commonly assessed items in sleep clinics, we selected 60 subjective and objective variables that have been shown to be associated with either sleepiness or fatigue, including demographic factors, mental health, lifestyle and behavioral factors, medical history, sleep questionnaires, rest-activity rhythms (actigraphy), polysomnographic variables (PSG), and sleep diaries. Fatigue was measured with the Fatigue Severity Scale, and sleepiness was measured with the Epworth Sleepiness Scale.

Results: The age of the sample was 47.1 years (SD 14.4, range 13 to 84), predominantly Caucasian (86%), 45% female, and the most common sleep disorder diagnosis was obstructive sleep apnea (67%) followed by insomnia (16%). There was a moderate correlation between sleepiness and fatigue (r=.34). There was a higher proportion of pathological fatigue (64.9%, n=413) than excessive daytime sleepiness (42.2%, n=269) in our sample. The RF model for fatigue yielded an explained variance of 51.3%, with depression being the strongest predictor for fatigue (relative explained model variance 30%), followed by insomnia severity (11.1%) and age (6.1%). The RF model for sleepiness yielded an explained variance of 21.7%, with insomnia symptoms being the strongest predictor for sleepiness (explained model variance 12.7%), followed by depression, sleep onset latency assessed by sleep diary, and morning headaches. A *post hoc* receiver operating characteristic analysis using depression (PHQ) scores indicated depression could be used to discriminate fatigue (AUC = 0.86) but not sleepiness (AUC = 0.65).

Conclusions: The moderate correlation between fatigue and sleepiness supports previous literature that the two concepts are similar yet not orthogonal. Importantly, fatigue was more characterized by depression than was sleepiness, suggesting depression could be used to differentiate the two concepts.

Frequency of COMISA and association with quality of life in older adults

M.C. Freitas[1], C. Aguiar[1], L.H. Gonzaga[1], C.M. Guimarães[1], M. Freitas[1], C. Dias[1], C. Salles[1,2,3]
[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]Federal University of Bahia, University Hospital Professor Edgar Santos, Salvador, Brazil, [3]Jorge Amado University Center, Salvador, Brazil

Introduction: Individuals with sleep disorders tend to complain about the quantity, length, and sleep quality, which result in significant suffering and impact the quality of life. Many older adults are affected by chronic non-transmissible diseases that require constant monitoring since they have no cure. Therefore, the objective of this study was to evaluate the frequency of COMISA and its association with quality of life in older adults.

Materials and methods: This study included 101 individuals aged 65 years or older, non-institutionalized, living in Salvador-BA. Data collection was carried out online or by telephone. Older adults with limitations to participate in the research or who did not answer all the questionnaires were excluded. Assessment tools: Sociodemographic questionnaire; Pittsburgh Index (PSQI); Epworth Sleepiness Scale; WHOQOL-BREF Questionnaire. This survey is part of a larger one in which the evaluation of the older adults aged 65 years or older was defined as the first stage.

Results: In the classification described, 36 (35.6%) of the patients had no sleep disorders, 12 (11.9%) patients presented sleep-disordered breathing (SDB) without other sleep disorders, 34 (33.7%) patients had insomnia without other sleep disorders, and 19 (18.8%) patients presented insomnia comorbid to SDB (COMISA). Regarding age, there was no statistically significant difference between the groups. The mean age was 74.7 ± 7 years. The mean group BMI was 27.55 ± 5.34, and there was a statistically significant difference between the no sleep disorder vs COMISA groups (25.5 ± 3.5 vs 31 ± 6.1; p=0.015). When comparing the Pittsburgh final score, a significant difference was observed between the no sleep disorder vs COMISA groups [4.0 (3.0 - 6.8) vs 10.0 (6.0- 11.0)] and between the no sleep disorder vs insomnia groups [4.0 (3.0 - 6.8) vs 8.0 (5.0- 9.0)]. The final Epworth scale score demonstrated a significant difference between the no sleep disorder vs COMISA [5.0 (3.0- 6.8) vs 11.0 (4.0- 16.0)] and no sleep disorder vs sleep-disordered breathing [5.0 (3.0- 6.8) vs 9.0 (7.3- 13.0)] groups. When assessing the quality of life between the no sleep disorder, SDR, insomnia, and COMISA groups, it was observed that individuals in the COMISA group had statistically significant impairment in domains I, II, IV, and mean WHOQOL-BREF scores when compared to individuals without sleep disorders.

Conclusions: Through this study, it was possible to observe that 64.4% of the individuals had sleep disorders. Besides, the quality of life between the groups had a more significant commitment among the individuals in the COMISA group, especially in the physical, psychological, and environmental domains, and the average score of the WHOQOL-BREF questionnaire compared to the individuals without sleep disorders.

From pulses to sleep stages: using heart-rate variability from low-cost wearable devices for accurate four-class sleep stage classification

P. Topalidis[1], D. Heib[1], S. Baron[1], E.-S. Eigl[1], A. Hinterberger[1], M. Schabus[1]
[1]University of Salzburg, Psychology, Salzburg, Austria

Introduction: Although polysomnography (PSG) conducted by human experts is considered the "gold standard" for measuring sleep, PSG and manual sleep staging require significant personnel and time resources, making thus monitoring an individual's sleep over extended periods impractical. For this reason, we aspired to develop an innovative, cost-effective and automated sleep staging four-class (Wake, Light [N1 + N2], Deep, REM) approach, utilizing deep learning, solely using inter-beat-interval (IBI) data.

Materials and Methods: This approach involves training a multi-resolution convolutional neural network (MCNN) on IBI data from 8898 manually sleep-staged recordings of full nights. Subsequently, we used transfer learning on the IBIs from two affordable consumer wearables (an optical heart rate sensor - VS, and a breast belt - H10) and evaluated the MCNN's sleep classification, epoch by epoch (30 sec.), against PSG. In addition, using the H10 we collected daily ECG data from 49 participants experiencing sleep difficulties throughout a digital cognitive-behavioural therapy for insomnia (CBT-I) program offered via the NUKKUAA™ App, to examine the objective effects of sleep training on daily objective sleep measures.

Results: Regarding the evaluation of the MCNN sleep stage classification, we observed an overall classification accuracy comparable to expert inter-rater reliability for both devices (VS: 81%, Cohen's κ = 0.69; H10: 80.3%, Cohen's κ = 0.69). Concerning the evaluation of the digital CBT-i program, participants reported significant enhancements in subjective sleep quality and sleep onset latency at the end of the training. At the same time, there was a trend for objective sleep onset latency improvement. Weekly sleep onset latency, wake time during sleep, and total sleep time exhibited noteworthy correlations with the subjective reports.

Conclusions: Combining deep learning with suitable wearables allows continuous and accurate sleep monitoring in naturalistic settings with profound implications for answering basic and clinical research questions.

Gender differences in sleep architecture of diabetic patients on metformin with sleep apnea: an analysis of polysomnography studies

T. Baranski[1], M. Eghbali[1], A. Sahai[2], M. Varma[1]
[1]California University of Science and Medicine, Colton, United States, [2]Trika Medical Inc., Apple Valley, United States

Introduction: Sleep disorders frequently occur in patients with insulin resistance. Metformin, a commonly prescribed medication for diabetics, has a significant but incompletely understood impact on sleep architecture. The connection between metformin, sleep architecture, and gender remains an unresolved area of research. Investigating the gender-specific sleep architecture differences in insulin-resistant patients on metformin is crucial for improving the management of gender-specific sleep disturbance and, ultimately, the management of insulin-resistant-related health conditions.

Materials and methods: Overnight polysomnography was performed on female and male diabetic patients taking metformin who had presented to a sleep clinic with signs of sleep disturbance. Per AASM guidelines, sleep staging was performed by a technician and verified by a physician, both of whom were blind to the study. Stages of sleep (N1, N2, N3, REM) and sleep efficiency (Total Sleep Time/Time in Bed as a %) were compared between female and male subjects. Histograms and Shapiro-Wilk Normality Test were used to assess for normal distribution of data. As data are not normally distributed, Mann Whitney U Test was used to assess statistical significance.

Results: Per AASM guidelines, all 20 females and 9 males met obstructive sleep apnea diagnostic criteria. Female patients had an average sleep distribution of N1 2.73%, N2 60.47%, N3 13.03%, and REM 5.89% with a sleep efficiency of 79.69%. Male patients had an average sleep distribution of N1 2.60%, N2 56.72%, N3 10.41%, and REM 5.32% with a sleep efficiency of 70.73%. The results of the Mann Whitney U Test yielded no significant difference for any variables between the two groups.

Conclusion: All patients, male and female, showed alterations in sleep architecture per the AASM guidelines. The results indicate there is no significant difference in the sleep architecture between diabetic males and females with obstructive sleep apnea who use metformin. Results are limited by a small sample size and a selective sample consisting of patients presenting to a sleep medicine clinic. Despite these limitations, these results serve as an important step in the evaluation of gender-specific sleep architecture of diabetic patients on metformin. Future work is needed to delineate possible differences between these groups and to improve gender-specific care.

Genetic analysis of obstructive sleep apnea and its relationship with severe COVID-19

S. Strausz[1], J. Koskela[1], A. Bachour[2], T. Sofer[3], D.J Gottlieb[4], A. Palotie[5], T. Palotie[6], S. Ripatti[1], H.M Ollila[1]

[1]University of Helsinki, FIMM, Helsinki, Finland, [2]Helsinki University Hospital, Helsinki, Finland, [3]Division of Sleep and Circadian Disorders, Department of Medicine, Brigham and Women's Hospital, Department of Biostatistics, Harvard T.H. Chan School of Public Health, Boston, United States, [4]Division of Sleep and Circadian Disorders, Department of Medicine, Brigham and Women's Hospital, Massachusetts Veterans Epidemiology Research and Information Center, VA Healthcare System, Boston, United States, [5]University of Helsinki, Helsinki, Finland, [6]Helsinki University Hospital and University of Helsinki, Helsinki, Finland

Introduction: While patients with obstructive sleep apnea (OSA) have a higher risk for COVID-19 hospitalization, the causal relationship has remained unexplored. We aimed to understand the causal relationship between OSA and COVID-19 leveraging data from vaccination and electronic health records, genetic risk factors from genome-wide association studies (GWAS) and Mendelian randomization.

Materials and Methods: We elucidated genetic risk factors for OSA using FinnGen (N total = 377,277 individuals) performing genome-wide association. We used the associated variants as instruments for univariate and multivariate Mendelian randomization (MR) analyses and computed absolute risk reduction (ARR) against COVID-19 hospitalization with or without vaccination.

Results: We identified 9 novel loci for OSA and replicated our findings in the Million Veterans Program. Furthermore, MR analysis showed that OSA was a causal risk factor for severe COVID-19 (P=9.41x10^{-4}). Probabilistic modelling showed that the strongest genetic risk factor for OSA at the *FTO* locus reflected a signal of higher BMI, whereas BMI independent association was seen with the earlier reported *IL18R1/SLC9A4* locus and a *MECOM* locus which is a transcriptional regulator with 210-fold enrichment in the Finnish population. Similarly, Multivariate MR (MVMR) analysis showed that the causality for severe COVID-19 was driven by body mass index (BMI), (P MVMR = 5.97x10^{-6}, beta=0.47). Finally, vaccination reduced the risk for COVID-19 hospitalization more in the OSA patients than in the non-OSA controls: ARR = 13.3% vs. ARR = 6.3% in the OSA vs. non-OSA population.

Conclusions: Our analysis identified novel genetic risk factors for OSA and showed that OSA is a causal risk factor for severe COVID-19. The effect is predominantly explained by higher BMI and suggests BMI-dependent effects at the level of individual variants and at the level of comorbid causality.

Global sleep health surveillance: where are we at and what do we do next?

Y.S. Bin[1,2]
[1]University of Sydney, Charles Perkins Centre, Sleep Research Group, Sydney, Australia, [2]University of Sydney, Faculty of Medicine and Health, Sydney Medical School, Northern Clinical School, Sydney, Australia

Introduction: Although the sleep research community recognises the importance of sleep to health and wellbeing, sleep is just only emerging as an important contributor to public health. Integration of sleep (and circadian) health into health surveillance systems is necessary to collect population representative data that can inform public health policies and expenditures. This presentation aims to provide an overview of the state of surveillance of sleep around the world and to discuss Australia as a case study in advocating for more sleep surveillance.

Materials and methods: We conducted scoping review to examine the current state of sleep health surveillance around the world. We searched websites of national and international health agencies and statistics departments, the PubMed electronic database, and the internet via Google to assess if and how sleep health was included in national health surveys for 196 countries.

Results: The review revealed the inclusion of sleep health in 63 national health surveys of adults in 49 countries (25% of total). Of national surveys that considered sleep, 97% assessed Sleep Quality, 22% Sleep Duration, 21% Sleep Medications, 13% Daytime Alertness, 11% Sleep Satisfaction, 11% Sleep Disorders, and 5% Sleep Timing. Most surveys that captured Sleep Quality used standardised questionnaires for mental health such as the Patient Health Questionnaire. Unsurprisingly, high-income countries comprised the majority of countries (82%) of those that surveilled sleep.

In Australia, sleep has not been consistently surveilled; a limited set of indicators was included in 2011-2013 Australian Health Survey but omitted from 2017-2018 National Health Survey. In 2011-2013 Survey, bedtime and waketime of the night prior to interview were queried, as was use of sleep medications; while these indicators are a valuable start to sleep health surveillance, the data are not without limitations.

Advocacy by the sleep community led to a *Parliamentary Inquiry into Sleep Health Awareness in Australia* in 2018-2019. The Inquiry provided experts, organisations, and individual citizens to comment on issues that were important for the federal government to address around sleep health. A key recommendation arising from the Inquiry was that "sleep be considered alongside nutrition and physical activity" in public health efforts and these findings sparked action across government departments. The National Nutrition and Physical Activity Survey is currently underway and this Survey will collect several self-reported sleep indicators and derive sleep from an actigraphic device for a subsample of children and adults. It remains unclear whether sleep surveillance will continue into the future.

Conclusions: Sleep health surveillance is guided by a range of priorities, including relevance to the local population, the availability of guidelines, and the ability of governments to act. There is a long path ahead before sleep is well-integrated into public health systems - in Australia and elsewhere - but continuing to conduct rigorous research and supporting efforts to increase public awareness and education are key to translating that research into public health action.

How to evaluate eco-anxiety and the impact on sleep-health? Results of a psychometric study on a representative sample of the adult French population

J.-A. Micoulaud-Franchi[1,2], C. Gauld[3], P.-A. Geoffroy[4], M.-F. Vecchierini[4,2], D. Cugy[1,2], C. Gronfier[3,2], A. Dakar[2], A. Labonne[2], I. Poirot[5,2], S. Royan-Parola[6,2], S. Hartley[6], J. Coelho[1], M. Rey[7,2]
[1]Université de Bordeaux, Bordeaux, France, [2]INSV, Paris, France, [3]Université de Lyon, Lyon, France, [4]Université de Paris, Paris, France, [5]Université de Lille, Lille, France, [6]Morphée, Paris, France, [7]Université de Marseille, Marseille, France

Introduction: Eco-anxiety is a complex construct that has been created to grasp the psychological impact of the consequences of global warming. The concept needs a reliable valid questionnaire to better evaluate its impact on the risk of poor sleep health. The Eco-Anxiety Questionnaire (EAQ-22) evaluates two dimensions: 'habitual ecological anxiety' and 'distress related to eco-anxiety'. However, a version in French, one of the world's widely spoken languages, was until now lacking. We aimed to translate and validate the French EAQ-22 and to evaluate the prevalence of the level of the two dimensions of eco-anxiety and the relationship with sleep health in a representative adult sample of the French general

Materials and Methods: This study was performed under the auspices of the INSV (Institut National du Sommeil et de la Vigilance). The Hospital Anxiety and Depression scale (HAD) was administered to assess anxiety (HAD-A) and depressive (HAD-D) symptoms. Self-reported sleep quality was assessed using a single item: 'In general, how would you rate the quality of your sleep?' rated from 1: excellent, 2: very good, 3: good, 4: poor, to 5: very poor and was further categorized as good ($\leq$ 3) or poor ($\geq$ 4). Internal structural validity and external validity were analyzed.

Results: Evaluation was performed on 1,004 participants: mean age 43.47 years (SD=13.41, range: [19-66]); 54.1% (N=543) women. Cronbach's alpha coefficient was 0.934, indicating very good internal consistency. Correlation between EAQ-22 and poor sleep quality was higher for 'distress related to eco-anxiety' than 'habitual ecological anxiety' dimension of the EAQ-22.

Conclusions: This study validates the French EAQ-22 and paves the way for using the EAQ-22 as a tool for assessing eco-anxiety. Further prospective studies are now required to better evaluate the impact of eco-anxiety on sleep health.

Hybrid homomorphic encryption: the future of privacy-preserving data analytics and machine learning in sleep medicine? (HARPOCRATES)

M. Salanitro[1], T. Penzel[1], L. Rosenblum[1], J. Bowden[2], D. Krefting[2], T. Leppänen[3], A. Michalas[4], T. Kiss[5]
[1]Charité-Universitätsmedizin Berlin, Interdisciplinary Sleep Medicine Center, Berlin, Germany, [2]University of Goettingen, Goettingen, Germany, [3]University of Eastern Finland, Kuopio, Finland, [4]Tampere University, Tampere, Finland, [5]University of Westminster, London, United Kingdom

Introduction: There is a strong need for a common platform to safely access patient data across medical specialities. This has been addressed by European Commission through the "European Health Data Space" (EHDS), with the proposal for its regulations published in May 2022. The EHDS has the potential to impact sleep medicine by allowing sleep specialists from different institutions to provide a second opinion and review sleep studies. However, the EHDS will need to fulfil European Commission's General Data Protection Regulation (GDPR, 2016/679), which provides strict regulations on sharing health data amongst institutions. To date, it remains unclear how the EHDS can not only securely transfer (Krefting, et al. 2021) but also analyze data whilst following GDPR. HARPOCRATES – a Horizon Europe-funded EU project – focuses on building a solution based on the promising concept of hybrid homomorphic encryption (HHE) (Bakas, et al. 2022). HHE can be seen as an extension of homomorphic encryption (HE) that has the potential to overcome certain challenges and bring HE closer to a realization phase. HHE is a primitive that combines symmetric cryptography with HE. More precisely, using HHE, users perform local data encryptions using a symmetric encryption scheme and then outsource them to the cloud where the data is transferred to homomorphic ciphertexts without decrypting them. This means, if executed properly, operations such as sleep scoring could be performed on encrypted data without compromisation. The aim of this opinion abstract is to highlight the possibility of improving privacy-preserving data analytics and collaboration among different institutions via HHE.
Materials and Methods: In the 4-year HARPOCRATES project, we are currently developing an open-source HHE software. Following this, a trial will be conducted in a real-world cross-border data-sharing scenario in the context of sleep medicine. Three centers from different countries (Germany, Finland, and France) will share and try to successfully apply analysis methods to score the encrypted data. The main aim is to illustrate that with HHE, sleep recordings can be handled and analyzed similarly to non-encrypted data.
Results: The perceived results come in 2-fold. The first is a developed platform that provides HHE. The second is that the trial is successful in safely transferring sleep studies among the centers and that machine learning (automated sleep scoring) can be performed on the encrypted data.
Conclusions: If the following results are achieved, it would showcase the potential power of HHE and demonstrate the feasibility of conducting digitally blind evaluations on sleep data. This could be one solution for the EHDS by providing strong privacy-preserving data analytics. Furthermore, it could open avenues for traveling patients, as their medical records can be securely accessed by designated physicians in institutions worldwide, alleviating concerns about compromising data privacy. It is important to note that this concept is still in its infancy but holds the potential of being the first step to finding the safest and most secure collaboration between institutions beyond mere end-to-end encryption.

Hypoglossal Nerve Stimulation for Obstructive Sleep Apnea: a multi-institutional study demographic observations

M.M.S. Matsumoto[1,2], J. DeKloe[3], S. Park[4,1], P. Gomes de Oliveira[1], V. Padhye[1], C. Maciel de Oliveira[1], K. Gill[5], M.S. Boon[3], C. Huntley[3], R. Capasso[1]
[1]School of Medicine, Stanford University, Department of Otolaryngology-Head and Neck Surgery, Sleep Surgery Division, Stanford, United States, [2]Aeronautics Institute of Technology, Electronics Engineering Division, Sao Jose dos Campos, Brazil, [3]Thomas Jefferson University, Department of Otolaryngology - Head & Neck Surgery, Philadelphia, United States, [4]Chungnam National University College of Medicine, Department of Otorhinolaryngology-Head and Neck Surgery, Daejeon, Korea, Republic of, [5]School of Medicine, Stanford University, Sleep Medicine Division, Stanford, United States

Introduction: Hypoglossal Nerve Stimulation (HNS) offers an approach for treating moderate to severe obstructive sleep apnea (OSA), as one alternative for PAP-intolerant patients. Eligibility for HNS candidacy depends on clinical evaluation of airway anatomy, collapsibility, sleep study findings, and body mass index (BMI). Many studies published use a particular dataset (ADHERE registry). Our aim is to describe the population demographics of patients who underwent the HNS procedure.
Materials and Methods: We evaluated a cohort of 487 patients that underwent HNS surgery for obstructive sleep apnea until 2022. Patient data was collected from medical records: demographic information (age, sex, BMI), sleep test results such as polysomnography (PSG), drug-induced sleep endoscopy (DISE), medical comorbidities, physical examination, patient fatigue score and Epworth sleep score.
Results: Within this cohort, the age mean was 62.1 ± 11.7 years and patients presented an overweight classification (BMI 28.5 ± 3.7), with 28.5% females (versus 71.5% males). Among a sample of patients in the cohort (N=136), 55.9% exhibited one or more comorbidities, including coronary artery disease (CAD), hypertension (HTN), diabetes mellitus (DM), or asthma (AST).
Conclusions: This is, to the best of our knowledge, the first independent registry for review of hypoglossal nerve stimulation cases with a multi-institutional systematic analysis. This initial description presents a large volume, multi-institutional demographic observations of the HNS cohort. Further work needs to be done to define and describe long-term outcomes.

Impact of circadian misalignment based on mediating role of chronotype on impulsivity, depression, anxiety, stress, addiction potential, and boredom: a randomized clinical trial and fMRI study

M. Niroumand Sarvandani[1], B. Garmabi[2], M. Asadi[3], H. Kalalian Moghaddam[4], R. Rafaiee[5]
[1]School of Medicine, Shahroud University of Medical Sciences, Addiction Studies, Shahroud, Iran, Islamic Republic of, [2]School of Medicine, Shahroud University of Medical Sciences, Neuroscience, Shahroud, Iran, Islamic Republic of, [3]Faculty of Humanities, Arak University, Psychology, Arak, Iran, Islamic Republic of, [4]School of Medicine, Shahroud University of Medical Sciences, Physiology, Shahroud, Iran, Islamic Republic of, [5]School of Advanced Technologies in Medicine, Mazandaran University of Medical Sciences, Neuroscience, Sari, Iran, Islamic Republic of

Introduction: Shift workers usually underwent circadian misalignment, which appears when the feeding and sleep-wake cycles are desynchronized with the temporal framework organized by the internal biological clock. People differ considerably in their tolerance to shift work depending on their chronotype. The aim of this study was to obtain information about circadian disorders and chronotype (as a mediating variable) on consequent psychological problems such as impulsivity, depression, anxiety, stress, addiction potential, and boredom in students of a medical university in northeastern Iran. We also used rsfMRI to study in the group of individuals with circadian misalignment and compared with alignment group.

Materials and methods: The design of this study is a double-blind, randomized, controlled clinical trial. Thirty-five participants were randomly assigned to circadian alignment/misalignment protocols. Subjects completed questionnaires as a baseline data (pre-test) and the end of the intervention (post-test) as well as obtained data of fMRI. The instruments were Multidimensional State Boredom Scale (MSBS), Addiction Potential Scale (APS), Depression, Anxiety and Stress Scale-21 (DASS-21), and Barratt Impulsiveness-11 (BIS-11). We categorized participants based on chronotype as mediate variable within each group (circadian aligned & misaligned condition) to analyze outcomes.

Results: The mean age of participants was 21.66 years (range: 18-25 years). The function of DMN and DAN areas in the misalignment group has decreased significantly compared to the alignment group. One-way analysis of variance to compare research variables in groups based on chronotype (evening, intermediate type, and morning types) showed a significant difference between the total and non-planning impulsivity, active and passive addiction potential, between the three groups of chronotype. The results of Bonferny post hoc test to compare the mean of variables in the chronotype groups about total and non-planning impulsivity scores, active and passive addiction showed that non-planning and active addiction in persons with evening and intermediate types were significantly lower than persons with morning type.

Conclusions: Alterations in diurnal profiles of activity, sleep and feeding time, based on chronotype related to impulsiveness and bored om, and such circadian misalignment were associated with addiction potential.

Acknowledgements: The Authors would like to thank the participants for their contribution

Keywords: Anxiety, circadian, depression, stress, addiction, chronotype, boredom resting-state fMRI, dorsal attention network (DAN), default mode network (DMN)

Impact of Obstructive Sleep Apnea-related surgery on cardiovascular outcomes: evidence from a 5-year follow-up in a cardiovascular disease-free cohort

C. Maciel de Oliveira[1], S. Marques[1], M. Abdelwahab[1], L.F. Drager[2], R. Capasso[1]
[1]School of Medicine, Stanford University, Division of Sleep Surgery, Department of Otolaryngology–Head and Neck Surgery, Stanford, United States, [2]University of São Paulo Medical School, Hypertension Unit, Instituto do Coracao, Sao Paulo, Brazil

Introduction: While health systems have only begun to utilize administrative datasets to deliver personalized sleep care, there is significant potential for leveraging such data to optimize obstructive sleep apnea (OSA) treatment. The primary aim of this study is to employ advanced statistical methodologies to compare the risk of developing cardiovascular outcomes in a five-year follow-up cohort of patients without pre-existing cardiovascular disease (CVD) at Stanford Health Care Center (SHC) who underwent OSA-related surgery or not.

Materials and Methods: This study involved an initial sample of 43,373 individuals aged 18 to 65 years who had received at least two physician-assigned diagnoses of OSA based on the International Classification of Diseases (ICD-9 and ICD-10) codes and also had two or more polysomnography sleep study indicated by Current Procedural Terminology (CPT) codes. Only patients a minimum follow-up of 5 years were considered for analysis. At baseline, patients with pre-existing conditions such as hypertension, cardiac arrhythmia, congestive heart failure (CHF), myocardial infarction (MI), stroke and peripheral vascular disorders (PVD), and those who had undergone cardiovascular procedures (Percutaneous Coronary Intervention, PCI), were excluded from the analysis. PCI codes and those cardiovascular diseases codes together were defined as a CVD composite in this study. Then, the final cohort was composed of 2,444 individuals. To minimize the effects of confounding variables and provide a more reliable assessment of treatment effectiveness and patient outcomes, propensity score matching (PSM) was incorporated into the analysis, considering demographics, ICD codes, CPT codes, drug codes for adjustments. Logistic regression was used tor analyzing the relationship between independent variables and the incidence of CVD, while controlling for confounding factors. Survival analysis was also employed.

Results: At the baseline, the OSA-related surgery group (n=775) exhibited a lower mean age (39.6 ± 12.3 vs 43 ± 12.9 years; $p<0.05$), a higher proportion of male participants (63% vs 52%), and a lower average comorbidity score (0.6 ± 1.1 vs 0.8 ± 1.3). Although the incidence of CVD, after a mean period of 8.7 years follow-up, was higher in the non-surgical group, the differences were not statistically significant for all the diseases evaluated: hypertension (21.9% vs 14.3%), cardiac arrhythmia (15.6% vs 9.9%), congestive heart failure (CHF) (2.8% vs 1.8%), myocardial infarction (2.2% vs 0.8%), stroke (1.0% vs 0.3%), PCI (1.0% vs 0.3%), peripheral vascular disorders (PVD) (2.8% vs 2.3%), and the CVD composite (33.5% vs 22.3%). When Propensity Score Matching (PSM) was conducted, we observed that patients who underwent OSA-related surgery had a lower risk of developing hypertension [HR=0.45 (IC 95% 0.26 - 0.79), $p<0.05$]. The result was also significant for the composite [HR=0.52 (IC 95% 0.34 - 0.81), $p<0.05$].

Conclusion: The results obtained from a cohort with a minimum 5-year follow-up, comprising patients with OSA at Stanford Health Center and initially free from cardiovascular disease, indicate that OSA-related surgery is linked to a reduced risk of developing hypertension and composite outcomes when compared to patients who did not undergo surgery. These results highlight the potential benefits of surgical intervention in mitigating cardiovascular risks in individuals with OSA.

Impact of preferred sleep induction sounds with guided imagery on sleep initiation and sleep quality

J. Jung[1], K.S. Cha[1], J. Hong[2], S.H. Kim[1], B. Yoo[3], S. Kim[4], J. Yoo[5], D. Lee[6], J.-W. Kim[7]
[1]ASLEEP CO.,LTD, Core Unit, Seoul, Korea, Republic of, [2]ASLEEP CO.,LTD, CTO, Seoul, Korea, Republic of, [3]ASLEEP CO.,LTD, BX Unit, Seoul, Korea, Republic of, [4]ASLEEP CO.,LTD, CEO Staff, Seoul, Korea, Republic of, [5]S-OMNI, Seoul, Korea, Republic of, [6]ASLEEP CO.,LTD, CEO, Seoul, Korea, Republic of, [7]Seoul National University College of Medicine, SNUBH, Otorhinolaryngology, Seongnam-si, Korea, Republic of

Introduction: In recent years, there has been a growing interest in utilizing sleep induction sounds to facilitate ease of falling asleep and improve sleep quality. These auditory cues, often with guided imagery, are designed to cultivate a calming atmosphere for relaxation and sleep. While sleep induction sounds have gained popularity among the general public, their medical validation remains limited. Scientific studies examining the effectiveness of these techniques are relatively sparse and yield inconsistent results. Notably absent is an investigation into the potential benefits tied to individual preferences for sleep induction sounds. This study aims to address the following question: "Does the application of preferred sleep induction sounds, coupled with guided imagery, result in an improved ease of falling asleep and improved sleep quality for individuals?"

Materials and Methods: We recruited 27 participants from a primary sleep-specialized clinic in Korea. The inclusion criteria encompassed individuals aged 19-45 years, reporting sleep onset difficulty, with the Pittsburgh Sleep Quality Index's sleep onset latency (SOL) > 30 minutes and Insomnia Severity Index > 8. We incorporated a collection of 12 sleep induction sounds for guided imagery, which were tailored to distinct sleep-inducing scenarios. Participants' preferences for these sounds were determined by providing descriptive texts outlining the auditory cues during their initial visit, and participants indicated their most and least preferred sounds.

Participants were randomly allocated into three groups:

Group 1 (preferred sound),

Group 2 (non-preferred sound), and

Group 3 (no sound).

Three-day consecutive polysomnography (PSG) protocol was implemented for the study. Night 1 was excluded from analysis due to the potential first night effect in PSG. Night 2 served as an intervention-free baseline for comparison. On Night 3, Group 1 experienced PSG with preferred sleep induction sounds during the initial hour of the test. Conversely, Group 2 underwent PSG with non-preferred sleep induction sounds, while Group 3 underwent PSG in silence.

Results: We observed a significant positive correlation between SOL and the amount of improvement facilitated by sleep induction sound (i.e., the difference in SOL between Night 3 and Night 2) for both Group 1 (p-value < 0.001) and Group 2 (p-value = 0.01). Conversely, no improvement was observed for participants in Group 3 (p-value = 0.639). In Group 1, participants exposed to their preferred auditory cues exhibited a notably higher deep sleep (N3) ratio on Night 3 compared to the baseline Night 2, with a p-value of 0.014. However, for participants in Group 2 and Group 3, no significant differences in deep sleep ratio were observed between Night 3 and Night 2.

Conclusion: Our study unveiled individuals with longer SOL experienced more pronounced improvements in sleep initiation through the application of sleep induction sounds, both in preferred and non-preferred conditions. More interestingly, participants exposed to individually tailored auditory cues exhibited a significant increase in deep sleep ratio exclusively within the preferred sound group. These findings indicate the favorable impact of sleep induction sounds with guided imagery on sleep initiation. Importantly, this underscores the potential of personalized auditory interventions to improve sleep quality.

Improving mid-life healthy adult TST and SWS through personalised interventions using AI and smart devices to objectively assess individual sensitivity to behavioural and environmental factors which influence sleep

T. Frame[1,2], J. Padget[1], G. Stothart[1], E. Coulthard[3]
[1]University of Bath, Computer Science, Bath, United Kingdom, [2]University of Oxford, Nuffield Department of Clinical Neurosciences, Oxford, United Kingdom, [3]University of Bristol, Clinical Neurosciences, Bristol, United Kingdom

Introduction: 77% of UK mid-life adults suffer from short sleep – i.e. <7 hours' total sleep time (TST). This has a negative impact on their health and wellbeing. The only treatment for those who are not chronic insomniacs is 'sleep hygiene'. While sleep hygiene has had a medium effect in healthy-adult sleep tests, the research used subjective measures and lacked behaviour change techniques (BCTs) like self-monitoring. Individual sensitivity varies greatly on each dimension: e.g. one person's sensitivity to evening light can be 58x that of another (Philips et al, 2019). Slow wave sleep (SWS) may be critical for mid-life adults because it supports clearance of beta-amyloid from the brain, which reduces the risk of developing Alzheimer's Disease. There is limited research into how to increase healthy-adult SWS.

Materials and Methods: A sleep-health-intervention system was built, using smart-device and digital-diary data and closed-loop machine learning (ML) to provide personalised intervention recommendations and tracking through a digital interface. The recommendation combines a sleep-research rules-based approach with a ML assessment of an individual's sensitivity to 16 sleep-hygiene behavioural and environmental factors. Supporting rationale, combining the individual's data with sleep-research insights, is explained using messaging and images accessible to the target audience. Once an individual selects up to 3 goals, the tracker provides daily feedback as to whether they are meeting these goals, using 10 high-impact digital BCTs to support change.

The system and supporting protocols were built in collaboration with 35 healthy 40-55-year-olds (no chronic insomnia, OSA, severe anxiety or depression). First, user-interface structure, imagery and messaging wireframes were co-created with 20 participants using Yardley's Person Based Approach. Second, data-extraction interfaces and protocols were built and tested with 10 participants: a daily-digital diary, Dreem (EEG headband), Oura (tracker), LYS (light) and Sleep Angel (a sleep-environment monitor built to privately and securely measure and transmit sound, temperature, and light levels. Third, the full digital interface and then the full system with supporting protocols were built and refined with 5 participants over 3 months.

A 10-participant pilot tested the digital system and protocols. Baseline data was collected over 2 months and, if there was an opportunity to improve sleep, participants implemented their chosen interventions over 28 days.

Results: 8 participants provided sufficient quality data to proceed to baseline; 6 chose to complete an intervention.
- TST increased by 23.3 minutes (+6%) on average over baseline [95% CI: 11.0-35.7]
- SWS increased 7.5 minutes [-3.4 to +18.4], +11%
We will share our full results, the Sleep Angel device and digital-intervention interface.

Conclusions: The impact of 16 sleep-hygiene practices on TST and SWS can be quantified objectively, using smart devices and closed-loop ML. Impact of each practice is notably different for each participant.

Personalised-advice packages, incorporating BCTs and the interventions individuals are most sensitive to, can increase objectively measured TST and SWS. Compliance is markedly different for each intervention.

Incidence and burden of the obstructive sleep apnea on the Mexican health system: an analysis based on the literature

L.F. Trujillo Arenas[1], J.L. Carrillo Alduenda[2], C.S. Albertini[3]
[1]Universidad El Bosque, Public Health / Medicine, Bogotá, Colombia, [2]Instituto Nacional de Enfermedades Respiratorias - INER, Sleep Medicine Unit, Ciudad de México, CDMX, Mexico, [3]Universidad de Chile, Physical Therapy, Santiago de Chile, Chile

Introduction: Obstructive sleep apnea (OSA) is a very common condition, which is accompanied by important cardiovascular and neurocognitive complications. Despite being a public health problem, most patients around the world lack a diagnosis and therefore also lack treatment. OSA care policies in the Mexican population are heterogeneous and depend on the different resources and capacities of each of the institutions that make up the Mexican health system; To calculate possible costs and design care plans, it is necessary to know the amount of population affected. Our objective was to calculate the incidence and number of Mexican individuals affected by OSA.

Materials and Methods: It was an observational and descriptive study from secondary sources. Data on the Mexican population were obtained from the 2020 Population and Housing Census of the United States of Mexico and the National Institute of Public Health. To identify reports of the prevalence of OSA in Mexico, 2 searches were performed in PubMed: 1) obstructive sleep apnea AND prevalence And Mexico and 2) obstructive sleep apnea AND prevalence AND global burden; in both cases, they were limited to articles written in English or Spanish from the last 10 years. Articles were analyzed by title and then full text by 2 researchers, controversies were resolved by consensus, and articles with reports of prevalence in Mexico were included. The following formula was used: Cumulative incidence = prevalence of OSA / average life expectancy X million inhabitants.

Results: The population in Mexico is 125,740,638 inhabitants, of which 56,086,731 are between 30 and 69 years old and the average life expectancy was 75.5 years. 81 articles were identified, of which the following were selected: 1) Guerrero-Zúñiga et al, who reported a prevalence of 27.3% in the population at high risk of OSA, 2) Benjafield et al, who reported a prevalence in the general adult population with Apnea Hypopnea Index (AHI) ≥ 15 h^{-1} of 10.7%; and, 3) additionally, the article by Peppard et al was included, which reported prevalences of 10 and 3% in men and women (respectively) between 30 and 49 years of age and 17 and 9% in men of women between 50 and 70 years of age.

A total of 22,707,775 Mexican adults are at high risk of suffering from OSA. The burden of OSA on the Mexican health system was calculated in 6,001,280 patients with an AHI ≥ 15 h^{-1} and 840,179 patients with AHI ≥ 30 h^{-1}. The calculated incidence was 1.417 cases per million inhabitants/year. The most affected states were the State of Mexico, Mexico City, Veracruz, Jalisco, and Puebla, which contain more than 40% of the country's cases.

Conclusions: Mexico has millions of inhabitants affected by OSA and the incidence is 1.417 new cases / million inhabitants/year.

Increased percentage of water and fat after total sleep deprivation

V.M. Brant[1], A.T. Barreto[2], R. Santarelli[3], R.d.C. Guerreiro[4], E. Stieler[2], I.G. Biasibetti[2], F.R.d. Silva[5], H.d.A. Andrade[2], M.A. Neto[4], M.E.M. Martins[4], S.L. Paim[4], A.d.S. Mello[2], M.T. Mello[2]
[1]Universidade Federal de Minas Gerais (UFMG), Departamento de Fisioterapia, Belo Horizonte, Brazil, [2]Universidade Federal de Minas Gerais (UFMG), Departamento de Esportes, Belo Horizonte, Brazil, [3]Universidade Federal de Minas Gerais (UFMG), Departamento de Neurociências, Belo Horizonte, Brazil, [4]Universidade Federal de Minas Gerais (UFMG), Belo Horizonte, Brazil, [5]Multidisciplinary Center in Somnolence and Accidents (CEMSA), Belo Horizonte, Brazil

There are many factors that contribute to increased body composition, and many studies point to sleep deprivation as a determining factor in increasing body mass. (Kawasaki et al., 2023; Magee & Hale, 2012; Marshall et al., 2008; Patel, 2009; Patel et al., 2006; Patel & Hu, 2008; Taheri & Thomas, 2008). Our aim was to observe the body composition variation of military firefighters, and volunteers, in a total sleep deprivation protocol of 36 hours. For this, the volunteers were evaluated using a scale with bioimpedance tetrapolar ((Inbody 570 – Inbody Co. Ltd., Seoul - Korea) in two distinct moments: at the beginning and at the end of the sleep deprivation protocol, totaling 36 hours of deprivation. During deprivation, the volunteers did not perform vigorous physical exercises and had all their food intake controlled and observed so that their eating habits did not change. It was observed that, acutely, the individuals increased their body mass after the experiment (T-test for paired samples, statistics -8.61, $p < 0.001$, mean difference -1.477, Cohen's d -1.455) and this increase can be explained by, basically, fluid retention (T-test for paired samples, statistics -3.75, gl 34.0, $p < 0.001$, mean difference -0.671, Cohen's d -0.634) in the extracellular medium and increase the percentage of body fat in relation to muscle mass (T-test for paired samples: statistics -3 .65, $p < 0.001$, mean difference -0.671, Cohen's d -0.503).

The foods offered to the participants were not rich in sugars or sodium and other salts, and the *ad libitum* feeding model was utilized. Possibly, this fact has contributed to the increase in fat mass in the studied population. Populations that are subject to night and/or rotating work need special attention to food, as the body naturally prepares itself for the adversity caused by sleep deprivation using the energy-saving strategy.

Indoor air quality in the sleeping environments of Lisbon dwellings, Portugal – preliminary results of HypnosAIR project

S. Mendez[1], C. Gamelas[2], J. Belo[3], M. Meira e Cruz[4], S. Almeida[1], N. Canha[1]
[1]Instituto Superior Técnico, Universidade de Lisboa, Centro de Ciências e Tecnologias Nucleares, Lisbon, Portugal, [2]Polytechnic Institute of Setúbal, ESTSetúbal/IPS and CINEA, Setúbal, Portugal, [3]Instituto Politécnico de Lisboa, Centro de Investigação em Saúde e Tecnologia (H&TRC) and ESTeSL-Escola Superior de Tecnologia da Saúde, Lisbon, Portugal, [4]Cardiovascular Center, University of Lisbon, Lisbon School of Medicine, Sleep Unit, Lisbon, Portugal

Introduction: Given that people spend a third of their lives sleeping and that sleep is essential for the wellbeing, performance and health of individuals, the sleeping environments have attracted the attention of the scientific community in recent years to assess exposure levels and how they may affect sleep quality - a question that remains unanswered. In addition, this micro-environment is poorly characterised (Canha et al., 2021), leading to an inaccurate assessment of the integrated daily exposure of individuals. Most studies focus on comfort parameters (temperature and humidity) or single pollutants, such as carbon dioxide (CO_2). The characterization of indoor air quality (IAQ) during sleep faces several challenges that make it difficult to achieve (such as the noise interference of monitoring equipment in the sleep of individuals) and it is therefore essential to implement monitoring strategies that overcome them. The HypnosAIR research project (www.hypnosair.com) aims to address this challenge by providing an overview of IAQ (focusing on several parameters) in the sleeping environments of 30 dwellings in Lisbon area, Portugal. This work presents the results obtained so far.

Materials and Methods: A monitoring campaign is being done in bedrooms (occupied by two adults) of 30 selected dwellings in the metropolitan area of Lisbon (Portugal), during the sleeping hours (weeknights only). Real-time monitoring in real time is being done for: temperature, relative humidity, carbon dioxide, carbon monoxide, formaldehyde, total volatile organic compounds, particulate matter (including ultrafine particles) and black carbon. $PM_{2.5}$ sampling is also being done, using silent $PM_{2.5}$ samplers (SILENT Sequential Air Sampler - FAI Instruments S.r.l., Italy) for indoors, while for parallel outdoor sampling, medium volume samplers (MVS6, Leckel, Sven Leckel, Germany) are being used.

Results: The present work provides an overview of the IAQ assessment in the dwellings already assessed. For example, for the first 7 dwellings, mean $PM_{2.5}$ levels during sleep were found to be 8.9 ± 2.8 µg.m^{-3} (ranging from 5.1 to 14.1 µg.m^{-3}), with all bedrooms having $PM_{2.5}$ levels above than the international guideline value of 5 µg.m^{-3} recommended by the World Health Organisation.

Conclusions: HypnosAIR aims to improve the knowledge of IAQ in sleep environments, by conducting a comprehensive assessment of the different parameters that characterise the complexity of indoor air. This work will contribute to the ultimate goal of HypnosAIR, which is to understand the impact of air quality on sleep quality, considering an integrated human exposure approach.

Insomnia as a risk factor for falls in the robust older adults

K. Donato[1], M. Meira e Cruz[2,3,4], M. Gomes da Rosa[5], C. Medina[1], A. Donato[1], A. Carlos[1], C. Salles[1,6,7]
[1]Bahiana School of Medicine and Public Health, Salvador, Brazil, [2]University of Lisbon, Sleep Unit, Cardiovascular Center, Faculty of Medicine in Lisbon, Lisboa, Portugal, [3]European Sleep Center, Lisboa, Portugal, [4]College Sao Leopoldo Mandic, Campinas, Brazil, [5]University of Lisbon, Lisbon, Portugal, [6]Federal University of Bahia, University Hospital Professor Edgar Santos, Salvador, Brazil, [7]Jorge Amado University Center, Salvador, Brazil

Introduction: Aging may present changes in the macro and microstructure of sleep, contributing to the high prevalence and severity of sleep complaints in older adults. With aging, sleep becomes more fragmented and shorter in overall duration. The definition of insomnia varies according to the diagnostic criteria adopted in studies; however, it is estimated that about 30 to 48% of older adults have insomnia symptoms, and the prevalence of insomnia disorder is about 12 to 20%. This disorder may be associated with impaired cognitive function, slower motor responses, and daytime sleepiness, contributing to an elevated risk of falls in older adults with insomnia.

The objective of this study is to evaluate the association between insomnia and falls among the older adult community-dwelling population.

Materials and Methods: This study is part of a more extensive study entitled "Sleep disorders and metabolomic profile related to the occurrence of falls in older adults community-dwelling: a prospective longitudinal study". The participants were selected through a non-probability sampling approach using the snowball method. Inclusion criteria comprised robust elderly aged 65 years or over, residing in Salvador-BA, who obtained approved scores in the Clinical FunctionalVulnerability Index and in the Montreal Cognitive Assessment. Exclusion criteria were older adults living in institutions, those with neurological or osteoarticular disorders affecting balance, and those unable to understand instructions. For data collection, sociodemographic questionnaires, history of falls in the previous year, clinical questionnaires, and the Insomnia Severity Index were used.

Results: Data from a sample consisting of 77 participants were examined. Mean sample characteristics revealed a mean Body Mass Index of 26.3 ± 4.1; mean neck circumference of 38.8 ± 3.6 cm; mean abdominal circumference of 92.9 ± 11 cm; and mean age = 71.0 ± 5.0 years. Of the participants analyzed, 68.8% (n=53) were female, and 76.6% (n=59) self-declared as black or brown. In addition, 93.5% (n=72) were not taking sleep-inducing medications, and 85.7% (n=66) were not receiving psychological counseling. Within the analyzed sample, 26.3% of the participants reported having suffered at least one fall in the previous 12 months, while 21.3% of the individuals had insomnia symptoms at the time of applying the Insomnia Severity Index. When comparing individuals with and without insomnia, it was observed that insomniacs had a higher frequency of falls in the previous 12 months (62.5% vs 18.6%; $p < 0.001$), respectively.

Conclusions: The existence of insomnia was associated with a higher frequency of falls among older adults over 65 years. It is of utmost importance to focus on preventing and treating insomnia, as this can play a fundamental role in the reduction of the risk of falls and the promotion of these individuals' health and general well-being.

Insufficient sleep and late bedtime are associated with greater dietary intake in adolescent females with Polycystic Ovary Syndrome (PCOS) and obesity

S.L. Simon[1], K.J. Nadeau[1], Y. Garcia-Reyes[1], M.A. Ware[1], H. Rahat[1], N. Morelli[1], J. Lo[1], K.P. Wright Jr[2,3], M.G. Cree[1]
[1]University of Colorado Anschutz Medical Campus, Pediatrics, Aurora, United States, [2]University of Colorado Boulder, Boulder, United States, [3]University of Colorado Anschutz Medical Campus, Medicine, Aurora, United States

Introduction: High rates of obesity and dramatically insufficient sleep co-occur in today's adolescents. In adults, energy expenditure is acutely increased during in-lab sleep restriction, but a net positive energy balance is observed due to an over-compensatory increase in caloric intake. In-home sleep restriction in non-obese adolescents increases caloric intake by 10%. Polycystic ovary syndrome (PCOS) is independently associated with increased risk of obesity and related comorbidities, as well as greater sleep disturbance, yet little is known about the association between dietary behaviors and sleep in this population. The aim of the current analysis was to examine associations between dietary intake and sleep health in adolescent females with PCOS and obesity. We hypothesized that those with shorter sleep duration and later bedtimes would have greater caloric and macronutrient intake.

Materials and Methods: Cross-sectional data from 101 adolescents with female sex at birth with PCOS+obesity and study participation during the academic year were pooled from four (NCT03919929, NCT03717935, NCT03041129, NCT02157974) research studies (15.9±1.6 years, 100% Tanner 5, BMI percentile 97.6±1.9, 89% White and 44% Hispanic). Dietary intake over the past week was assessed with SEARCH Food Frequency Questionnaire, and macronutrient intake (grams of fat, protein, and carbohydrate) were calculated. One week of home monitoring with wrist-worn actigraphy and concurrent sleep diary was completed from which total sleep time (TST), bedtime, waketime, sleep efficiency (SE), and wake after sleep onset (WASO) were estimated. Participants were dichotomized by those obtaining ±7h sleep duration per night and bedtime before or after midnight. Independent samples t-tests compared differences in dietary variables between groups. Pearson correlations were used to identify associations between continuous sleep and dietary variables.

Results: This sample of adolescent females with PCOS+obesity obtained 7.2 ± 0.8h sleep per night. Thirty-eight percent of participants obtained <7h sleep, and 33% had bedtimes after midnight. Those obtaining <7h sleep reported higher caloric intake (p=0.001) and grams fat (p=0.001), protein (p<0.001), and carbohydrate (p=0.01) compared to those with >7h sleep duration. Participants with bedtimes after midnight consumed more calories (p=0.037) and grams protein (p=0.006), but there was no difference in fat or carbohydrate intake compared to those with earlier bedtimes. Significant correlations were observed between sleep variables and dietary intake, such that shorter TST, worse SE, and higher WASO were associated with higher caloric and macronutrient intake (all p<0.05).

Conclusions: Short sleep duration and bedtime after midnight were both associated with greater dietary intake in adolescent females with PCOS+obesity. Additional food intake coinciding with short sleep duration may compensate for the additional energy expenditure of increased wakefulness but is excessive in modern society when food is readily available. Higher energy intake with poor sleep health has implications for weight gain and type 2 diabetes risk. Further research is needed to investigate the impact of improved sleep health on dietary intake and health risk in this population.

Let's talk about sleep: a qualitative study on the attitude, perception, and management of insomnia in South Asian ethnic minorities in Hong Kong

D.J. Yu[1,2], C.Q.L. Lin[1,3], E.C.Y. Wong[1,4], A.C.M. Fu[1,2], S. Hussain[2], S.W.H. Chau[1,2], Y.K. Wing[1,2], R.N.Y. Chan[1,2]
[1]The Chinese University of Hong Kong, Li Chiu Kong Family Sleep Assessment Unit, Department of Psychiatry, Faculty of Medicine, Hong Kong, Hong Kong, SAR of China, [2]The Chinese University of Hong Kong, Department of Psychiatry, Faculty of Medicine, Hong Kong, Hong Kong, SAR of China, [3]University College London, Institute of Epidemiology and Health Care, Faculty of Population Health Sciences, London, United Kingdom, [4]The Chinese University of Hong Kong, Global Physician-leadership Stream, MBChB Program, Faculty of Medicine, Hong Kong, Hong Kong, SAR of China

Introduction: Insomnia is a prevalent sleep problem affecting a substantial proportion of individuals and frequently associated with psychiatric and physical health problems. In particular, ethnic minorities (EM) are disproportionately affected, with approximately 40% of South Asian EM in Hong Kong reported insomnia symptoms. Given the high prevalence rate, it is crucial to comprehend EM's attitudes and perceptions regarding sleep and insomnia, as they play significant roles in understanding help-seeking behaviors and treatment adherence.
Cognitive-behavioral therapy for insomnia (CBT-I) is recommended as the first-line treatment for chronic insomnia in adults and can be delivered effectively through different digital forms. While digital CBT-I is accessible, low-cost, and effective in improving sleep, there remains uncertainties whether a culturally adapted content could further enhance the treatment outcomes. Preliminary evidence suggests that deep-level cultural adaptation not only improve insomnia but also further enhance adherence and completion rate. This study aims to explore South Asian EM's experience in sleep disturbance and their help-seeking behavior through in-depth interview and to develop a culturally adapted digital CBT-I using a participatory approach.
Methods: Participants inclusion criteria: 1) aged ≥ 18 years, 2) South Asian ethnicities, 3) able to read and communicate in English, and 4) has been living in Hong Kong ≥ 3 months.
Procedure: Eligible participants were invited to join an individual interview, with interview questions centered around their experience of sleep disturbances, factors influencing their sleep, attitudes towards help seeking, and suggestions on how the traditional CBT-I could be adapted to fit their cultural contexts.
Data analysis: We conducted a thematic analysis to identify and categorize themes that will reflect the attitude and perception of insomnia among South Asian ethnic minorities.
Results: We completed interviews with ten participants (mean age[SD]: 32.7[8.3]; Female%: 70%; Mean ISI Score[SD]: 13.2[7.0]). Four major themes have been identified: 1) Factors contribute to sleep disturbance. A number of factors have been identified to affect sleep, with family stress as one of the main factors, particularly among female participants (e.g., "I do every, everything, I mean housework… from laundries to cooking, from cooking to shopping. I do all by myself… I got nobody."), 2) skeptical about using medicines for sleep problems (e.g., "I'm afraid they will put me on drugs… it's, I mean, it's dangerous."), 3) attitudes towards sleep do not translate into actions (e.g., "I don't tend to wake up on time… so even when the alarm rings, I try to ignore it."), and 4) digital delivery is preferred (e.g., "Most [people who can't sleep] are on their phone before bedtime, it won't take that much effort to go on the digital app.").
Conclusions: Despite having some sleep knowledge, participants often engage in suboptimal sleep habits and ignore their sleep-related issues. Participants generally accept digital CBT-I as an accessible and safe form for insomnia treatment, and acknowledge the significance of cultural adaptation in developing digital CBT-I.
Acknowledgements: We would like to extend our heartfelt thanks to all the participants who joined the study.

Meeting 24-hour movement guidelines among children with autism spectrum disorder and association with autism severity

Y. Tang[1], J. Liu[1], Z. Wang[2], Y. Deng[1], G. Wang[1]
[1]National Children's Medical Center-Shanghai Children's Medical Center, Shanghai, China, [2]Shanghai Mental Health Center, Shanghai, China

Introduction: Physical activity, screen time, and sleep duration have been linked to multiple health outcomes among children with autism spectrum (ASD). The current study aims to explore whether adherence to 24-hour movement guidelines is associated with the presence and symptom severity among ASD children.

Materials and methods: We used data from the 2018-2020 National Survey of Children's Health, a national cross-sectional, address-based survey administered annually in the US. Data of 6-17 years old ASD children and demographic-matched 2410 typically developing (TD) peers were used to compare lifestyle behaviors including sleep, physical activity, and recreational screen exposure. Furthermore, the association between lifestyle behaviors and ASD severity was analyzed with multiple logistic regression.

Results: Compared with matched TD group, ASD children were significantly less likely to meet the sleep (OR=0.83, 95%CI:0.73-0.93), physical activity (OR=0.54, 95%CI:0.47-0.63), and screen time (OR=0.44, 95%CI:0.39-0.50) guidelines. They were also less likely to meet two or all three guidelines (OR=0.47, 95%CI:0.42-0.53) versus zero or one guideline. Furthermore, ASD children who adhered to the sleep guideline were less likely to show more heavier symptom severity (OR=0.81, 95%CI:0.66-0.98). The screen time guideline only worked for the symptom severity when it was combined with adherence to the sleep guideline (OR=0.68, 95%CI:0.50-0.93). However, physical activity guideline shows no association with ASD severity. At last, compared with meeting no guideline, meeting two or three guidelines was also a protective factor for ASD severity (OR=0.69, 95%CI:0.53-0.91).

Conclusions: The findings reported here underscore the fact that children with ASD are less likely to meet 24-hour movement guidelines, and sleep as well as screen time exposure are associated with symptom severity, which suggests it is imperative to take measures to guide daily activities of ASD children in the service of improving their life quality.

Mental health during and after the COVID-19 pandemic among healthcare workers in the Total Worker Health® perspective. Psychological preliminary findings by an Italian Occupational Health Service

A. Santoro[1], R.R. Di Prinzio[1], G. Bondanini[1], M.R. Vinci[1], V. Camisa[1], F. De Falco[1], G. Dalmasso[2], S. Zaffina[1]
[1]Bambino Gesù Children's Hospital, Occupational Medicine Unit, Rome, Italy, [2]Bambino Gesù Children's Hospital, Health Directorate, Rome, Italy

Introduction: Since the beginning of COVID-19 pandemic, healthcare workers (HCWs) have undoubtedly experienced overwhelming levels of strain associated with social and occupational stressors. Psychological impact of pandemics has been widely observed in the past, particularly for frontline HCWs who particularly feel the extreme pressure of being victim of the virus or the main source of SARS-CoV-2 transmission for their families and for users.

Materials and methods: This study aimed to investigate the potential psychological effects experienced by hospital workers and their associated demographical and occupational characteristics during the COVID-19 pandemic. A cross-sectional study was carried out in a public hospital in Rome, Italy, from June 2020 to July 2021. 635 hospital workers (HCWs, administrative and technicians) were enrolled in the study. The "Psychological Injury Risk Indicator" (PIRI) questionnaire was used. Beyond demographic variables (age and gender), occupational variables were considered, including seniority, professional categories (nurses, physicians, technicians, and administrative personnel), commuting, night shifts, and agile working. The latter concerns the opportunity to work at home for more susceptible workers who are at high risk of serious sequelae and mortality in the event of SARS-CoV-2 infection because of a chronic disabling disease (the so called 'frail health status'). This further measure belongs to the COVID-19 specific disability management program carried in the hospital during the pandemic. Statistical analyses have been made using Student's T test for categorical binomial variables and analysis of variance for multi-categorical variables. Logistic regression analysis was then performed assessing the extent of the impact of the considered variables on PIRI scores.

Results: 30.6% of the sample was at risk for general psychological impairment; reduced energy recovery was found in 48.0% and sleep problems in 44.7% of them. Female workers reported a two-fold risk for potential psychological impairment compared to male colleagues. Nurses presented a three-fold risk while physicians a two-fold risk for the overall score. Additionally, physicians had a four-fold risk to develop a lack of energy recovery and a three-fold risk for chronic fatigue. Technicians showed a significant double risk for sleep problems and chronic fatigue as well as a three-fold risk for reduced energy recovery. Administrative personnel reported a tendency on sleep problems. Interestingly, agile working was a two-fold protecting factor. No-night shifters have a half risk for reporting problems in energy recovery. The measure of agile working is effective to mitigate the impacts of COVID-19 on mental health by protecting and promoting the psychological wellbeing of HCWs during and after the outbreak.

Conclusions: In the context of COVID-19 pandemic, emerging problems can lead to further risks of damage to both physical and mental health. Actions are needed to address the psychological impact by improving coping skills and resilience of HCWs for a safe and quality assistance in the Total Worker Health® perspective. In the next future, agile working approaches could be wider inserted in healthcare systems involving assistance figures too, likely providing specific training and a proper turnover of personnel.

Mixed modality training (MMT) and resistance training: impact on changes in sleep, mood, fatigue and chronotype

T.G. Alberto[1], V.M.S. De Bruin[1]
[1]Universidade Federal do Ceará, Medicina - Programa de Pós-Graduação em Ciências Médicas, Fortaleza, Brazil

Introduction: Evidence shows that the regular practice of physical activity is essential at any age, whether to prevent disease, promote health or a sense of well-being. It constitutes an important factor for maintaining health, delaying the loss of functional capacity throughout life (CIPRIANI et al., 2010; MACEDO et al., 2003); Physical exercise plays a beneficial role in mood and sleep changes, being a method of prevention and non-drug therapeutic intervention (ZUO et al., 2012; FREIRE et al., 2014; JIMÉNEZ-GARCÍA et al., 2021). This study aimed to evaluate the relationships between Mixed Modality Training MMT-CrossFit® and Resistance Training (RT) with sleep, fatigue, depressive symptoms and chronotype.

Materials and Methods: Clinical, sociodemographic, anthropometric, habits and lifestyle data of 90 individuals who practice MMT-CrossFit® and 44 who practice TR, in the city of Fortaleza, were evaluated. The instruments used were: Epworth Sleepiness Scale (ESS), Morning-Evening Questionnaire (MEQ), Insomnia Severity Index (IGI), Patient Health Questionnaire (PHQ-9) and Fatigue Severity Scale (FSS). Data were expressed as mean, standard deviation, percentage and absolute values or frequencies, when appropriate. Data were submitted to the IBM SPSS Statistics 22.0 software, with a significance level of 95% ($p < 0.05$). The study adhered to the norms of Resolution n.º 466/12 of the National Health Council.

Results: The results revealed that 57.85% of the MMT-CrossFit® group were women aged between 18 and 55 years old; and in TR, 52.3% were women, aged between 20 and 55 years. No differences were found regarding gender, age, anthropometric measurements, BMI, WHR, weekly frequency of activity practice, training schedules, alcoholism and smoking habits, as well as clinical data on Systolic and Diastolic Blood Pressure, Heart Rate and Frequency Respiratory. There were no differences between groups regarding excessive daytime sleepiness, insomnia, depressive symptoms and chronotype. However, the group that practiced RT showed more fatigue ($p = 0.01$). It was observed that regardless of the sport practiced, the group with afternoon preference had a higher incidence of insomnia ($p < 0.001$) and depressive symptoms ($p < 0.05$).

Conclusions: This study emphasizes the importance of considering factors such as sleep, circadian rhythm, fatigue and depressive symptoms when planning changes in habits regarding the adjustment of sports practice schedules, the type of training, its duration and intensity, considering the individual variables of age, gender and chronotype. Such measures aim to optimize performance and ensure a more adequate response from the body to physical exercise, reflecting on better sleep quality, better physical and cognitive performance in exercise and sport.

Multidimensional sleep health and long-term cognitive decline in community-dwelling older men

C. Cavaillès[1], K. Yaffe[1,2,3], T. Blackwell[4], D. Buysse[5], K. Stone[4], Y. Leng[1]
[1]University of California, San Francisco, Department of Psychiatry and Behavioral Sciences, San Francisco, United States, [2]University of California, San Francisco, Department of Neurology and Epidemiology, San Francisco, United States, [3]San Francisco Veterans Affairs Health Care System, San Francisco, United States, [4]California Pacific Medical Center, Department of Research Institute, San Francisco, United States, [5]University of Pittsburgh School of Medecine, Department of Psychiatry, Pittsburgh, United States

Introduction: Individual sleep characteristics have been associated with cognitive decline, Alzheimer's disease, and related dementias. However, sleep can be measured across multiple dimensions, and studies examining the association between multidimensional sleep (a more comprehensive integration of sleep parameters) and cognitive decline are lacking. Therefore, this study aimed to examine the longitudinal association between a multidimensional sleep health assessment and subsequent cognitive decline over 10-12 years in community-dwelling older men.
Materials and Methods: We examined 2,811 older men (aged 76.0 ± 5.3 years) without dementia at baseline, recruited from the Osteoporotic Fractures in Men Study (MrOS) Sleep Study. Sleep characteristics over the past year were self-reported and categorized as "good" or "poor" based on the five sleep dimensions of the Satisfaction, Alertness, Timing, Efficiency, and Duration (SATED) scale. A multidimensional measure of sleep health was derived by summing the number of "poor" dimensions, with total scores ranging from 0 to 5 and higher scores indicating poorer sleep health. Cognitive function was assessed at up to four follow-up timepoints using the Modified Mini-Mental State Examination (3MS) as a measure of global cognition and the Trails B for executive function. Random effects models were performed to examine the association between multidimensional poor sleep health, its dimensions, and change in cognitive function over the follow-up.
Results: After adjusting for demographic and health-related covariates, men with none, 1-2, and 3-5 "poor" sleep health dimensions had a 10-year change score in 3MS of 2.9, 4.0 and 3.5 points (p-trend=0.05), and in Trails B completion time of 36.7, 42.7, and 46.7 seconds (p-trend<0.01), respectively. When individual sleep health dimensions were examined, Poor Efficiency was associated with a decrease in 3MS score after multivariable adjustment (4.5-point and 3.3-point decrease for "poor" and "good" categories, respectively), whereas Poor Timing was associated with an increase in Trails B completion time (48.7-second and 40.0-second increase for "poor" and "good" categories, respectively).
Conclusions: A multidimensional measure of sleep health was associated with greater cognitive decline in both global cognition and executive function. The SATED scale is a simple measure and easy to assess on a large scale, making it a promising tool at the population level to evaluate sleep health as an early marker of cognitive decline in late life.

Multidimensional sleep health is associated with worse cardiometabolic health in adolescent females with Polycystic Ovary Syndrome (PCOS) and obesity

S.L. Simon[1], K.J. Nadeau[1], Y. Garcia-Reyes[1], M.A. Ware[1], H. Rahat[1], N. Morelli[1], J. Lo[1], K.P. Wright Jr[2,3], M.G. Cree[1]
[1]University of Colorado Anschutz Medical Campus, Pediatrics, Aurora, United States, [2]University of Colorado Boulder, Boulder, United States, [3]University of Colorado Anschutz Medical Campus, Medicine, Aurora, United States

Introduction: Polycystic ovary syndrome (PCOS) impacts 10-15% of females and is associated with increased risk of obesity, type 2 diabetes, and cardiovascular disease. Adolescents with PCOS demonstrate greater objective and subjective sleep disturbance compared to BMI-similar controls. Individual components of sleep health, including short sleep duration and late bedtime, have been associated with greater cardiometabolic risk in adolescents with and without PCOS. Examination of sleep health, a construct comprised of multiple dimensions of sleep functioning, may provide a more holistic understanding of sleep among adolescents with PCOS+obesity. The goal of the current analysis was to examine associations between multidimensional sleep health with cardiometabolic health parameters in adolescent females with PCOS+obesity.

Materials and Methods: Data from 101 adolescents assigned female sex at birth diagnosed with PCOS+obesity and with study participation in one of four studies occurring during the academic year were analyzed (NCT03919929, NCT03717935, NCT03041129, NCT02157974). Participants completed the Sleep Disorders Scale for Children (SDSC) and wore wrist-actigraphy at home for one week prior to an in-laboratory study visit that included vital signs, fasting labs (glucose, insulin, lipid panel, highly sensitive c-reactive protein [hs-CRP] and androgens), an oral sugar tolerance test (OSTT, 75 grams of glucose + 25 grams of fructose), and MRI (Dixon method, Seimans 3T Skyra) to assess live fat fraction. A multidimensional sleep health risk score was derived based on empirically supported "healthy" or "unhealthy" ratings on 4 sleep dimensions: duration (±7h/night), timing (bedtime ±midnight), efficiency (SE; ±85%), and sleep disorders symptoms (SDSC score ±39). Pearson correlations examined associations between multidimensional sleep health score and cardiometabolic health variables. Independent t-tests assessed differences in health variables by each sleep health score component.

Results: The cohort was 15.9±1.6 years old, 100% Tanner 5, BMI %ile 97.6±1.9, majority white (89%), and 44% Hispanic. Thirty-seven percent of participants had a sleep health risk score of ≥3, indicating at least 3 of 4 sleep health dimensions rated as poor. A higher sleep risk score correlated with higher HOMA-IR (r=0.26, p=0.01), indicating lower insulin sensitivity, as well as higher total cholesterol (r=0.21, p=0.037) and LDL (r=0.22, p=0.03). Examining the individual sleep health components separately, those obtaining <7h sleep duration had higher total testosterone (p=0.04) and percent liver fat (p=0.049). Those with SE <85% had higher triglycerides, triglyceride/HDL ratio, mean OSTT insulin area under the curve, and higher diastolic blood pressure, and lower 1/fasting insulin, (all p<0.05). Those with an SDSC ≥39 had higher LDL, hs-CRP, and HOMA-IR (all p<0.05). No differences in health variables were found for bedtime before or after midnight.

Conclusions: Multidimensional sleep health factors were collectively and individually associated with lower insulin sensitivity and worse cardiometabolic health in adolescent females with PCOS+obesity. Given the increasing prevalence of PCOS and the preponderance of poor sleep health in adolescents, additional research examining the impact of improving sleep health in this population is warranted.

Musical medleys designed for sleep increase objectively measured deep sleep and reduce wake

H. Rus[1], S. Danoff-Burg[1], E. Gottlieb[1], M. Weaver[1], K. Carmon[1], D. Upadhyaya[1], D. Lara Ledesma[1]
[1]SleepScore Labs, Carlsbad, United States

Introduction: The use of sedative music to improve pre-sleep affect and increase parasympathetic tone is a non-invasive, budget-friendly, and easily accessible intervention that has the potential to improve sleep outcomes for a broad range of populations. Empirical research is needed to determine what type of music is most beneficial for which individuals. The current study is a first step in that program of research.

Materials and Methods: Healthy adults (60% female, ages 18-55) participated in a 3-week field study, using a counterbalanced pre-post intervention design. Following a 1-week baseline period with no music, participants listened to two proprietary medleys designed for sleep for one week each, with half the sample listening to Medley 1 first and half the sample listening to Medley 2 first before switching to the other. Objective sleep was measured nightly using SleepScore Max, a non-contact, bedside radar device validated against PSG. Perceived sleep was measured daily and pre-post using surveys. Multilevel regression and paired t-tests were used to test for statistical significance.

Results: Over 772 total nights of sleep across 47 participants were analyzed. Each medley improved both objectively measured sleep and self-reported sleep. The medleys affected sleep somewhat differently.

Compared to no music, Medley 1 was associated with more deep sleep measured in minutes (12% increase) and as a proportion of the night (2% relative increase) and higher BodyScore, an age- and sex-normalized measure of deep sleep (4% increase); less WASO as a proportion of the night (2% relative decrease); higher sleep efficiency (2% relative increase) and sleep maintenance (2% relative increase); all ps<.05. Compared to no music, Medley 2 was associated with higher SleepScore, an aggregate objective measure of sleep quality (3% increase); more deep sleep measured in minutes (7% increase) and as a proportion of the night (1% relative increase), and higher BodyScore (2% increase); less WASO measured in minutes (15% decrease) and as a proportion of the night (2% relative decrease); higher sleep efficiency (2% relative increase) and sleep maintenance (2% relative increase); all ps<.05. A head-to-head analysis showed that neither medley was better than the other for improving objective sleep, perhaps because any potential differences in the impact on sleep between medleys were too small to detect with this sample size. Self-report results mirrored the objective results; additionally, participants felt sleepier at bedtime, felt they fell asleep faster, and woke up feeling well-rested when listening to both medleys compared to no music; all ps<.05.

Conclusions: Each medley showed significant improvement in aspects of both objective sleep (e.g., time spent in deep sleep) and self-reported sleep (e.g., perceived sleep quality). However, overall, neither medley was better than the other for improving sleep. Future research directions include a larger sample to increase the likelihood of detecting potential between-medley differences, a non-music sound control condition, and testing additional musical elements.

Napping: its importance for airline pilots

I.T.A. Sampaio[1], F.M. Fischer[1]
[1]University of São Paulo, School of Public Health, São Paulo, Brazil

Introduction: Recovering sleep through naps, or preemptively taking a nap to anticipate potential sleep restriction or extended wakefulness, is the strategy considered most appropriate in the individual management of fatigue. The aim of this study was to describe cycles of sleep and activity of airline pilots in their normal routines considering the irregular working shifts.

Materials and methods: Fifty-one Brazilian airline pilots (7 female), mean age 40.2 (+-10.12), were monitored with actigraphs for 15 consecutive days during both work and free days (two-pilot crew, mostly domestic flights). They also filled out sleep logs and rated sleep quality from 1 to 10. The data collection took place from December 2021 to May 2022.

Results: There were 229 episodes of napping out of the 753 days monitored. Among them, there were 24 second nap episodes between two main sleep episodes. The naps primarily occurred during the rest time after shifts that encroached the night period (00h00-06h00, 33.6%) and that started early in the morning (06h01-07h59, 11%). Naps were also observed in days off (21.4%), after morning shifts (08h00-11h59, 2.2%) and before night (00h00-06h00, 6.6%), evening (18h00-23h00, 4.4%) and afternoon shifts (12h00-17h59, 2.2%), and during stand-by (5.8%) and positioning (5%). Furthermore, naps were reported in-flight (7.8%), mostly during early-starting and overnight shifts (61%). Napping episodes led to an average increase of 44 minutes in the total sleep duration (p=0.00102). The mean of the main sleep duration immediately before the naps was 364.9 minutes (+- 116.9), while the mean of the main sleep not followed by naps duration was 465.8 minutes (+-111.2). The mean of napping duration of the first episodes was 99.5 minutes (+-70.4) and the second was 97.21 (+-52.6). When considering the working shifts preceded by naps of at least 30 minutes, the average time awake before the duty was reduced by approximately one hour, from 4.5 to 3.5 hours. According to the reporting time for work, naps were responsible for reducing time awake of an average of two hours for duties starting between 18h00 and 23h59 (from 11.15 (+- 3.65) to 9.18 (+-4.57) hours, p<0.05). Regarding sleep quality, naps were rated lower than the main sleep episodes preceding them (6.70 (+-1.91) versus 7.29 (+-1.77), respectively, p<0.001), while the main sleep episode not followed by naps received higher ratings (7.65 (+-1.65), p< 0.001).

Conclusions: Naps significantly interfered with the total sleep duration and the time awake among airline pilots. They improved total sleep time and reduced time awake before flight duties. Despite the lower ratings atributed to napping sleep quality, we can support that strategic naps help reduce sleep debt. The current Brazilian regulation does not comprise controlled rest into the flight deck although naps have been reported during flights.

Neighborhood noise and child sleep: insights from objective sleep data

S. Thakur[1], M. Lucchini[1], D. Macia[1], N. Barnett[1], S. Berger[2]
[1]Nanit Lab, New York, United States, [2]City University of New York, New York, United States

Introduction: Based on a socioecological model, several factors at different levels affect sleep. At the level of the environment, many neighborhood characteristics play a crucial role, such as light, green spaces, temperature and noise. Although research has been conducted on the effects of neighborhood noise on adult sleep, there remains a remarkable scarcity of studies investigating the specific implications of noise exposure on child sleep. The few studies that have explored the effects of noise on children's sleep, have mostly relied on parental reports of child sleep. The aim of this study was to explore the association between neighborhood noise and objective infant sleep data.

Material and methods: A total of 134 families of infants aged 5-18 months (10.3 ± 3.23) from the Greater New York City area participated in a study which was conducted during the summer of 2023. The parents reported on perceived noise disturbance on their child's sleep during the night and completed the Brief Infant Sleep Questionnaire-Revised (BISQ-R). Objective sleep data of the infants and parent nighttime visit information was collected using Nanit baby monitors for 2 weeks (average 10.93 nights per infant).

To examine the relationship between objective total nighttime sleep (TST), parental visits and parent-reported longest stretch of sleep with perceived noise, linear regression analysis was employed. Additionally, logistic regression was used to identify associations between perceived noise and parent-reported sleep onset latency (SOL). Infants's age was included as a covariate in all analyses.

Results: Nineteen percent of parents reported that noise during the night disturbed their child's sleep and the average age of the children in this group was not significantly different from those who did not report noise disturbance. Main causes of noise reported were loud vehicles, loud neighbors, firecrackers and construction work after regular hours. Children whose parents reported no impact of nighttime noise on their child's sleep exhibited significantly longer TST, on average 52 minutes longer per night ($p < 0.001$), and experienced fewer objective parental visits (1.14) during the night compared to those whose parents reported sleep disturbances caused by noise at night (3.27) ($p < 0.001$). The former group also reported the longest stretch of sleep to be on average 2 hours and 23 minutes longer than the latter group ($p < 0.001$). Parents who reported nighttime noise disturbances were also 2.5 times more likely to report their child taking more than 15 minutes to fall asleep compared to parents who reported no disturbances ($p = 0.035$).

Conclusion: This study provides preliminary evidence on the significant impact of nighttime neighborhood noise on infant sleep patterns. Given the importance of sleep in infancy and early childhood for optimal neurodevelopment, information on upstream determinants of optimal sleep is relevant to develop interventions and for appropriate public policies. One strength of the study is the inclusion of objective sleep metrics, but future studies should be conducted on a larger population and include objective noise measurements.

Noninvasive device for sleep tracking and adherence to the treatment based on detection of physiological and environmental variables

S. Mejía[1], I.C. Muñoz[1], F. Castaño[1], A.M. Hernández[1]
[1]Universidad de Antioquia, Bioinstrumentation and Clinical Engineering Research Group—GIBIC, Bioengineering Department, Medellín, Colombia

Introduction: Sleep is one of the basic physiological processes for human survival, therefore, sleep loss and sleep quality are global health concerns. Recent reports show 62% of adults around the world say they do not sleep as well as they would like and 67% report sleep disturbances at least once every night. Some studies have shown poor sleep could cause health and mental conditions such as diabetes, hypertension, depression, and anxiety; so, interventions from medical treatment and new selfcare technologies are need it. Polysomnography is the gold standard method for sleep study in the diagnosis stage, but its weaknesses are well known and their implementation in the patient following to promote the adherence to treatment is limited. New devices have been developed to track sleep at home. *SmartBedding* is a self-developed bedsheet device which includes pressure, moisture and temperature sensors, accelerometers, and microphones for data collection during night focus in sleep tracking and treatment adherence. This paper reports preliminary results in the identification of bed position, sleep stages, events that disrupt sleep, and respiratory sounds and their correlation with sleep quality.

Materials and Methods: Ten volunteers were connected, overnight, to polysomnography equipment (Natus® Quantum™) where EEG, ECG, pulse oximetry, airway flow, and mandible electromyographic signals were recorded according to the AAST Technical Guideline standard. For EEG signals, 8 electrodes were in head and 4 in face for ocular movement information; pressure-based sensors (FM2 TriplePlay™) were used for air flow signal acquisition, and 3 surface electrodes at the mental and submental space were located to determine the level of muscle tone. At the same time, the *SmartBedding* device was placed between the mattress and the user's bedsheet for data acquisition. All data were digitally processed using time, frequency, and machine learning techniques. Both polysomnogram and SmartBedding data were compared through statistical techniques.

Results: Respiratory and cardiac frequency, sleep position and events that disrupt sleep during night could be detected using the *SmartBedding* sensed data during night. Those variables in conjunction with temperature, moisture, environmental and respiratory sounds provide enough information to detect the sleep position, sleep stages, wakeup events and snoring. The data validation using polysomnography showed a good approximation.

Conclusions: According to the preliminary validation results, the data collected from the *SmartBedding* device provides enough information to detect inbed position, sleep stages, events that disrupt sleep and snoring. This information not only will permit the fitting of a mathematical model to estimate sleep quality, but also, providing valuable information to make decisions to improve sleep health, all these facilitating the tracking and development of tools focused on the adherence of the patient to the treatment.

Novel metabolic disturbance following noise-induced sleep fragmentation: a pilot study

M. Smith[1], A. Nause[1], M. Basner[2], S. Fredriksson[1], D. Malmodin[3], A. Bay Nord[3], K. Persson Waye[1], N. Vincens[1], M. Younes[4], D. Zou[5]
[1]University of Gothenburg, School of Public Health and Community Medicine, Institute of Medicine, Gothenburg, Sweden, [2]University of Pennsylvania, Unit for Experimental Psychiatry, Division of Sleep and Chronobiology, Department of Psychiatry, Perelman School of Medicine, Philadelphia, United States, [3]University of Gothenburg, Swedish NMR Centre, Gothenburg, Sweden, [4]University of Manitoba, Sleep Disorders Centre, Winnipeg, Canada, [5]University of Gothenburg, Center for Sleep and Vigilance Disorders, Gothenburg, Sweden

Introduction: Epidemiological studies show associations between chronic traffic noise exposure and cardiometabolic disorders and disease, but the pathophysiological pathways in the noise-sleep-disease relationship remain unclear. A potential intervention to mitigate effects of night-time noise are so-called "white noise machines/sound apps", which may improve sleep by masking traffic noises that would otherwise disturb sleep. However, evidence for the efficacy of noise as a sleep aid is mixed. We here investigate the mechanisms linking noise-induced sleep disruption with the development of disease, and the mitigation afforded by sound masking.

Materials and methods: N=12 young, healthy individuals (mean±SD 23.6±2.4 years; 7 women) spent five consecutive nights in acoustically isolated bedrooms. Following one habituation night, randomised study nights included one quiet control night, one night with traffic noise of different types (road, rail and air) and noise levels (45-65 dB $L_{AS,max}$), one night with continuous 45 dB L_{AEq} pink noise, and one night with both traffic and pink noise. Sleep was measured with polysomnography and questionnaires. Sleep fragmentation was assessed using the Odds Ratio Product (ORP), a continuous measure of sleep depth and stability derived from EEG spectral power. To identify neurobehavioural and metabolic consequences of nocturnal noise, we measured cognitive performance across multiple domains with a computerised test battery every morning and evening, and collected daily blood samples for metabolomics analysis. Data were analysed in linear mixed models (random subject effect) adjusted for sex and time in study. Event-related analyses were further adjusted for time of night and sleep at noise onset.

Results: Traffic noise induced event-related elevations ORP in a dose-dependent relationship (main effect p<.001), ranging from a maximal change relative to pre-noise baseline of ΔORP=0.91 at 45 dB to ΔORP=1.20 at 65 dB. Sleep fragmentation by traffic noise was attenuated when pink noise was also present. Relative to Control, no noise exposure conditions were associated with significant changes in sleep macrostructure. Relative to Control, nights with traffic noise were associated with elevated concentrations of leucine (z-score +0.70, p=.021), lactic acid (z-score +0.89, p=.004), and acetone (z-score +1.00, p=.003). In the traffic + pink noise night, concentrations of these metabolites were reduced to levels not significantly different from the Control and Pink-only conditions. These physiological improvements by pink noise were not associated with improvements in self-reported sleep quality or recouperation. No significant effects of noise were found for cognitive performance.

Conclusions: These novel findings extend beyond previous research, and implicate metabolic upregulation or reduced metabolite uptake after noise-induced sleep fragmentation in the noise-sleep-disease relationship. Sleep fragmentation by traffic noise and metabolic effects were mitigated when pink noise was introduced, highlighting the importance of noise emergence from the background state for physiological, although not subjective, disturbance. Although a promising first step, as a pilot study these findings need to be reproduced in larger and more representative study before firm conclusions can be drawn.

Nursing interventions for sleep derangements in the postoperative period: a systematic review

A. Kowdley[1], G. Taylor[2], C. Linh[2], R. Mahmud[3], J. Buzalewski[1], G. Kowdley[1], R. Joyner[4]
[1]TidalHealth Hospital Peninsula Regional, Surgery, Salisbury, United States, [2]Philadelphia College of Osteopathic Medicine, Philadelphia, United States, [3]Cooper Medical School of Rowan University, Camden, United States, [4]TidalHealth Richard A. Henson Research Institute, Salisbury, United States

Introduction: Sleep quality in the postoperative period plays an important role in patient recovery. Decreased sleep duration and sleep quality can lead to a prolonged recovery period and hospital intervention needed for patients. Our aim was to conduct a systematic review looking at the effects of various, non-routine nursing interventions on postoperative sleep quality in patients. We intend to apply the knowledge described here as a potential intervention to promote higher sleep quality through reductions in stress, depression and anxiety, and improvement of well-being.

Materials and Methods: A systematic review was conducted utilizing the PRISMA 2020 guidelines to explore non-pharmaceutical modalities to improve sleep and recovery in post-operative patients. English articles were identified that were published within the past 10 years through keyword searches. Keywords included: perioperative AND Surgery AND Sleep NOT (sleep apnea); postoperative sleep disturbances NOT (sleep apnea); Surgery AND Sleep NOT (sleep apnea); Surgery AND Sleep NOT (sleep apnea). Searches provided 2678 articles from each of the following databases: 843 – Embase; 623 – PubMed; 568- Scopus; 394 – Web of Science; 250 – CINAHL. Duplicates were removed (928) leaving 1750 studies to screen. Inclusion and exclusion criteria were determined by investigator consensus. Criteria included requiring a focus on sleep disturbance in the post-operative period with non-pharmacologic interventions, and excluding a focus on sleep apnea or a diagnosis of delirium/dementia. Two independent reviewers voted on inclusion of an article used in data extraction or exclusion from the review, and in cases of conflict between reviewer votes, consensus during a group meeting was obtained by all reviewers. The remaining 64 articles were included for data extraction and analysis. Twelve of the 64 articles that utilized nursing interventions were chosen for this research. Of these twelve, nine were randomized controlled trials and three were non-experimental studies.

Results: Among the twelve nursing interventions, sleep was measured using the Pittsburgh Sleep Quality Index (PSQI). The Chalder Fatigue Scale was used in one study and four studies did not specify the scale used. Eleven of the nursing interventions showed improvements in sleep quality/duration in the postoperative period. One study demonstrated shorter time to fall asleep and sleep duration in the intervention group. Eight articles demonstrated improvements in Stress/Anxiety levels. Six of the articles noted improvements in pain scores after the nursing interventions. Five of the articles demonstrated improvements in overall quality of life (QOL) scores.

Conclusions: These data suggest high-quality, non-routine nursing interventions are effective in improving sleep quality/duration. All studies showed improvements in perioperative sleep quality and other effects. Potential future research should evaluate which non-routine nursing invention strategies (e.g., evidence-based, individualized, comprehensive, rapid rehabilitation, human-oriented, etc.) lead to best practices for patient sleep and postoperative recovery.

Observational study of HeadPulse sleep bursts in normal subjects

C. Walsh[1], T. Neylan[1,2], L. Yack[2], N. Pandher[2], Q. Coppola[2], F. Song[2], L. Grinberg[2], D. Randazzo[1], P. Lovoi[1], W. Smith[1]
[1]University of California, San Francisco, Neurology, San Francisco, United States, [2]University of California, San Francisco, Psychiatry, San Francisco, United States

Introduction: The "headpulse" (HP) is a novel biological phenomenon measurable in humans. The HP is generated by cardiac contractile forces impacting the human head and dissipated by the brain. The head forces can be transduced with highly-sensitive accelerometers applied to the scalp providing a time-domain varying signal. We report the first series of headpulse recordings during normal sleep in humans to determine prevalence and occurrence during sleep stages.

Materials and Methods: Adult volunteers consented to headpulse and sleep measurements during a normal night of sleep. The headpulse was recorded from a custom UCSF-designed device worn as a hairband containing force transducers in contact with the temporal scalp anterior to the right ear. These signals were digitized and stored on a memory card on the battery powered headset, and signals were analyzed in custom software written in MATLAB (Math Works, Natick, MA, USA). Sleep staging was accomplished using the Sleep Profiler (SP) (Advanced Brain Monitoring, Carlsbad, CA). Sleep was staged in 30 sec epochs. The timing of SP and HP recordings were aligned and analyzed in register.

Results: 9 subjects (5 female, average age of 44.5 years (IQR 22-76)) were assessed for a total of 55.1 hours of combined HP and SP recordings. Headpulse recording revealed transient increases in forces beginning just prior to sleep onset, and increased in magnitude over the sleep period. We termed this phenomenon as HeadPulse Sleep Bursts (HPSB). HPBS were observed in 9/9 (100%) subjects. The number of HPBS in subjects with a full night of sleep ranged from 100 - 312. Overall, HPBS occurred at a mean frequency of 0.38 HPSB/min (IQR 0.22-0.62), or 0.006 Hz. In some subjects the timing of HPBS was remarkably periodic, happening every 50 seconds in one subject and every 2 minutes in another. Using the awake period just prior to sleep as the reference, HPBS occurred 0.88, 1.26,1.19, and 1.03 times more frequent in REM, N1, N2 and N3 sleep stages. The frequency of N2 stage HPBS frequency was marginally significant compared to REM (p = 0.07, T-test). Normal subjects who had headpulse recordings in the seated or supine position did not exhibit periodic headpulse bursts.

Conclusions: This is the first report of HPSB phenomenon in humans. HPBS occurred in 100% of recorded subjects and is mostly independent of sleep stage. HPSB began during wakefulness just prior to sleep onset in all subjects and are not present in awake subjects not preparing for sleep. The relative low frequency of these bursts in the 0.15 – 0.63/min range (0.003 – 0.01 HZ) has no parallel in human sleep profiles but does match that seen with transient reversal of CSF flow in the cerebral aqueduct in sleeping humans measure on MRI, and the frequency of locus coeruleus discharges in sleep. The presence only during sleep suggests this may be linked to mammalian glymphatic drainage and therefore could be a novel biomarker for this putative cleansing mechanism during sleep.

Obstructive sleep apnea and long sleep are associated with increased genetic risk of incident Diabetes Mellitus: the Hispanic Community Health Study/Study of Latinos

Y. Hrytsenko[1], B. Spitzer[2], M. Cassidy[2], H. Wang[3], S.M. Bertisch[4], K.D. Taylor[5], C.R. Isasi[6], J. Cai[7], R. Kaplan[6], Q. Qi[6], C. Alcantara[8], S. Redline[3], T. Sofer[2,3,9]
[1]Harvard Medical School, Boston, United States, [2]Beth Israel Deaconess Medical Center, Cardiology, Boston, United States, [3]Brigham and Women's Hospital, Division of Sleep and Circadian Disorders, Departments of Medicine and Neurology, Boston, United States, [4]Brigham and Women's Hospital, Division of Sleep and Circadian Disorder, Boston, United States, [5]The Lundquist Institute, Torrance, United States, [6]Albert Einstein College of Medicine, Department of Epidemiology & Population Health, Bronx, United States, [7]UNC Gillings School of Global Public Health, Biostatistics, Chapel Hill, United States, [8]Columbia School of Social Work, New York, United States, [9]Harvard T.H. Chan School of Public Health, Boston, United States

Introduction: Poor sleep health is associated with impaired metabolic health, including increased risk of type 2 Diabetes Mellitus (DM2). We hypothesize that several markers of poor sleep health interact with genetic risk for DM2, modifying the risk of incident DM2. Polygenic risk scores (PRSs) summarize the genetic predisposition to a disease. We studied the interaction between measures of poor sleep health with DM2-PRS and its effect on incident DM2.
Materials and Methods: We used data from the Hispanic Community Health Study/Study of Latinos (HCHS/SOL). Polysomnographic and self-reported sleep measures were modelled as binary variables, and included insomnia, short sleep, long sleep, excessive daytime sleepiness (EDS), mild obstructive sleep apnea (OSA), and moderate-to-severe OSA. We developed DM2-PRS using summary statistics from two large DM2 GWASs: the DIAGRAM consortium and the Million Veteran Program (MVP), each stratified by groups defined by genetic ancestry. Together, these included 5 genetic ancestry groups: European (EUR), African (AFR), Amerindian (AMR), East Asian (EAS), and South Asian (SAS). We applied the PRS-CSx software to develop ancestry-specific DM2-PRSs for each of these genetic ancestries. For each participant, we combined ancestry-specific DM2-PRSs corresponding to the 3 ancestral populations of admixed Hispanic/Latino individuals from HCHS/SOL: EUR, AFR, and AMR, into a single DM2-PRS as weighted sum of each with weights being the individual's estimated ancestry proportions. We then performed the association analyses with the DM2-PRS. We confirmed the association of the DM2-PRS with DM2. Next, we estimated the DM2-PRS association with incident DM2 in normal glycemic individuals at baseline, also including interaction terms between the DM2-PRS and the sleep measures of interest. Finally, we also estimated the association of DM2-PRS with the sleep measures to assess potential bidirectional association between DM2 genetics and sleep outcomes. All models were adjusted for age, sex, BMI, and the first 5 genetic principal components (PCs), accounting for complex survey sampling design.
Results: There were 10,231 HCHS/SOL individuals (51% female) with available data on DM2 status, with 2,413 individuals having DM2 at baseline. At baseline, per 1 standard deviation (SD) increase of the PRS, DM2-PRS was associated with increased prevalence of DM with odds ratio (OR) =2.76, 95% confidence interval (CI) [2.44; 3.13]. Among normal glycemic individuals (n=5,090), 80 individuals had incident DM2. DM2-PRS was associated with incident DM2 with incident rate ratio (IRR) per 1 SD increase of 3.36, 95% CI [2.22; 5.07]. In a model adjusting for the 6 binary sleep exposures and their interactions with the DM2-PRS (n=2,308), DM2-PRS had statistically significant interaction with moderate-to-severe OSA (Respiratory Event Index; REI > 15) (IRR=2.77, 95% CI [1.41; 5.43]), and with long sleep (self-reported sleep > 9 hours) (IRR=5.48, 95% CI [1.48; 20.31]). Finally, DM2-PRS was associated with increased risk of OSA. OR for mild-to-severe OSA (REI>5) compared to no OSA was 1.13, 95% CI [1.01; 1.25], and OR for moderate-to-severe OSA compared to no or mild OSA was 1.15, 95% CI [1.00; 1.31].
Conclusions: DM2-PRS increases risk of OSA, while OSA and long sleep amplify the genetic risk of DM2.

Obstructive sleep apnea in patients with pulmonary hypertension

M.F. Dourado[1], T.G. Alves[1], C.M. Guimarães[2], A.R. Silva[2], R. Galtieri[3], L.G. Ferreira[1], C. Salles[4]
[1]Federal University of Bahia, University Hospital Professor Edgard Santos, Salvador, Brazil, [2]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [3]Federal University of Bahia, Post Graduate Program in Interactive Processes of Organs and Systems, Salvador, Brazil, [4]Bahiana School of Medicine and Public Health, Jorge Amado University Center, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil

Introduction: Pulmonary hypertension is characterized by progressive pulmonary vascular remodeling and, when untreated, can progress to right ventricular failure and death. The three-year survival rate in patients diagnosed with high-risk pulmonary hypertension is 28 - 55%. Obstructive sleep apnea (OSA) has a negative influence on cardiovascular disease, taking on particular importance in patients diagnosed with pulmonary hypertension (PH). Both hypoxemia resulting from OSA and repetitive oscillations of intrathoracic negative pressure attributable to upper airway obstruction are implicated in the worsening evolution of pulmonary hypertension in patients with OSA.
Objective: To evaluate polysomnographic features in patients with obstructive sleep apnea and pulmonary hypertension.
Materials and Methods: Seven patients followed up in a PH outpatient clinic in Salvador, Bahia, Brazil, with a diagnosis established through invasive measurement of pulmonary arterial pressure (mPAP) by right-chamber catheterization (mPAP > 20mmHg) and who underwent a polysomnographic study participated. Sleep-related variables and obstructive events were evaluated through type I polysomnography at the Sleep Laboratory of the University Hospital Complex Professor Edgard Santos in Salvador - Bahia - Brazil.
Results: From this case series, composed of 7 patients diagnosed with pulmonary hypertension and who underwent type I polysomnography, the mean age was 63 ± 13.9 years. Self-declared blacks were 85.7% (n = 6); females = 71.4% (n = 5). The mean BMI was 39.84 ± 4.3 Kg/m2. Regarding the polysomnographic variables sleep onset latency of 12.05 ± 8.7 min; REM sleep onset latency of 164.5 ± 46.8 min; total sleep time of 309.5 ± 77.9 min; sleep efficiency of 69.4 ± 11.8%; stage N1 of 6.0 ± 4.4%; stage N2 of 59.4 ± 11.6%; stage N3 of 13.4 ± 8.4%; REM sleep of 15.6 ± 7.6%; awake time after falling asleep of 110.7 ± 49.6 min; 251.5 ± 101 awakenings; awakening index of 45 ± 26.8 events/hour; median periodic limb movement index was 2.1 (0.65 - 10) ev/h; median periodic limb movement index associated with awakenings was 0.4 (0.15 - 2.5) ev/h; median 178 (75.7 - 380.2) ev resp/h; median index of apneas/hypopneas 45.8 (14.8 - 79.2) ev/h; median index of respiratory disturbances during REM sleep 71.1 (35.0 - 79.5) ev/h; median index of respiratory disturbances during NREM sleep 28 (11.1 - 88.0) ev/h; mean SaO2 of 93.1 ± 7.4%; minimum SaO2 of 73.9 ± 26.9%; median desaturation index during REM sleep of 50.1 (26.2 - 100.1) ev/h; median desaturation index during NREM sleep of 10 (5.1 - 77.8) ev/h.
Conclusion: This study shows that patients with pulmonary hypertension have high rates of apnea and hypopnea, impairing sleep quality, N3 and REM sleep, and significant sleep fragmentation. Studies have shown the intersection between PH and OSA, however, the causal factor of this relationship has not yet been demonstrated, while other studies have shown that OSA can worsen PH.

Obstructive Sleep Apnea (OSA): Prevalence among 4-8 Years Old Children in the General Population and Connection with Overweight/Obesity

I. Ingólfsdóttir[1,2], L. Hrólfsdóttir[2,3], Þ.I. Halldórsson[1], S. Magnúsdóttir[4], E.G. Hallgrímsdóttir[2,5], H. Petersen[1,2], G. Árnason[6], M.I. Birkisson[2], G.B. Jóhannesdóttir[2]
[1]University of Iceland, Reykjavík, Iceland, [2]Akureyri Hospital, Akureyri, Iceland, [3]University of Akureyri, Institution of Health Science Research, Akureyri, Iceland, [4]MyCardio, SleepImage, Denver, United States, [5]Aarhus University, Aarhus, Denmark, [6]Orthodontic Specialist - Private Practice, Akureyri, Iceland

Introduction
Sleep plays a fundamental role in mental and physical health with recent research indicating that untreated obstructive sleep apnea (OSA) has negative effects on cardiovascular-, cardiometabolic- and neurocognitive health and may have non-reversible effects on young children if untreated. Most of the literature looking at prevalence of OSA in young children is based on subjective questionnaires known to be inaccurate. The prevalence of childhood overweight and obesity is a public health concern globally. Obesity is the most common cause of OSA among adults but there is a lack of research into the causes of OSA among children. The study aimed to evaluate: 1) prevalence of obstructive sleep apnea among 4-8 years old children, 2) the association between overweight or obesity and obstructive sleep apnea.

Materials and Methods
A cross-sectional study. After ethics approval (VSN-22-096) and study registration (NCT05479201) healthy population-based children aged 4-8 years residing in Akureyri, Iceland were invited to participate. Parents assisted their child to record their sleep for a minimum of 2-nights for OSA diagnosis with FDA-cleared/EU Medical Device Directive (CE mark 0413) HST, SleepImage®, and respond to sleep- and health-questionnaires (pediatric sleep questionnaire (PSQ-sleep related breathing disorders (SRBD)). OSA diagnosis was defined based on apnea-hypopnea-index-3% ($AHI_{3\%}$)/hour of sleep; no-OSA (AHI<2), mild-OSA (AHI 2-5), moderate-OSA (AHI 5-10), severe-OSA (AHI $\geq$ 10). The night with highest AHI was used to determine the severity of OSA. Data was collected July 2022 – June 2023; participation was not compensated for. The children's height and weight were measured to calculate BMI z score. In the study, overweight was defined when a child is more than 1.5 standard deviations above the average body weight curve, and obesity if a child is more than 2.5 standard deviations above the average body weight curve. Binary logistic regression was used to analyze the association between weight and OSA.

Results
Of 373 children, 51% were male and 97% were Caucasian. The average age was 6 years. Prevalence of OSA was high, with 23% (n=86) diagnosed with moderate (16,1%) or severe (7%) -OSA. In total 12% were overweight and 9% had obesity. After adjustment, each 1 BMI z-score increase was associated with 1.58 (95% CI: 1.30, 1.91) higher odds of having moderate/severe OSA. Childhood overweight (OR= 4.04; 95% CI 2.06, 7.92) or obesity (OR=3.82; 95% CI 1.81, 8.04) was associated with ~four times higher odds of having OSA.

Conclusion
Prevalence of OSA in young children is higher than previously has been estimated with 23% diagnosed with moderate or severe OSA. The results show that overweight and obesity is strongly associated with childhood OSA. Moreover, early weight gain (from 18 months of age) may be an important risk factor for childhood OSA. Further studies including more diverse race-groups, more economically diversified population and conducted in other geographical locations are needed to better understand the prevalence of OSA in young children and how OSA may affect health and quality of life if not addressed.

Obstrutive Sleep Apnea syndrome and interstitial lung disease – a complex but underestimated relationship

A.P. Cunha Craveiro[1], E. Magalhães[1], I. Vicente[1], M.L.S. Valente[1], D. Sousa[1], D. Rocha[1]
[1]CHUCB, Covilhã, Portugal

Introduction: Obstrutive sleep apnea syndrome (OSAS) is a highly frequent comorbidity among patients with Diffuse Pulmonary Disease (DPD). Their timely diagnosis and treatment represent an opportunity of paramount importance, namely in the improvement of QOL, exertional dyspnea, stress tolerance and management of other comorbidities (such as pulmonary and arterial hypertension) also prevalent among these patients.

Objetive: Characterize the profile of patients with concomitant diagnoses of OSAS and DPD, seeking to determine whether pulmonary fibrosis is associated with more severe OSAS and worse therapeutic outcomes, and to understand if patients feel improvement after OSAS treatment.

Materials and Methods: Observational retrospective study carried out by consultation of clinical reports of patients with concomitant diagnosis of DPD and OSAS, followed in outpatient pulmonology department. Application of a quality of life questionnaire to patients regarding their general condition before and after sleep apnea treatment.

Results: From 20 patients followed in outpatient pulmonology department by OSAS and Interstitial Lung Disease, 5 were females, median age was 72.9 years (min 60, max 87) and 14 had pulmonary fibrosis (6 of them under oxigenotherapy). In terms of comorbidities, there were no statistically significant differences between the group with or without pulmonary fibrosis. The diagnosis of OSA were made by polissonography and cardiorespiratory studies. In terms of events, both groups had predominantly hypopneas and reras vs. apneas, but the group with fibrosis had more frequently roncopaty (which can correlate with the higher body mass index of that one). Median of Epworth scale was normal in patients with pulmonary fibrosis, but not in patients without. The majority of the patients accepted the OSA therapy with good aderance, and without statistically significant differences between groups. All oh them felt clinical benefits with the treatment.

Conclusions: As attested in extensive literature, the treatment of OSAS contributes to a decrease in the pro-inflammatory state frequent in diffuse lung disease. The existence of pulmonary fibrosis does not contraindicate the application of treatment with positive pressure and, when it exists, the identification and treatment of OSAS results in an improvement of the overall status, regardless of the diagnosis and the existence or not of pulmonary fibrosis.

One night of sleep restriction influences subjective sleepiness and objective alterness: a meta-analysis

L.N. Wuest[1,2], N. Capdevila[1,2], L. Lane[1,2], C.F. Reichert[1,2], R. Lasauskaite[1,2]
[1]Psychiatric Hospital of the University of Basel, Centre for Chronobiology, Basel, Switzerland,
[2]University of Basel, Reseach Platform Molecular and Cognitive Neurosciences, Basel, Switzerland

Introduction: Considerable research has addressed effects of acute and chronic sleep restriction on sleepiness and cognition. Research results are mixed when looking at the effects of only one single night of restricted sleep. The present meta-analysis addresses whether one night of restricted sleep impacts subjective sleepiness and cognitive functioning during the following day.

Materials and Methods: A systematic literature search was conducted via *Scopus*, *Web of Science,* and *Pubmed* in February 2023. Studies were included where

a) participants were healthy adults,

b) study protocols did not include shift work,

c) studies included control and sleep restriction conditions of at least 2 hours difference,

d) subjective sleepiness and/or cognitive performance was assessed in the control condition and after one night of sleep restriction, and

e) sleep was undisrupted during study nights.

The present abstract focuses on subjective sleepiness and simple reaction time tasks. Subjective sleepiness was assessed via the Karolinska Sleepiness Scale and the Stanford Sleepiness Scale, which are single-item scales with 9 or 7 points, respectively. Simple reaction time tasks, such as the psychomotor vigilance or similar tasks, are used to assess sustained attention, which is seen as an objective indicator of alertness.

In total 33 studies were included for meta-analyses, representing data of 780 participants. Data was extracted from paper text, tables, graphs, or supplementary materials. For retrieval of data presented graphically, *WebPlotDigitizer* was used. Three separate meta-analyses were run for subjective sleepiness, reaction times, and lapses, i.e., non-responses within 500 ms, in the reaction time tasks using R and the meta package.

Results: Sleep duration in the sleep restriction condition in included studies ranged between 3 and 6 hours. We have decided for common effects models. The meta-analysis of subjective sleepiness revealed that participants felt significantly sleepier after sleep restriction compared to control ($k = 19$ studies, *standardized mean difference (SMD)* = 0.824, *95%-CI* = [0.685, 0.964], $z = 11.61$, $p < .001$). Regarding objective alertness, participants responded significantly slower after restricted sleep compared to control ($k = 25$, $SMD = 0.371$, *95%-CI* = [0.236, 0.506], $z = 5.38$, $p < .001$). Additionally, the number of lapses in reaction time tasks was significantly higher after sleep restriction compared to control ($k = 14$, $SMD = 0.462$, *95%-CI* = [0.318, 0.605], $z = 6.29$, $p < .001$).

Conclusions: Our meta-analyses show significant small to medium sized effects on subjective and objective alertness after only one night of sleep restriction. As reduced sleep for a single night seems to occur rather often in modern societies, this finding raises awareness of the consequential slower reaction times and attentional lapses that may translate into increased risks in everyday situations (e.g., driving) and highlights the importance of disseminating this information through public health and safety campaigns.

Partner involvement in infant care at night is associated with better maternal sleep postpartum

M. Lucchini[1], M. Kahn[2], S. Thakur[1], N. Barnett[1]
[1]Nanit Lab, New York, United States, [2]Tel Aviv University, School of Psychological Sciences, Tel Aviv, Israel

Introduction: Sleep plays a critical role in maintaining optimal mental health. New mothers are particularly at risk for poor sleep and mental health. Several factors are known to contribute to poor sleep in this population, including the demands of caring for their newborn, managing the needs of other children, the sleep environment, occupational status, and available social support. Partner support at night could serve as a vital function in protecting maternal sleep, yet studies are lacking to evaluate its impact. Given the high rates of postpartum depression and its profound implications for both maternal and infant outcomes, understanding modifiable factors associated with better maternal sleep is critical to support maternal health. Thus, the aim of this study is to quantify the associations between maternal depression symptoms, sleep duration, and partner involvement in infant care at night.

Materials and methods: We recruited 117 mothers at 3-4 months postpartum (3.2±0.4 months), among Nanit consumers in the US. Mothers completed the Edinburgh Postnatal Depression Scale (EPDS), the Pittsburgh Sleep Quality Index (PSQI), and the Brief Infant Sleep Questionnaire (BISQ-R), which entails items regarding partner involvement in nighttime caregiving. Objective infant sleep metrics were obtained from the Nanit (11±4nights). We ran two linear regressions, one with maternal depression scores as dependent variable and sleep duration as independent, and one with maternal sleep duration as dependent variable and who takes care of the baby at night as independent. Number of children, baby's sex, baby's and mother's age, infant total sleep time, and number of night awakenings were included as covariates.

Results: Among recruited mothers, 78% were first time mothers, and 37% were stay-at-home parents/on parental leave. Mothers reported sleeping 6.7±1.1 hours per night and had an EPDS score of 6.2±4.8, with 11% of the sample having an EPDS score≧13, indicating a high likelihood of clinical depression. The majority (55%) of mothers reported that their partner was not involved in infant care at night, while the remainder reported that both parents were equally involved (36%) or that their partner was the only one involved in infant care at night (8%). Longer sleep duration was significantly associated with lower EPDS score (β=-1.2±0.4, p=0.002). Partner involvement in infant care at night was significantly associated with maternal sleep duration, which was on average 40 minutes longer for mothers whose partners were involved in infant care at night, compared to mothers who were attending baby's needs without help (β=0.7±0.2, p=0.001). Number of children, maternal age, baby's age and sex, baby's total sleep time and number of awakenings were not associated with maternal sleep duration.

Conclusions: Previous research has established the important role of social support for maternal mental health and sleep postpartum, but this study is the first to quantify the association between partner involvement in infant care at night and maternal sleep duration, accounting for infant sleep. These results provide evidence for actionable recommendations to improve postpartum maternal sleep.

Perspectives from community-based pediatric healthcare providers on sleep health practices among children in economically stressed urban environments

J. Page[1], J. Owens[1], R. Robbins[2]
[1]Boston Children's Hospital, Harvard University, Boston, United States, [2]Brigham and Women's Hospital, Harvard University, Boston, United States

Introduction: Children living in economically stressed urban environments and those who are members of historically marginalized communities are particularly vulnerable to sleep deficiencies, irregular sleep schedules, and late bedtimes, all of which are linked to increased daytime behavior problems and poor academic performance. Community-based healthcare providers can act as a first line of defense in diagnosing sleep health problems and promoting sleep health practices for school-aged children and their families. Yet, competing priorities, lack of training and insufficient attention to sleep, are frequently cited barriers to supporting sleep health practices. Furthermore, anticipatory guidance on healthy sleep practices, particularly for school-aged children remains scant, and could further contribute to sleep health inequalities in communities who disproportionality experience poor sleep.

Materials and methods: We collected demographic data and used descriptive statistics to describe the participant sample. We conducted semi-structured interviews with healthcare providers in community pediatric primary care settings to examine knowledge and perceptions of sleep health and sleep health practices that inform anticipatory guidance, and clinical decisions around screening and follow up. Providers were also asked about resources on sleep health for families and to identify topics that providers wanted to learn more about. Interviews were video-and-audio-recorded and transcribed. A constant comparative analysis was performed to code interviews and identify themes. Codes were iteratively audited and finalized by the study team to reach consensus.

Results: Participants included 10 pediatric healthcare providers from 3 community healthcare centers in the US Northeast, including 6 pediatricians and 4 pediatric nurse practitioners with an average of 15.6 ± 10.37 years of experience and mean age 42.5 ± 10.02 years. All participants were female. Among participants, 60% identified as White, 20 % Multiracial, 10% Asian, and 10% Latine. Major themes were broadly classified as (1) sleep as a pillar of health (sleep health features, age-related features, parent/caregiver role); (2) surveillance (anticipatory guidance, screening, risk factors, sleep health concerns); (3) practices that influence healthy sleep (cultural influences, co-sleeping, melatonin); (4) barriers to healthy sleep for caregivers (work schedules, trauma, competing comorbid conditions, contextual factors, access to informational resources) and providers (time, training, recommendations); (5) facilitators to healthy sleep (delivering useful information on treatment options, applicable treatments that can easily adapted, shared decision-making); and (6) general practitioner professional development needs (sleep topics, resources, and additional training needed).

Conclusions: All providers spoke at length about the importance of sleep as a pillar health and the need for additional training for pediatric sleep healthcare providers. Specific topics of interest included recommendations for sleep duration, medication management for melatonin, and identifying applicable resources to address sleep concerns. Many of the providers acknowledged that many of their families have multiple competing sources of stress and paired with a lack of resources, sleep becomes secondary. Findings here will directly inform the development of sleep health education material for community pediatric providers and caregivers of school-aged children.

Physical activity and sleep quality, integrative review

G. Nobre Nogueira[1], R. Facundes da Rosa[1], F. Duque de Paiva Giudice Junior[1], B. Henrique Alcântara Lopes de Souza[1], L. Elias Araujo dos Santos[1], J. Pedro Barreto Rocha[1], K. Emilly Ribeiro Aureliano[1], I. Carvalho Gonçalves[1], M.d.S. Queiroz Alves de Souza[2]
[1]Federal University of Ceará, Medicine University, Fortaleza, Brazil, [2]Federal University of Ceará, Department Pathology and Legal Medicine, Fortaleza, Brazil

Introduction: Sleep is an important physiological process related to the prevention of many pathological conditions such as mental disorders, type II diabetes mellitus, inflammation, obesity and cardiovascular diseases. According to many studies, the prevalence of sleep disorders has increased in the last years. Thus, sleep disorders, such as insomnia, can bring serious consequences for the individuals, with an increase in the frequency of these problems being reported in the elderly and young people. In this context, it is speculated that a sedentary lifestyle is related to a worsening of these clinical conditions and that the presence of physical activities can positively influence the quantity and the quality of sleep. This review aims to associate the importance of physical activities in the regulation of sleep quality, with the intent of guaranteeing the existing benefits of such a practice.

Materials and methods: The established inclusion criteria were articles researched in the English language, along with the use of the DeCS/MeSH descriptors "Sleep quality", "Physical activity" and "Sedentary behavior", intersected with the Boolean operators "AND" and "OR" to search the PubMed platform. Following these specificities, six articles were selected following these criteria.

Results: The effect of physical activity on sleep quality is evident, since, with hormonal regulation and sleep quality being interconnected, performing physical activities causes the release of cortisol and serotonin, in addition to stimulating the release of melatonin during sleep, through homeostatic regulations. Melatonin hormon is important in sleep regulation and it can improve the circadian rhythm cycle. In this sense, the importance of guaranteeing the quality of sleep stands out, associated with several improvements in health, such as the decrease in the incidence of cardiovascular diseases, metabolic syndrome, mental disorders and dementia, as well as improvement in memory, mood, self-esteem and even appetite. On the other hand, sleep disorders, such as insomnia, narcolepsy and excessive sleepiness, have numerous adverse effects on health, these problems are leveraged by sedentary lifestyle and lack of physical activity, as well as the comorbidities that may result from them. Many studies have suggested an association of proinflammatory markers such as interleukins (IL-1, IL-6 and IL-17), C-reactive protein and tumor necrosis factor (TNF) in association with sleep deprivation.

Conclusions: Physical activity was postulated as an effective tool to improve sleep quantity and quality, especially due to its regulatory role on the circadian rhythm. In fact, low levels of physical activity and a sedentary lifestyle has been proposed as relevant risk factors for insomnia and sleep disorders in adults. Considering this, sleep has a direct influence on health aspects, such as heart and blood pressure, as well as exercise has a protective effect over those same physiological parameters, thus, the implementation of physical activity promotes sleep quality, ensuring a sum of positive aspects. Therefore, it is evident the necessity of further research on the subject, with the intent to find out all the benefits that physical activity and a quality sleep can offer.

Physical and mental health among Blacks with OSA and insomnia: results from a culturally tailored sleep health education study

A. Rogers[1], A. Seixas[2], D. Chung[3], T. Hassan[1], F. Zizi[2], G. Jean-Louis[2]
[1]St. John's University, Queens, United States, [2]University of Miami Miller School of Medicine, Miami, United States, [3]Pace University, New York, United States

Introduction: Health consequences of co-occurring obstructive sleep apnea (OSA) and insomnia have been well documented. However, little is known about the mental and physical consequences of co-occurring OSA and insomnia among Blacks. We aimed to investigate the prevalence of OSA risk and insomnia symptoms and potential associations with physical and mental health in a community sample of Blacks.

Materials and methods: Data were collected from an NIH-funded study 'Peer-Enhanced Education to Reduce Sleep Ethnic Disparities, designed to navigate blacks at risk of OSA to receive timely diagnosis and treatment using peer-delivered linguistically and culturally tailored sleep health education. Blacks (n=878) were screened for OSA using the Apnea Risk Evaluation System Questionnaire; a score ≥6 denoted high OSA risk. The Sleep Disorders Questionnaire was used to assess insufficient sleep duration (<7 hours) and prevalence of insomnia based on three common symptoms: trouble falling asleep, difficulty staying asleep, and early morning awakening. Physical Health Composite Score (SF-12PCS) and Mental Health Composite Scores (SF-12MCS) were generated based on how the person answered the twelve questions. Scores range from 0 to 100, where zero indicates the lowest level of health and 100, the highest. Logistic regression models were used to assess associations of physical and mental health among Blacks at risk for OSA, insomnia symptoms, and co-occurring OSA risk and insomnia symptoms. All models adjusted for differences in age, sex, and BMI.

Results: The prevalence of OSA risk, insomnia symptoms, and co-occurring OSA risk and insomnia symptoms was 47.9%, 73.3%, and 40.2%, respectively. Logistic regression analyses showed lower physical score was positively associated with the odds of reporting insomnia symptoms (OR=1.03, p=0.007) and co-occurring OSA risk and insomnia symptoms (OR=1.02, p=0.001). Lower mental score was positively associated with the odds of OSA risk (OR=1.04, p=0.001), insomnia symptoms (OR=1.04, p=0.001), and co-occurring OSA risk and insomnia symptoms (OR=1.04, p=0.001). Those with OSA were less likely to report higher physical scores compared with those with co-occurring OSA risk and insomnia symptoms.

Conclusions: Results demonstrate that Blacks with insomnia symptoms are more likely to endorse higher physical and mental health. Future research should investigate further the mechanism underlying co-occurring OSA and insomnia in this population.

Poor maternal sleep health adversely affects neonatal and pregnancy outcomes: a prospective cohort study

M. Saraei[1], M. Shaffaat[2], O. Aminian[1], S. Eftekhari[1], E. Hesari[3], A. Behkar[2], A. Najafi[2]
[1]Tehran University of Medical Sciences, Center for Research on Occupational Diseases (CROD), Tehran, Iran, Islamic Republic of, [2]Tehran University of Medical Sciences, Occupational Sleep Research Center, Tehran, Iran, Islamic Republic of, [3]Tehran University of Medical Sciences, Epidemiology and Biostatistics, School of Public Health, Tehran, Iran, Islamic Republic of

Introduction: Pregnancy is a delicate time in women's lives, and maintaining healthy sleep is crucial for maternal and fetal well-being. However, the impact of maternal sleep health on overall pregnancy well-being remains under investigation. This study investigated the relationship between sleep quality during pregnancy and adverse maternal and fetal outcomes.

Materials and methods: This was a prospective cohort study on 500 pregnant women referred to the prenatal outpatient clinic of Imam Hospital in Tehran, Iran, from 2020 to 2021. The Pittsburgh Sleep Quality Index (PSQI) questionnaire was used to evaluate sleep quality. We focused on four key components of the PSQI: self-reported sleep quality, self-reported night sleep duration, presence of sleep disorders, sleep medication use, and daytime sleepiness. The participants were followed until delivery. We assessed the association between PSQI components and the following perinatal complications: type of delivery, preterm delivery, preeclampsia, intrauterine growth restriction (IUGR), low birth weight, stillbirth, neonatal resuscitation requirement, neonatal intensive care unit (NICU) admission, and premature rupture of membranes. Analysis was conducted using SPSS version 25.0.

Results: The mean age of the participants was 31.12 ± 5.84 years old, with a range of 17-50. The mean number of pregnancies was 2.55 ± 1.30, ranging from 1 to 7. Mothers who had vaginal deliveries (NVD) reported better sleep quality compared to those who had cesarean sections (p:0.009), while mothers with preeclampsia reported worse sleep quality (p:0.010). Surprisingly, mothers who delivered a stillbirth (p:0.002) or had infants with low birth weight (p:0.070) also reported better sleep quality. However, regression analysis only showed a significant association between sleep quality and preterm delivery (OR: 1.27, p = 0.039).

Mothers who had a vaginal delivery and term labor had a significantly lower frequency of reporting sleep disorders compared to mothers who had cesarean sections (p < 0.001) and preterm labor (p=0.060). Conversely, mothers whose newborns required NICU admission or resuscitation reported a higher frequency of sleep disorders during pregnancy (p=0.020 and p=0.030, respectively). However, these associations did not remain significant in the regression models. In contrast, there was a significant association between sleep disorders and the 5-minute APGAR score, both in correlation tests (CC=0.090, p=0.040) and regression models (B=-0.057, p=0.047, R2=0.772).

There was no significant association between using sleeping pills and prenatal outcomes. Regarding daily dysfunction, the t-test indicated that mothers with preeclampsia reported less daily dysfunction compared to those without preeclampsia (p=0.060). However, the regression analysis found that daily dysfunction was associated with preeclampsia, but with odds of 1.148 (p = 0.021), indicating a positive correlation.

Reporting sleep cough or loud snoring during pregnancy was more reported in mothers with preeclampsia (p=0.006) and mothers whose newborns ended up in NICU (p=0.020) or needed resuscitation (p=0.030).

Conclusions: We found that different aspects of sleep health were associated with different perinatal adverse outcomes. Considering the impact of sleep quality on pregnancy outcomes, assessing mothers' sleep health appears essential in prenatal care.

Poor sleep quality and insomnia severity before infection predict long-term symptoms after COVID19

F. Salfi[1], G. Amicucci[2,1], D. Corigliano[2,1], L. Viselli[1], A. D'Atri[1], D. Tempesta[1], M. Ferrara[1]
[1]University of L'Aquila, Department of Biotechnological and Applied Clinical Sciences, L'Aquila, Italy,
[2]"Sapienza" University of Rome, Department of Psychology, Rome, Italy

Introduction: Since the beginning of the pandemic emergency, 750 million cases of COVID-19 have been confirmed globally. Recent meta-analytic studies showed that four out of ten COVID-19 survivors experienced a wide range of long-term symptoms after acute infection (long COVID). Due to the burden on the international healthcare systems and the societal and economic costs, identifying potential antecedents of long COVID is crucial to driving preventive interventions and targeting at-risk populations. In this study, we evaluated for the first time the possible role of pre-infection sleep disturbances in predisposing people to experience a wide range of long COVID symptoms.
Materials and methods: This prospective cohort study involved two assessments (April 2020 and 2022). At baseline, sleep quality and insomnia symptoms in participants without current/prior SARS-CoV-2 infection were measured using the Pittsburgh Sleep Quality Index (PSQI) and the Insomnia Severity Index (ISI), respectively. At follow-up, we evaluated the presence of twenty-one symptoms (psychiatric, neurological, cognitive, bodily, and respiratory) one month (n=713, mean age ± SD: 33.38 ± 11.40 years, 122 males; infection in April 2020–February 2022) and three months after COVID-19 (n=333, 33.09 ± 11.80 years, 60 males; infection in April 2020–December 2021). Finally, participants reported the recovery time to return to the pre-infection daily functioning level. Zero-inflated negative binomial (ZINB) regressions were modelled to estimate the effect of previous sleep on the number of long COVID symptoms. Binomial logistic regressions were performed to evaluate the prospective association between sleep outcomes with (i) the incidence of each post-COVID-19 symptom and (ii) having reported a full recovery after one/three months from infection. All analyses were adjusted for well-documented risk-factors for long COVID (age, gender, body mass index, COVID-19 severity).
Results: ZINB models highlighted a significant effect of PSQI and ISI score on the number of long COVID symptoms that occurred one month [IRR=1.07 (1.05–1.09), p<0.001; IRR=1.05 (1.03–1.06), p<0.001; respectively] and three months after infection [IRR=1.09 (1.05–1.14), p<0.001; IRR=1.05 (1.03–1.08), p<0.001; respectively]. Binomial logistic regressions showed that higher PSQI and ISI scores at baseline significantly increased the odds of each long-term symptom at one month (OR range=1.08–1.19, all p≤0.006; OR range=1.09–1.17, all p≤0.031; respectively) and three months from COVID-19 (OR range=1.06–1.14, all p≤0.014; OR range=1.08–1.18, all p≤0.009; respectively), except for smell/taste dysfunctions (all p≥0.284). Finally, higher PSQI and ISI scores predicted longer recovery times [after one month: OR=1.13 (1.08–1.19); OR=1.09 (1.06–1.013); after three months: OR=1.21 (1.12–1.32); OR=1.012 (1.06–1.018), all p<0.001; respectively].
Conclusions: This study shows a crucial role of pre-infection sleep disturbances in predisposing COVID-19 survivors to experience post-COVID-19 conditions. We found a prospective dose-dependent association between previous sleep quality and insomnia severity with the manifestation of a wide range of long-term symptoms one/three months after COVID-19. Promoting sleep health may represent an effective preventive approach to mitigate the COVID-19 sequelae, with substantial public health and societal implications.

Poor sleep quality during pregnancy predicts neonatal white matter integrity and subsequent negative emotionality in infancy

M. Nevarez-Brewster[1], C.H. Demers[1], M. Hoeflich Haase[2], K. Al-Ali[2], M.M. Bagonis[2], J.H. Gilmore[2], M.C. Hoffman[3,4], M.A. Styner[2,5], B.L. Hankin[6], E.P. Davis[1,7]
[1]University of Denver, Psychology, Denver, United States, [2]University of North Carolina at Chapel Hill, Psychiatry, Chapel Hill, United States, [3]University of Colorado Anschutz Medical Campus, Psychiatry, Denver, United States, [4]University of Colorado Denver School of Medicine, Obstetrics and Gynecology, Denver, United States, [5]University of North Carolina at Chapel Hill, Computer Science, Chapel Hill, United States, [6]University of Illinois at Urbana-Champaign, Psychology, Urbana-Champaign, United States, [7]University of California, Irvine, Pediatrics, Irvine, United States

Introduction: Poor prenatal sleep is a pervasive health concern affecting eight in ten pregnant individuals. Despite sleep disturbances being common across pregnancy, poor prenatal maternal sleep and its impact on offspring health remain understudied. Evidence exists linking poor sleep during pregnancy to offspring health including preterm birth, low birth weight and length, and higher body mass index and blood pressure in childhood. Notably, poor sleep during pregnancy has also been linked to compromised infant socioemotional development. What has yet to be thoroughly examined is the link between prenatal maternal sleep health and offspring neurobiology, which may play a critical role in linking poor prenatal sleep and infant socioemotional development. We recently found that poor sleep quality during pregnancy predicts changes in newborn hippocampal volume. However, the association between prenatal maternal sleep and neonatal white matter microstructure remains unexplored. This study examined the associations between prenatal maternal sleep quality and neonatal white matter integrity of the uncinate, a major corticolimbic tract that forms and develops *in utero*. We additionally explored whether neonatal uncinate integrity partially mediated associations between prenatal maternal sleep quality and subsequent negative emotionality in infancy.
Materials and methods: Pregnant participants (n = 116) completed the Pittsburgh Sleep Quality Index to assess prenatal sleep quality three times across pregnancy. Neonatal (53% female) uncinate white matter integrity was assessed via diffusion tensor imaging (DTI). White matter integrity was assessed using fractional anisotropy (FA), an index of white matter tract maturation and directional integrity. Infant negative emotionality was collected using the Infant Behavior Questionnaire at six postpartum months.
Results: More maternal sleep problems during pregnancy predicted higher neonatal fractional anisotropy (FA) in the uncinate (left: b = 0.20, p = .004; right: b = 0.15, p = .027), bilaterally. These associations remained after covarying for infant postconceptional age at MRI scan, motion in MRI scan, sex, and income-to-needs ratio. Further, higher uncinate FA predicted more negative emotionality in infancy (e.g., right: b = 0.25, p = .011) and uncinate FA partially mediated the associations between prenatal maternal sleep and negative emotionality in infancy (right: indirect effect = 0.014, CI = [.0001, .0323], p < .05).
Conclusions: These findings provide novel evidence linking poor sleep during pregnancy to offspring white matter and subsequent socioemotional health. White matter integrity may be a key pathway in the intergenerational transmission of health, and disease. Pregnancy is a great point of intervention in which improving sleep may enhance the health and well-being of the next generation.

Population-based estimates of sleep characteristics and disruptors in the United States and South Korea

J.M. Dzierzewski[1], D. Jung[2], D. Lee[2], S. Jeon[2], J. Hong[2], S. Lee[2], H. Yang[2], J. Lopos[1]
[1]National Sleep Foundation, Washington, DC, United States, [2]Asleep Co., LTD, Seoul, Korea, Republic of

Introduction: Sleep is critical to health and well-being, affecting all aspects of daily life. Numerous factors can disrupt sleep, including job-related or financial concerns, neighborhood factors such as light or noise pollution, health or medical conditions, current political or social concerns and events, and family or personal relationships—to name a few. As such, it is not surprising that a growing body of research indicates that large portions of adults are not sleeping the recommended 7-9 hours of nightly sleep or report low quality sleep. Whether sleep characteristics and challenges to obtaining needed sleep are consistent across distinct cultures remains an underexplored question. We sought to provide current, population-level estimates of sleep characteristics and barriers to obtaining adequate sleep in both the United States and South Korea.

Methods: We conducted two nationally-representative, probability-based surveys, one in the United States and one in South Korea, to assess current sleep characteristics as well as common challenges to individuals getting the sleep they need. The surveys were fielded January and February 2023, respectively, for the US and South Korea. Final sample sizes were 1009 (US) and 1000 (South Korea), both with an estimated margin of error of ~3%. RIM weights were applied to both datasets to ensure accurate representation of national demographics. Survey respondents reported general sleep quality ratings, perceived sleep need, habitual sleep duration, and largest challenge to getting adequate sleep. Measures of central tendency and dispersion were used to characterize responses.

Results: American adults averaged 6 hours and 56 minutes of sleep on weekdays and 7 hours and 25 minutes on weekends. In comparison, Korean adults slept for an average of 6 hours and 13 minutes on weekdays and 7 hours and 11 minutes on weekends. Despite the differences in actual sleep duration, reported sleep need was similar, 7 hours and 31 minutes and 7 hours and 12minutes for American and Korean adults, respectively. Interestingly, there was a striking difference in subjective sleep quality between the two countries. Only 6% of Americans reported their sleep as 'poor;' however, in South Korea 1 in 4 adults (25%) reported their sleep as 'poor.' Conversely, 26% of Americans reported their sleep as 'very good' compared to only 10% of Koreans. In terms of sleep challenges, the most common barrier to getting needed sleep identified by Americans was 'family or personal relationships.' However, the most common challenge to getting needed sleep in South Korea was reported as 'job-related or financial concerns.'

Conclusion: Despite both the United States and South Korea being industrialized nations, striking differences were observed regarding sleep duration and quality—with adults in South Korea getting significantly less, and poorer quality, sleep than adults in the US. Adults in South Korea accumulate large sleep deficits, which may partially contribute to the country experiencing the highest suicide rate amongst all OECD countries. Cultural differences were also abundant regarding commonly experienced sleep challenges. Findings highlight the global importance of raising sleep awareness and advocating for international cooperation in promoting sleep health.

Population profile of public healthcare system users who underwent polysomnography, identified by the ICD as sleep disorders, between 2008 and 2022

D.G.d. Silva[1], L.H.B. Junior[2], S.F. Furlan[3], C. Albertini[3]
[1]ResMed Latam, Institutional, São Paulo, Brazil, [2]ResMed Latam, Public Market, São Paulo, Brazil, [3]ResMed Latam, Clinical, São Paulo, Brazil

Introduction: Obstructive sleep apnea (OSA) is a common condition with major neurocognitive and cardiovascular sequelae. Recently estimated in up to 1 billion OSA patients worldwide, with a reported prevalence of moderate to severe in Brazil of 32.9–38.4% depending on the definitions used. The Brazilian Unified Health System (SUS) is responsible for attending 100% of the Brazilian population, 75% of which depend exclusively on it. There isn't currently a national public policy in Brazil to organize and direct the care of sleep disorders patients. Polysomnography has been the test of choice and was standardized in 2008. In this sense, the study's goal is to describe both the historical series from 2008 to 2022 and the population profile who underwent polysomnography and were identified by ICD 47 (0-9) codes.

Materials and Methods: Quantitative, descriptive cross-sectional analysis, with data from January 2008 to December 2022. The selection criterion was procedures performed with users identified by the ICD G47 (0-9), inpatients or outpatients for polysomnography (SIGTAP code 211050105). Data collection was carried out through the hospital information system (SIH-RD) and outpatient information system (SIA-PA) hosted by DATASUS. Data were extracted in April/2023, processed using the Tabwin software and analyzed in Microsoft Excel®.

Results: A total of 105,211 thousand procedures were identified in the 15-year period, an average of 7 thousand polysomnography's per year. The most prevalent ICDs were 'G47.3 Sleep apnea' (69%), 'G47.9 sleep disorders, not otherwise specified' (18%) and G47.8 Other sleep disorders (7%). People aged 30 years and older accounted for 83% of the total polysomnography's performed between 2008 and 2022, with 63% of these exams being performed by people aged 30 to 69 years. In the period from 2018 to 2022, this same age group concentrated 88% of the total exams, which represents the increase of 10 percentage points from the previous period (2008-2017), where they represented 78%. The mean age found was 48.0 years being 45.7 to men and 50.2 to woman over the total period. Women accounted for 52% of the total number of exams *performed*. White individuals represented 58% of the total number of exams, while black and brown individuals represented only 23% and yellow individuals 2%. In 18% of the exams the race was not identified. Considering only the period from 2018 to 2022, the average number of exams was 10.3 thousand per year, a volume 47% higher than the annual average for the total period.

Conclusions: There was an increase in the total amount of polysomnography over the years, especially among women and white individuals in the 30 to 69 age group. The most prevalent ICD was Sleep Apnea. Despite this increase, this number of exams are still far below of what is needed to diagnose the total population, which underlines the importance of establishing a comprehensive federal line of care nationwide. This requires an effective dialogue between public health managers to promote care from prevention and early detection to treatment and ongoing follow-up of people who have sleep-disordered breathing.

Prediction of Daytime Sleepiness Risk in Shift Working Firefighters using a Machine Learning Model

A. Cho[1], Y. Song[2], S. Jeon[3], J.K. Kim[2], S. Chung[4], Y. Ahn[5], S. Suh[1]
[1]Sungshin University, Department of Psychology, Seoul, Korea, Republic of, [2]Korea Advanced Institute of Science and Technology, Department of Mathematical Science, Daejeon, Korea, Republic of, [3]Mokwon University, Department of Marketing Bigdata, Daejeon, Korea, Republic of, [4]Asan Medical Center, University of Ulsan College of Medicine, Department of Psychiatry, Seoul, Korea, Republic of, [5]Wonju College of Medicine, Yonsei University, Department of Preventive Medicine, Wonju, Korea, Republic of

Introduction: Most firefighters work in shifts, which result in irregular sleep patterns that can increase daytime sleepiness. High risk of daytime sleepiness may interfere with the ability to respond adequately in emergency situations. Thus, the current study aims to identify predictors of daytime sleepiness risk in shift-working firefighters using a machine learning algorithm.

Materials and Methods: A total of 136 shift working firefighters (mean age=38.17±8.78, males 86.76%) participated in this study. Participants completed a 7-day sleep diary to assess Wake After Sleep Onset (WASO), Number of Awakenings (NWAK), and Sleep Efficiency (SE). Participants also completed other related self-report questionnaires: Epworth Sleepiness Scale (ESS), Disturbing Dream and Nightmare Severity Index (DDNSI), and Insomnia Severity Index (ISI). XGBoost, a machine learning algorithm that builds models by sequentially correcting errors in previous models, was used to predict the daytime sleepiness risk group by "xgboost" package in R.

Results The model including 9 factors demographic (age, gender, marital status, and Body Mass Index (BMI)), self-reported clinical variables (DDNSI, and ISI), and sleep variables (WASO, NWAK, and SE) to predict daytime sleepiness risk group (10 < ESS). Results indicated the accuracy of the model was 75.61%. SE was the most important predictor (26.11% contribution to model), followed by age (20.62%), DDNSI (20.34%), BMI (10.44%), WASO (6.57%), and gender (5.44%). Other variables contributed less than 5%.

Conclusions: A machine learning model was used to identify predictors of daytime sleepiness risk in a group of shift workers. Sleep efficiency was the most important predictor for daytime sleepiness risk. It indicate shift workers need interventions about setting an appropriate sleep schedule based on work shift and modifying dysfunction sleep behaviors to improve sleep efficiency. Nightmares due to exposure to a traumatic scene can also affect daytime sleepiness. Improving sleep efficiency and nightmares are more important in managing daytime sleepiness for shift working firefighters.

Prevalence and characteristics of sleep-related complaints in patients attending an otorhinolaryngology clinic: a retrospective study

L. Lauriano[1]
[1]Universidade Federal de Minas Gerais, Interinstitutional Post Graduate Program in Bioinformatics, Belo Horizonte, Brazil

Introduction: This study aims to investigate the prevalence of sleep-related complaints in 1989 patients attending an otorhinolaryngology clinic from August 2017 to May 2023. The primary objective is to identify common sleep-related complaints, including poor sleep quality, snoring, bruxism, and temporomandibular joint-related complaints (TMJD).

Materials and Methods: The medical records were retrospectively extracted and processed using Python, resulting in the creation of spreadsheets. Separate spreadsheets were created for children who underwent nasal endoscopy to compare the size of their tonsils between those with and without sleep-related symptoms using the Mann-Whitney U test. The study also included a comparison between children and adults using the chi-square test, focusing on complaints such as snoring, poor sleep quality and TMJD/Bruxism.

Results: Among the total of 1989 patients, 64.1% were female. In the subgroup of children under 12 years old, 54.4% were female. Within the adult group aged 18 and above, 66.9% were female. Poor sleep quality or snoring was reported by 36% of the study population, with each condition accounting for 18% of the cases.

Out of the 1367 adults aged 18 or older, 29% reported experiencing some of the mentioned complaints, with poor sleep quality being the most prevalent (18% of individuals). Approximately 2% of adults reported the use of zolpidem.

A total of 319 children under 12 years old (16% of the total patients) were included in the study. Out of these children, 190 (60%) had poor sleep quality, snoring, or bruxism. Snoring was the most prevalent complaint, reported by 48% of the children. Among those with complaints, 113 (59%) underwent nasal endoscopy.

Among the 129 children under 12 years old who did not have any of the sleep-related complaints, 39% underwent nasal endoscopy.

A comparison was made between the size of the adenoids and tonsils between the groups with and without symptoms that underwent nasal endoscopy.

The findings revealed that children with complaints had larger tonsils and adenoids, with a statistically significant correlation based on the Mann-Whitney U test.

A statistically significant difference in the prevalence of snoring was observed between adults and children under 12 years old, as determined by the chi-square test ($p < 0.05$). Snoring was found to be more common among children.

Conclusions: Sleep-related complaints, including poor sleep quality, snoring, and temporomandibular joint disorders, are frequently reported in patients visiting otorhinolaryngology clinics. Healthcare professionals in this field must have the knowledge and expertise to diagnose and treat sleep disorders effectively.

Anatomical factors may play a significant role in sleep-related issues, particularly in children. Nasal endoscopy is a valuable tool for investigating anatomical factors related to snoring and sleep-related issues.

Lastly, it can be stated that knowledge in programming has the potential to broaden a physician's perspective on the vast amount of information they directly receive from patients. This expanded viewpoint can lead to valuable insights for new research and approaches, while also guiding and yielding tangible results from proposed treatments. By leveraging programming skills, physicians can unlock new possibilities for enhancing patient care and advancing medical knowledge.

Prevalence and incidence of the association between insomnia and Obstructive Sleep Apnea (COMISA) in the city of São Paulo

Y.M. Luciano[1], A.S. Porcacchia[1], S. Tufik[1], M.L. Andersen[1], G.N. Pires[1]
[1]Universidade Federal de São Paulo (UNIFESP), Departamento de Psicobiologia, São Paulo, Brazil

Introduction: Obstructive sleep apnea (OSA) and insomnia are the most prevalent sleep disorders, affecting around 30% and 15% of the world's population, respectively. Although the epidemiological profile of OSA and insomnia is already known, the knowledge about the comorbid presentation of insomnia and sleep apnea (COMISA) is rather limited. This study aimed to investigate the prevalence and incidence of COMISA in the city of São Paulo, Brazil, using the data from the São Paulo Epidemiological Sleep Study.

Materials and Methods: This study was based on EPISONO 3rd edition (performed in 2007), and on its follow-up edition (performed in 2015). Data collection took place in 2 stages: 1) Home sleep assessment: the participants were interviewed at their homes and answered to a set of sleep questionnaires, including the insomnia severity index (ISI). 2) Institutional stage: the participants were invited to undergo an overnight type-I polysomnography (PSG). OSA was categorized based on the apnea-hypopnea index (AHI) and individuals with AHI>5 were considered as positive for OSA. Insomnia symptoms was categorized based on the ISI score and individuals with ISI>7 were considered as positive for insomnia. The diagnosis of COMISA was based on the concomitant positive diagnosis for OSA and insomnia based on the 2007 and 2015 editions. All volunteers signed the Informed Consent Form and both editions were approved by UNIFESP Research Ethics Committee (3rd edition: 0593/2006, follow-up 6105/2014).

Results: The sample of EPISONO 3rd edition had 1.042 participants and 708 participants were included in the follow-up. For this study, 585 individuals were considered eligible, presenting valid ISI and AHI data for both editions. The prevalence of COMISA in 2007 was 17.7% [95%CI: 15.6 to 19.7] and in 2015 it was 23% [95%CI: 21.7 to 24.3]. The incidence of COMISA in 2015 among those who had neither OSA nor insomnia in 2007 was 7.8% [95%CI: 6.3 to 9.2]. The incidence of COMISA among those who already had one of these sleep disorders was 16.7% [95%CI: 15.3 to 18]. When calculating the relative risk of developing COMISA at the 8-year follow-up, the risk of developing COMISA in 2015 was 3.35 times higher among those who had OSA in 2007, and 2.25 times higher among those who had insomnia, in comparison with those with none of these conditions.

Conclusions: The prevalence of COMISA increased by 5.3% after 8 years. The incidence of COMISA among those who had either insomnia or sleep apnea on the baseline evaluation is high. Although lower, the incidence of COMISA among those who did not have any of the conditions at baseline is noteworthy. These results demonstrate how close the relationship between OSA and insomnia is in the general population.

Prevalence of Postoperative Complications Following Zetapalatopharyngoplasty: A Retrospective Study

A.R.A. Paiva[1], R.E.S. Guimarães[1], R.B. Guimarães[2], L.B. Ferreira[2], N.O. Pio[1], M.C.A. Costa[3], R.S. Fantauzzi[3], J.M.B. Sales[3], A.P.A. Pereira[1], Y.A.M. Amaral[1], F.V. Pacheco[3], M.B.M. Vieira[1]
[1]Hospital Felicio Rocho, Otorhinolaryngology, Belo Horizonte, Brazil, [2]Faculdade da Saúde e Ecologia Humana, Medical School, Vespasiano, Brazil, [3]Hospital Socor, Otorhinolaryngology, Belo Horizonte, Brazil

Introduction: Zetapalatopharyngoplasty (ZPFP) was first introduced by Vieira in 2001 as an intervention for addressing obstructive sleep apnea (OSA). This technique was designed with the primary aim of diminishing the Mallampati score, promoting a more anatomically favorable configuration of the palate, and mitigating the chronic complications associated with palatal surgery.In the outset, this surgical procedure exhibited promising outcomes in the management of OSA. However, the available body of clinical cases in the literature remains limited, necessitating further substantiation of these findings. Consequently, the objective of this retrospective study is to assess the incidence of surgical complications in 116 patients.

Materials and Methods: This is a retrospective cohort study involving adult patients who underwent treatment for obstructive sleep apnea syndrome utilizing the Zetapalatopharyngoplasty technique. A total of 116 patients who underwent surgical procedures employing the ZPFP technique, performed by four distinct surgeons, between the years 2012 and 2023, were included in the study. Initial data analysis encompassed the comprehensive review of medical records, focusing on the evaluation of hospital readmission rates. Subsequently, all enrolled patients were subjected to structured interviews aimed at assessing the occurrence of late-onset complications.

Results: Among the 116 participants, 91 (79.31%) were male, and the mean age was 44 years. A majority of the participants presented with comorbidities (68.10%), with systemic arterial hypertension being the most prevalent (19.8%). The distribution of surgeries across the four participating surgeons was as follows: the most experienced surgeon conducted 71 surgeries during the evaluation period, followed by the second surgeon with 21 cases, the third surgeon with 19 patients, and the fourth surgeon with five cases. The mean duration of hospitalization after surgery was 1.2 days.Out of the surgeries, 78 had a combined nasal approach, with septoplasty as the most common supplementary procedure. Early complications were primarily characterized by dysphagia and odynophagia, which were reported in 98% of cases. Only one patient, constituting less than 1% of the sample, necessitated a return to the operating room due to postoperative bleeding. Four patients required intravenous analgesia in the immediate postoperative period. Approximately 4% of patients exhibited persistent dysphagia, primarily related to the ingestion of liquids. Additional late-onset complications were reported at a prevalence of less than 1%. These included heightened symptoms of pharyngolaryngeal reflux, sialorrhea, a sensation of pharyngeal constriction, and alterations in voice quality. The incidence of mortality, emergency tracheostomy and nasopharyngeal stenosis was observed to be 0%.

Conclusions: Surgery for the treatment of sleep apnea is typically recommended for patients with anatomical features that predispose them to upper airway collapse. Observational studies involving individuals who have undergone palatal surgery have previously shown a reduced risk of cardiovascular diseases and long-term mortality, even after adjusting for comorbidities. In the context of this study, both early and late complications associated with the Zetapalatopharyngoplasty (ZPFP) technique exhibited a lower prevalence compared to the traditional uvulopalatopharyngoplasty technique, and their rates were similar to those observed in barbed pharyngoplasty. Consequently, Zetapalatopharyngoplasty is considered a safe surgical option with a low incidence of late complications.

Prevalence of sleep apnea in Schaaf-Yang syndrom: a sistematic review

R. Mascarenhas[1], R. Kruschewsky[2]
[1]Escola Bahiana de Medicina e Saúde Pública, Salvador, Brazil, [2]Universidade Federal da Bahia, Salvador, Brazil

Introduction: Schaaf-Yang Syndrome (SYS) is a very rare genetic alteration that affects neuropsychomotor development and has many characteristics in common with Prader-Willi Syndrome. This condition occurs due to truncating point mutations of the paternal allele of MAGEL2 .The most common manifestations are sleep apnea, neurodevelopmental delay, endocrine disorders and breathing problems after birth.

Materials and methods: Searches carried out in MEDLINE/Pubmed data source were performed via a combination of descriptors. The PRISMA protocol was applied for the selection of articles to be analyzed in the review. The terms used for the search were related to the registered name of the syndrome: schaaf-yang[All Fields], the term "syndrome": ("syndrome"[MeSH Terms] OR "syndrome"[All Fields]) and to the symptoms related to sleep apnea used: ("sleep apnea"[All Fields] OR "sleep apnea"[MeSH Terms]). Some references present in the selected articles were also consulted to search for additional information about the work.

Results: After applying the PRISMA protocol, the study became restricted to 10 articles that answered the systematic review question. The article with the largest sample size (n=13), of 13 patients analyzed, 9 reported having sleep apnea. Combining the result of all articles analyzed, we get a sample size of 36 patients who have the syndrome, of those, 18 reported having sleep apnea. Analyzing the numbers, we have a prevalence of 50% of people with the SYS have sleep apnea characteristic symptoms.

Conclusions: After this analysis, it´s become clear the strong relationship between the SYS and Sleep Apnea. However, the difficulty of making this diagnosis is still very high, due to the rarity of the syndrome, the few methods capable of diagnosing it and the similarity with the Prader-Willi Syndrome.

Acknowledgements: Special thanks to Ramon Kruschewsky, my advisor in writing this article and my family, especially my sister, who is diagnosed with the SYS.

Prevalence of sleep healthcare night-workers disorders in a french caribbean public hospital

M. Rejaudry Lacavalerie[1]
[1]Université des Antilles, Physiology, Fort de France, Martinique

Introduction: Several studies have shown that night work can lead to sleep disturbances and alertness. The literature agrees that the prevalence of sleep disorders is higher among the night-workers than among other workers and the overall population. The aim of our survey was to determine the prevalence of sleep healthcare night-workers disorders in a French Caribbean public hospital.
Materials and Methods: Healthcare night-workers volunteers took part in this cross-sectional descriptive observational study. CHUGSOM 1 survey includes validated scales items of sleep disorders: The Berlin questionnaire, the Epworth Sleepiness Scale and the Insomnia Severity Index.
Results: 154 complete questionnaires have been analyzed: 33 (21,4%) men and 121 (78,5%) women; aged from 40±8,9 years. 66% of healthcare night-workers suffered from insomnia, medical staff mostly. 23% suffered from excessive daytime sleepiness, medical staff mostly. 20% suffered from sleep apnea, paramedics staff mostly. Most of volunteers were neither morning nor evening. 94% used a screen at night and 64% were napping.
Conclusions: We found a high prevalence of insomnia, sleep apnea and excessive daytime sleepiness in healthcare night-workers. It would be advisable to include systematic investigations of sleep disorders in the occupational health follow-up of healthcare night-workers.
Acknowledgements: Dr Aviane AUGUSTE researcher, Universitary Public Hospital of Guadeloupe French Caribbean, Nurses of Occupational medicine service of the Universitary Public Hospital of Guadeloupe, Dr CHICOT Medical Doctor in Occupational Medecine.

Prospective association between inadequate sleep and mental health in US counties

J. Xiao[1], H. Wang[1]
[1]Brigham and Women's Hospital, Medicine, Boston, United States

Introduction: Sleep disturbances are common in individuals with mental health problems, including stress, anxiety and depression. Although inadequate sleep is associated with increased odds of frequent mental distress among US adults in a recent cross-sectional study, longitudinal research is needed to determine temporality. This study examines the bidirectional prospective associations between sleep and mental health over two to three years across US counties.

Materials and Methods: We used two releases of PLACES: County Data, both published by the CDC. These datasets were generated from the Behavioral Risk Factor Surveillance System (BRFSS) of health-related telephone surveys from 2021/2020 and the baseline at 2018. Inadequate sleep was measured as self-reported less than seven hours of sleep in a 24-hour period, and poor mental health was measured as self-reported stress, depression, and problems with emotions for >=14 days in a month. Age-adjusted prevalence data among adults aged >=18 years in 3,074 counties were used in our analysis. Linear regressions were performed between mental health change and baseline inadequate sleep adjusting for baseline poor mental health, and between inadequate sleep change and baseline poor mental health adjusting for baseline sleep. We performed additional sensitivity analyses, adjusting for baseline prevalent binge drinking, smoking, lack of leisure-time physical activity, and obesity.

Results: Although the mean age-adjusted prevalence of not good mental health has increased by 2.06% to reach 17.15% from 2018 to 2021, the mean age-adjusted prevalence of sleeping less than 7 hours has decreased by 2.32% to reach 34.4% from 2018 to 2020. Each percent increase of poor mental health prevalence at baseline was significantly associated with a 0.23% increase of inadequate sleep prevalence over two years (95% CI: 0.191, 0.276; $p < 2 \times 10^{-16}$). This association remained significant after adjusting for additional covariates. However, inadequate sleep prevalence at baseline was not significantly associated with changes in poor mental health (95% CI: -0.022, 0.0003; p=0.057).

Conclusions: This study suggests a causal association of poor mental health to inadequate sleep, but not the opposite direction. From 2018 to 2021/2020, the prevalence of not good mental health has increased while the prevalence of sleeping for less than seven hours has decreased. Further research should evaluate the impact of environmental factors such as COVID-19 that may have affected the sleep and mental health status of the population.

Racial/ethnic disparities in objective sleep measures from polysomnographic studies in the U.S.

M.-W. Sohn[1], N. Farr[1], S. Ahn[2], M. Goldman[3], S. Pasha[4], H. Shin[1], J. Lobo[5]
[1]University of Kentucky College of Public Health, Health Management and Policy, Lexington, United States, [2]Vanderbilt University, School of Nursing, Nashville, United States, [3]Virginia Commonwealth University, Neurology, Richmond, United States, [4]University of Kentucky College of Medicine, Pulmonary Critical Care and Sleep Medicine, Lexington, United States, [5]University of Virginia School of Medicine, Public Health Sciences, Charlottesville, United States

Introduction: In the United States, racial/ethnic disparities in sleep health are emerging as important public health issues. Previous studies have amply demonstrated shorter self-reported sleep duration for Black patients compared to White patients. However, for disparities in other dimensions of sleep such as objectively measured sleep quality, obstructive sleep apnea (OSA), or sleep architecture, evidence is still insufficient or mixed. We aimed to assess disparities in objectively measured sleep parameters between races and ethnicities.
Materials and Methods: We used data extracted through text mining from sleep reports of in-lab polysomnography (PSG) studies conducted for adults aged 18 years or older at the University of Virginia in the USA between 2010 and 2017. All split-night studies, continuous positive airway pressure titration studies, and studies whose duration was shorter than one hour were excluded. For patients with multiple PSG studies, we used only the first study. Sleep parameters extracted include total sleep time (TST), sleep efficiency, duration of each NREM-REM stage, total number of stage changes, number of awakenings, and apnea-hypopnea index (AHI). AHI was defined using the American Academy of Sleep Medicine Rule 1.B.
Results: The study sample included 4377 patients of whom 63% were non-Hispanic (NH) Whites, 21% NH Black, 4% Hispanic/Latinx, and 12% Other/Unknown, who were 52±15, 49±13, 45±12, and 50±16 years old and 41%, 30%, 35%, and 40% male, respectively. Average total sleep time (TST) was 350 minutes, sleep efficiency 76%, apnea-hypopnea index (AHI) 15.8±17.6, with 37% of patients having OSA (moderate, 24%; severe, 13%). After adjusting for age, sex, body mass index, comorbidities, and antidepressant or antipsychotic medications, we found that, compared to NH Whites, NH Blacks had 12 minutes (95% CI = -17.6, -7.2; $p < 0.001$) and Hispanics had 13 minutes (95% CI = -24.4, -2.9; $p = 0.013$) shorter N3 sleep. NH Blacks had 6 minutes (95% CI = 3.2, 8.7; $p < 0.001$) and Hispanics had 8 minutes (95% CI = 2.5, 13.8; $p = 0.005$) longer REM sleep compared to NH Whites. NH Blacks experienced 8 fewer awakenings (95% CI = -14.9, -1; $p = 0.027$) but 4 more stage changes (95% CI = 1.6, 7.2; $p = 0.002$) compared to NH Whites. The number of awakenings and total stage changes for the Hispanic patients were not significantly different from those for NH Whites. We did not find significant differences in TST, sleep efficiency, N3 and REM sleep duration, and AHI between races/ethnicities.
Conclusions: Our data show that NH Blacks and Hispanics had shorter N3 sleep and longer REM sleep than NH Whites. NH Blacks had fewer awakenings but more frequent stage changes than NH Whites. More frequent stage changes and shorter N3 sleep observed here in NH Black individuals may undermine subjective sleep sufficiency independent of sleep duration and efficiency. More research is needed to better understand how much of these differences are due to underlying physiology versus social/environmental factors between races and ethnicities.

Racial/ethnic disparities in sleep health among adolescents in South Korea: the role of substance use behaviors

B. Jeon[1], S.J. Chung[2], K.J. Breaker[1], Y.J. Lee[3]
[1]University of Iowa, College of Nursing, Iowa City, United States, [2]Chung-Ang University, Red Cross College of Nursing, Seoul, Korea, Republic of, [3]University of Pittsburgh, School of Nursing, Pittsburgh, United States

Introduction: Optimal sleep health in adolescents is a prerequisite to their mental and physical well-being. However, among adolescents, historically minoritized racial/ethnic groups are more likely to experience sleep disturbances. Additionally, substance use, which negatively affects sleep health in adolescents, is more common in historically minoritized racial/ethnic groups. Despites the known racial/ethnic disparities in each sleep and substance use, it remains unclear whether the impact of substance use on sleep differs based on racial/ethnic disparities. In Korean society, where racial and ethnic identity has traditionally been tied to a shared bloodline, children with one or both parents not born in South Korea are often perceived as belonging to minoritized racial/ethnic groups. Despite a rising proportion of these minority adolescents, they have been understudied. Thus, the objective of this study is to examine whether racial/ethnic disparities interact with substance use behaviors to influence sleep health in adolescents.

Materials and methods: We analyzed data from the Korea Youth Risk Behavior Web-based Survey (KYRBS), examining health behaviors among Korean adolescents (7th to 12th grade) in 2021. The total 2,644 adolescents were categorized as the racial/ethnic minority group (one or two of their parents not born in South Korea) or the racial/ethnic majority group (both parents born in South Korea). Substance use behaviors included current alcohol and tobacco use (yes vs. no). Sleep health included sleep duration (average sleep duration between weekday and weekend; hours), sleep debt (difference between weekend and weekday sleep duration; hours), and sleep timing (midpoint of sleep). Multiple linear regression analyses were conducted to determine whether racial/ethnic disparities and substance use behaviors interact to influence sleep health in adolescents, controlling for sociodemographic and psychosocial covariates.

Results: Out of the total participants, 2.6% (n=68) were classified as racial/ethnic minorities. Sleep health and substance use behaviors did not statistically differ between the two groups. In the regression models, alcohol use was independently associated with shorter sleep duration (b=-0.09, p=.045) and delayed sleep timing (b=0.30, p<.001) regardless of racial/ethnic groups. Sleep debt was higher in the racial/ethnic minority group than in the racial/ethnic majority group in adolescents when they used alcohol (interaction term between racial/ethnic difference and alcohol use; b=1.17, p=.039). Tobacco use was independently associated with increased sleep debt (b=0.25, p=.006) and delayed sleep timing (b=0.29, p<.001) regardless of racial/ethnic groups.

Conclusions: Overall, being racial/ethnic minority adolescents in South Korea was not significantly associated with their sleep health. However, substance use behavior was an independent factor negatively impacting sleep health in adolescents. Managing substance use behaviors is crucial for improving sleep health among adolescents in South Korea regardless of racial/ethnic differences. Although there were no statistical racial/ethnic differences in alcohol use, racial/ethnic minority adolescents in South Korea are more vulnerable to the detrimental effects of alcohol use on sleep debt. Assessing the level of racial-related discrimination in each group is essential for a better understanding of the interplay between racial/ethnic disparities and substance use behaviors.

Reduced sleep efficiency, insomnia symptoms and fatigue during menses are not related to increased inflammatory mediators: a polysomnographic study from EPISONO

I. A. Ishikura[1], H. Hachul[1,2], M. Moysés-Oliveira[3], G.L. Fernandes[1], S. Tufik[1,3], M. L. Andersen[1,3]
[1]Universidade Federal de São Paulo, Psychobiology, São Paulo, Brazil, [2]Universidade Federal de São Paulo, Gynecology, São Paulo, Brazil, [3]Sleep Institute, São Paulo, Brazil

Introduction: Menses occurs at every menstrual cycle during the reproductive stage of women's life. It involves inflammatory and hormonal aspects that brings out physiological changes to female's body, which can result in sleep complaints, fatigue, anxiety and depression symptoms, worsening quality of life. **Aims:** Our study aimed to observe the effects of menses on sleep, inflammatory mediators, fatigue, anxiety and depression symptoms, and repercussions on quality of life.
Materials and Methods: For this study, 232 women were submitted to a 1-night polysomnography (PSG) and distributed in 2 groups, according to the presence of menses during PSG (i.e., menstruating and non-menstruating). Menses was confirmed by female sexual hormones levels and responses of the institutional women's questionnaire. The participants responded to questionnaires related to sleep quality, insomnia, anxiety and depression symptoms, fatigue, somnolence and quality of life. Blood dosages of IL-6, TNF-alpha and C-reactive protein were analyzed to gain insights on inflammatory processes. Kruskal-Wallis with Dunn post hoc were used for statistical analysis, considering $p < 0.05$.
Results: Sleep efficiency was statistically reduced in menstruating women (81%±13) when compared to non-menstruating women (84.2%±13.3). Both groups presented poor sleep quality and insomnia symptoms, but only menstruating women showed fatigue symptoms. No statistical differences were observed in respect of inflammatory mediators' levels, other sleep parameters and questionnaires related to anxiety, depression and quality of life.
Conclusions: Menses negatively impacted on sleep leading to insomnia symptoms and fatigue, but was not associated with inflammatory mediators' levels. Both groups of women presented poor sleep quality and insomnia symptoms, according to the questionnaires applied.

Relationship between body fat percentage and sleep quality in university students with normal body mass index, 2015

E.M. Ruiz Sanchez[1,2,3], I.I. Bernui Leo[1]
[1]Universidad Nacional Mayor de San Marcos, Nutrition, Lima, Peru, [2]Universidad Privada del Norte, Lima, Peru, [3]Universidad Peruana Los Andes, Huancayo, Peru

Introduction: The university students are a population with a tendency to a poor quality of sleep and bad eating habits, altering their body composition, having a greater predisposition to excess adipose tissue, relating to cognitive problems, chronic non-communicable diseases, reduced mental abilities, and premature mortality due to these reasons. This research sought to determine the relationship between body fat percentage and sleep quality in university students with a normal body mass index.
Materials and methods: This study used a cross-sectional design. The population were nutrition students from the second to the fourth year of studies at the Universidad Nacional Mayor de San Marcos with the inclusion criteria of having a normal body mass index (BMI) (18.5 - 24.9). The sample was selected through a probabilistic sampling of the type stratified by years of study. The percentage of body fat was quantified through electrical bioimpedance using an OMROM model HBF-516 scale. The cut-off point for high percentage of fat was ≥20% in men and ≥33% in women. For sleep quality, the Pittsburgh Sleep Quality Index (ICSP) test was applied, being considered poor sleep quality with a cut-off point > 5 points regardless of sex. The chi square test was used to measure the relationship between the variables.
Results: A cross-sectional study was conducted in a sample of 93 students, 68% of them were woman with mean age of 21.23 ± 1.9 years. 49% of the sample obtained high percentage of body fat; 49% of the sample obtained high percentage of body fat; women higher than men (52% vs. 42%) and women in the last years higher than women in the first years. 75% of students were considered as poor sleepers or with poor quality sleep, their biggest problem was the duration of sleep hours, being less than 6 hours at night, generating greater daytime dysfunction due to accumulated sleep deficit and greater difficulty performing their daytime tasks normally. No statistically significant relationship was found between the percentage of body fat and their sleep quality ($p>0.05$) in university students with a normal body mass index.
Conclusions: No association was found between percentage of body fat and the quality of sleep of students with normal BMI. More studies with large samples should be carried out since high values are found in both variables that could generate health problems in the university students.
Keywords: Sleep quality, body composition, bioelectrical impedance analysis, university students.

Relationship between subjective sleep quality, self-reported sleep-wake complaints, and objective measures of sleep quality in patients with sleep disorders - preliminary results

M. Tecedeiro[1], J. Marôco[1], T. Paiva[2], R. Staats[3,4], P. Pinto[3,4], C. Bentes[5,6], A.R. Peralta[5,6], S. Parreira[5,3], A. Franco[5,6], C. Reis[7,8,4]
[1]William James Centre for Research – ISPA, Lisbon, Portugal, [2]CENC - Sleep Medicine Center, Lisbon, Portugal, [3]Clínica Universitária de Pneumologia, CHULN, Lisbon, Portugal, [4]ISAMB - Faculdade de Medicina, Universidade de Lisboa, Lisbon, Portugal, [5]Laboratório de EEG/Sono-Unidade de Monitorização Neurofisiológica. Serviço de Neurologia. Departamento de Neurociências e Saúde Mental. Hospital de Santa Maria/CHULN, Lisbon, Portugal, [6]Centro de Estudos Egas Moniz. Faculdade de Medicina da Universidade de Lisboa, Lisbon, Portugal, [7]Universidade Católica Portuguesa, Católica Research Centre for Psychological, Family and Social Wellbeing, Lisbon, Portugal, [8]Instituto de Medicina Molecular João Lobo Antunes, Faculdade de Medicina, Universidade de Lisboa, Lisbon, Portugal

Introduction: Self-reported sleep assessments are frequently used in sleep research and clinical practice since they are easily available and cost-effective instruments. Among self-reported measures, subjective sleep quality (SSQ) is of particular interest, because reduced SSQ is a common reason for seeking medical advice, and it may be affected in many sleep disorders. Furthermore, there is no consensus regarding the objective measures that better relate to SSQ. The aim of this study was to increase the understanding regarding the relationship of self-reported sleep-wake complaints, objective sleep parameters, and self-reported sleep quality across a wide range of sleep disorders.
Materials and methods: A consecutive sample of 212 adults (56.6% women) aged 19 to 86 years (48.9±15.5 years) undergoing polysomnography was recruited from three Portuguese sleep laboratories with different settings (Neurology and Pulmonology Departments, CHULN, and CENC-Sleep Medicine Center, Lisbon, Portugal). Diagnosis was established by certified sleep medicine physicians according to the International Classification of Sleep Disorders – Third Edition criteria. Self-reported sleep-wake parameters, including SSQ, were collected using the Karolinska Sleep Questionnaire (KSQ). 18 KSQ items referring to night and daytime symptoms of poor sleep, PSG variables (Total Sleep Time-TST, Wake After Sleep Onset-WASO, sleep latency, sleep efficiency percentage, REM percentage, N3 percentage, arousal index, Oxygen Desaturation Index-ODI), age, sex and Body Mass Index (BMI) were used as independent variables (IV) and tested for multicollinearity (for a VIF>3). KSQ item on sleep quality "*How is your sleep in general?*" was used as dependent variable. Multiple ordinal regressions were conducted with the remaining IV eliminating, at each stage, the non-significant variables, until we reached a final model composed only by significant predictors. We used SPSS 29 for statistical analysis. Statistical significance was set at $p \leq 0.05$.
Results: For the total 212 sleep disorder patients, 128 participants were diagnosed with obstructive sleep apnea (OSA), 46 with insomnia, and 104 with other sleep disorders. Among all patients, 92 had more than one sleep disorder. The final model had a Cox and Snell Pseudo $R^2=0.506$, and was composed by KSQ items *"Difficulties falling asleep"* (OR = 2.00; CI=1.51-2.66), *"Feelings of exhaustion at the awakening"* (OR=1.99; CI=1.50-2.63), *"Premature (final) awakening"* (OR=1.50; CI=1.15-1.94), BMI (OR=1.09; CI=1.01-1.18) and ODI (OR=0.95; CI=0.93-0.98). A lower ODI was associated with higher odds of having better SSQ, whereas higher levels of the remaining variable were associated with poorer SSQ. In this cohort SSQ was explained by three variables associated with sleep complaints, BMI and ODI, which is associated with Obstructive Sleep Apnea. Self-report items had better predictive power than the other variables.
Conclusions: These results, although preliminary, underline the importance of a comprehensive clinical interview in the diagnosis of sleep disorders, due to the relevance of some night and daytime symptoms to predict SSQ. It will be important to increase the size of the sample to strengthen statistical relationships and to perform further analysis separating the sample by disorder groups. This will be particularly important for the case of ODI.

Religiosity, the quest for religious meaning, and a good night's sleep: the role of anxiety and depression

N. Basis[1], L. Keinan Boker[2], T. Shochat[1]
[1]The University of Haifa, The Faculty of Social Welfare and Health Sciences, Haifa, Israel, [2]The University of Haifa, The School of Social Public Health, Haifa, Israel

Introduction: Studies have shown that living a religious lifestyle with religious belief is beneficial to mental health, specifically for anxiety and depression, both of which are strongly linked to poor sleep. Yet few studies have looked at the specific components of religious meaning in association with the quality and/or quantity of sleep. To investigate this relationship, we surveyed religious and non-religious members of the minority Druze population on Mount Carmel in Israel, using Voci and colleagues' (2017) Religious Life and Orientation Scale (RLOS), to gauge religion as an end (where religion is seen as an ultimate end in itself), religion as means (where religion is a means to achieve other self-serving ends), and religion as quest (this orientation treats religion not as a means or an end, but a search for truth), and assessed associations between these dimensions with sleep quality and quantity, testing anxiety and depression as underlying mechanisms.

Materials and methods: By snowball sampling, participants included 55 religious and 110 non-religious Druze adults who were surveyed at their homes. They completed the RLOS, Hospital Anxiety and Depression Scale (HADS), and completed a 2-week sleep diary. We tested the effects of religiosity on sleep quality (scale 1-5) and quantity (reported hours of sleep) by examining religion as a dichotomous variable (religious/non-religious and religion orientations (religion as an end, religion as mean, and religion as quest). Next, we examined anxiety and depression as mediators in these relationships. Mediation analysis was provided using the Process method (Hayes, 2013).

Results: In mediation models in which anxiety was used as a mediator, anxiety fully mediated the relationship between religion (yes/no) and sleep quality (indirect effect: $\beta=0.117$, %95, CI 0.372, 0.222). Non-religious status predicted higher anxiety ($\beta=-2.554$. %95, CI -3.687, -1.422), and anxiety predicted lower sleep quality ($\beta=-0.0459$, %95, CI-0.070, -0.0209). Furthermore, anxiety fully mediated the relationship between religion as quest and sleep quality (indirect effect: $\beta=-0.047$, % 95 CI -0.0954, -0.094). Religion as quest predicted higher anxiety ($\beta=0.263$, %95, CI 0.1330, 0.3947), and anxiety predicted lower sleep quality ($\beta=-0.177$, %95, CI-0.2992, -0.0548). No other models were significant for anxiety or depression.

Conclusion: Anxiety plays a crucial role in the relationship between religion (yes/no) and religious orientation (religion as quest) and sleep quality. Religious individuals on the one hand, and those who report low levels of meaning seeking in religion (religion as quest) on the other, experience less anxiety and report better sleep quality.

Self-perceived concerns regarding sleep quality and its association with anxiety and depressive factors in patients with Hereditary Endocrine Neoplasia type 1: a cross-sectional study

F.S. da Silva[1], D.F. de Araújo[1], M.A. Sobreira Neto[2], A.R. Pinto Quidute[1]
[1]Universidade Federal do Ceará, Núcleo de Pesquisa e Desenvolvimento de Medicamentos, Fortaleza, Brazil, [2]Universidade Federal do Ceará, Sleep Medicine Program, Fortaleza, Brazil

Introduction: Hereditary Endocrine Neoplasia type 1 (MEN-1) is a genetic neoplastic syndrome characterized by the development of tumors primarily affecting the parathyroids, pancreas, and pituitary gland. These tumors significantly impact the quality of life of affected individuals. Sleep quality plays a crucial role in physical and mental health, and it is often compromised in cancer patients, potentially contributing to mood and anxiety disorders. Objective: This study aims to evaluate self-perceived concerns about sleep and examine their correlation with anxiety and depression in patients with MEN-1.

Materials and Methods: A cross-sectional study was conducted at a tertiary hospital in northeastern Brazil. Following approval from the institution's ethics committee, individuals diagnosed with MEN-1 were assessed using the NCCN Distress Thermometer and Problem List (DTPL) scales, as well as the Hospital Anxiety and Depression Scale (HADS). The DTPL measures distress levels on a scale of 0 to 10 and assesses various concerns, including personal, practical, family, emotional, spiritual, and physical aspects. The HADS consists of 14 questions that help screen for symptoms of anxiety and depression.

Results: 28 patients with MEN-1 (15 men, mean age: 42.10±11.38 years were included. The mean DTPL score was 6.42±2.85, with concerns related to sleep (67.9%) presenting as the most prevalent, followed by fatigue (57.1%) and memory/concentration issues (50%) within the physical concerns section. The HADS identified anxiety factors in 75% of the participants and depressive factors in 50%.

Conclusions: The high prevalence of sleep-related concerns among individuals with MEN-1 suggests that sleep disorders are significant sources of distress. Anxiety negatively impacts sleep quality by interfering with the ability to fall asleep and maintaining restful sleep, leading to frequent awakenings. The presence of anxiety, coupled with physical concerns related to sleep, creates an unhealthy cycle where anxiety disrupts sleep, while fatigue and memory/concentration problems increase anxiety and emotional distress. The data indicates a simultaneous presence of anxiety and depressive factors, which can detrimentally influence sleep quality in patients with MEN-1. Furthermore, the interplay between physical and emotional concerns exacerbates symptoms of anxiety and depression, perpetuating a vicious cycle. In conclusion, this study highlights the importance of addressing sleep-related distress in individuals with MEN-1. By effectively managing anxiety and depression, healthcare providers can potentially improve sleep quality and enhance the overall well-being of these patients. Future interventions should focus on breaking the cycle of anxiety, sleep disturbances, and emotional distress, thereby providing a holistic approach to improve the lives of individuals with MEN-1.

Keywords: Neuroendocrine Tumor, Anxiety, Depression, MEN-1

Shift workers show musculoskeletal complaints associated with sleep quality

A. Silva[1], A. Amaral[1], R. Guerreiro[1], F. Silva[2], G. Cavalcante[1], B. Ramos[1], M.T. Mello[1]
[1]Universidade Federal de Minas Gerais (UFMG), Departamento de Esportes, Belo Horizonte, Brazil,
[2]Multidisciplinary Center in Somnolence and Accidents (CEMSA), Belo Horizonte, Brazil

Introduction: Sleep is defined as a fundamental behavioral and physiological state for biological functions and maintenance of body homeostasis, being a reversible process that representes one third of a person's life. Among sleep functions, some have been highlighted, such as the ability to restore metabolic processes, cognitive development, which is essential for learning and consolidating memory and adequate maintenance of immune system. Experts recommend that the duration of sleep for adults should be between seven and nine hours a night 5. However, shift workers or those who perform their work activities at night have an average sleep duration between 5 and 6 hours. In this sense, studies relate shiftwork with the presence of sleep disorders, fatigue, physical complaints, and musculoskeletal disorders. To verify the association between sleep and the musculoskeletal complaints in shift workers.
Materials and methods: Cross-sectional study, 41 volunteers, employees of a mining company. Musculoskeletal complaints were assessed by the Nordic Musculoskeletal Symptoms Questionnaire together with the Visual Analogue Scale. Sleep quality were assessed through actigraphy for 15 days, and by Pittsburg Sleep Quality Index (PSQI). For data analysis, the Kendall correlation test was used.
Results: Negative association between the number of musculoskeletal complaints in the last 12 months with sleep efficiency using the PSQI (p = 0.03). A positive association was observed between the number of musculoskeletal complaints in the last 12 months and PSQI score (p = 0.02).
Conclusions: The presence of musculoskeletal complaints in shift workers was associated with a worsening of the subjective perception of sleep quality, as well as with sleep efficiency. Thus, we indicate that a low quality of sleep can negatively impact musculoskeletal complaints in shift workers.

Shift working and risk of dyslipidemia: a cross-sectional study among health care workers in Iran

N. Izadi[1], M. Cheraghi[2], A. Najafi[2]
[1]Tehran University of Medical Sciences, Occupational Medicine, Tehran, Iran, Islamic Republic of,
[2]Tehran University of Medical Sciences, Tehran, Iran, Islamic Republic of

Background: Shift works [p1] among nurses can affect metabolic disturbances such as dyslipidemia. The aim of this study was to evaluate the relationship of shift work of nursing staff with sleep problems and their lipid profile in a large referral medical center in Tehran, Iran.
Methods: This cross-sectional study was conducted on 1772 nurses (1399 women and 373 men) working in Imam Khomeini Hospital in Tehran in 2020. Baseline characteristics including gender, age, weight and height, medical history and medications, marital status, educational level, history of smoking, physical activity and diet status, as well as their job status details, especially shift work, work experience, job category, and employment status were collected. Intravenous blood samples were taken from all personnel after 12 hours of fasting and sent to the hospital laboratory for evaluation of lipid profile.
Results: Hypertriglyceridemia was revealed in 34.2%, hypercholesterolemia in 34.0%, abnormal raising LDL level in 13.6%, abnormal reducing HDL in 56.1% and overall dyslipidemia in 38.9%. As revealed by the multivariable linear regression modeling, shifting work along with sleep problem, lack of physical activity, and unhealthy dietary regimen could predict abnormal serum LDL level. Shift work [p2] and sedentary lifestyle were the main predictors for hypercholesterolemia. Sleep problem was the main predictor for hypertriglyceridemia.
Conclusion: Shifty work and sleep problems are major predictors for lipid profile disturbances among nurses.

SKY and its effects on sleep: a systematic review of a breathing technique for sleep improvement

G. Kowdley[1], P. Castro[2], H. Kowdley[1], S. Ramji[1], R. Joyner[1]
[1]TidalHealth Richard A. Henson Research Institute, Salisbury, United States, [2]Philadelphia College of Osteopathic Medicine, Philadelphia, United States

Introduction: Sleep is often disturbed in many individuals at various times in their lives and it is estimated that 50-70 million adults in the USA alone report chronically disturbed sleep[1]. Sudarshan Kriya Yoga (SKY) is a rhythmic breathing technique which consists of four stages of breathing and takes approximately 30 minutes to complete. It can be self-administered after training. SKY has shown beneficial effects in anxiety reduction, well-being, and stress reduction. In some studies, it has been shown to have beneficial effects on sleep in terms of latency and overall sleep quality[2]. In this study, we performed a systematic review of the current literature looking for evidence of SKY's effectivity when sleep quality is directly measured.

Materials and Methods: The review procedure followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology. Articles of interest were identified using PubMed, Cochrane Review, and expert recommendation. The search terms used were SKY, Sudarshan Kriya, sleep, breathing, and meditation. A total of 760 articles were initially identified in PubMed, no articles were identified in the Cochrane Library, and 1 was identified through expert recommendation. Of these, 720 were eliminated through article title review. The remaining 41 publications underwent independent review by each author. Inclusion criteria required that the article use SKY as an intervention with sleep as a measured outcome. Articles that assessed populations with diagnosed psychiatric disorders were excluded. Following independent review, 9 articles were agreed upon by all authors for inclusion, data extraction, and analysis.

Results: Among the 9 publications analyzed, 3 were prospective cohort studies, 2 were randomized controlled trials, 2 were open trial single-armed pre-post studies, and 2 were cross-sectional studies. Sleep was assessed by 4 studies using the Pittsburgh Sleep Quality Index (PSQI), 1 using the Epworth Sleepiness Scale (ESS), 3 using their own study-specific survey, and 1 using polysomnography. All 9 studies showed some beneficial effects of SKY on sleep immediately after training, however, return to baseline sleep patterns were noted in 2 of the studies. Sleep quality improved with the regular and more frequent practice of SKY in a cross-sectional study.

Conclusions: SKY does show beneficial effects on sleep. All studies showed some benefit to participants who learned the technique. SKY provides a tool for individuals to improve their sleep quality. A strong recommendation is difficult to offer based on the small nature of the trials, lack of systematic controls in many, and some trials showing a return to baseline sleep quality, after a latent period. Further, investigation through controlled and prospective studies specifically designed to measure sleep quality with this technique are needed.

Sleep and glycemic variability in people with diabetes: A systematic review

J. Yuan[1], Y. Wang[1], J. Wang[1], P. Chen[2], Y. Mu[1], C. Fritschi[2], Y. Chen[3], S. Reutrakul[4], B. Zhu[1]
[1]Shanghai Jiao Tong University, School of Nursing, Shanghai, China, [2]University of Illinois Chicago, College of Nursing, Chicago, United States, [3]Lujiazui Community Health Service Center, Shanghai, China, [4]University of Illinois Chicago, College of Medicine, Chicago, United States

Introduction: Diabetes is a global health issue. Glycemic variability (GV) is an important indicator for glycemic control. An increasing number of studies have investigated factors associated with GV to guide the development of appropriate medical and nursing care plans. As a novel risk factor for diabetes, sleep may play a role in GV. The aim of this systematic review was to synthesize current evidence on the relationship between sleep and GV.

Materials and Methods: This systematic review followed PRSIMA guidelines. A protocol was registered in PROSPERO (CRD42022331493). PubMed, Embase, Web of science, Cochrane library, CINAHL, PsycINFO, and Opengrey were searched from inception to March 2023. Information about the study characteristics, participant characteristics, measurement of sleep and GV, and key findings were extracted. The adapted Newcastle Ottawa Scale, NIH Quality Assessment Tool for Before-After Studies with No Control Group, and Cochrane Risk of Bias 2 were used for quality appraisal. Due to significant heterogeneity, the results were synthesized with qualitative narratives instead of pooled meta-analyses.

Results: Among the 29 included studies, 15 focused on sleep health (including sleep duration, sleep quality, sleep timing, sleep variability, and sleepiness), 13 focused on sleep apnea, and one focused on both. Based on 11 studies, sleep duration may be associated with GV in people with T2D, but not in people with T1D. The association between sleep quality related parameters and GV was not consistent. Based on six studies, evidence on the association between sleep timing and GV was not strong. The number of studies focusing on other dimensions of sleep health (e.g., sleep variability and sleepiness) has been limited. Based on five observational studies and nine interventional studies, OSA severity may be positively associated with GV and continuous positive airway pressure treatment might be beneficial among people with OSA and T2D.

Conclusions: Preliminary associations were found between sleep duration and OSA with GV in people with T2D. Further well-designed longitudinal and interventional studies are needed to understand how changes in sleep affect GV. More studies conducted in people with T1D and focusing on other dimension of sleep (e.g., sleep timing, sleepiness, and sleep variability) are needed to add to current evidence base. In future clinical practice, it is essential to incorporate sleep assessments and interventions into diabetes self-management regimen.

Sleep and neurodegeneration an integrative review

G. Nobre[1], G. Gerson[2]
[1]Federal University of Ceará, Medicine University, Fortaleza, Brazil, [2]Federal University of Ceará, Department Pathology and Legal Medicine, Fortaleza, Brazil

Introduction: Scientific evidence supporting the bidirectional role of disturbed sleep on neurodegenerative disease risk and progression has increased rapidly. The evidence comes from four strands of investigation: Sleep disturbances, particularly obstructive sleep apnea syndrome, increase the risk for the development and progression of cognitive decline and dementia. Because various neurodegenerative diseases are characterized by stereotypic patterns of disease onset and progression, and because various facets of sleep can be studied topographically, examining local features of sleep deepens our understanding of sleep and dementia, which is characterized for the neurodegeneration that happens in these health problems.

Materials and Methods: The established inclusion criteria were articles researched from 2022 and 2023, along with the use of the DeCS/MeSH descriptors "Sleep physiology", "Neurodegeneration" and "Neuroprogression", intersected with the Boolean operators "AND" and "OR" to search the PubMed platform. Following these specificities, six articles were selected following these criteria.

Results: Insomnia, sleep deprivation, and altered circadian sleep may promote neurodegeneration and neuroprogression in mood disorders. These sleep disturbances may induce a state of chronic inflammation by increasing neuroinflammation both directly and indirectly via activation of microglia and astrocytes. They may act as neurobiological stressors that can negatively affect neuronal plasticity and cause neuronal damage by over activating the stress system. In addition, sleep disturbances may promote the accumulation of neurotoxic proteins, oxidative stress, and a deficit in neuroprotection, contributing to neurodegeneration and neuroprogression. Sleep disturbances have been shown to play a causal role in the increased production of amyloid β (Aβ) and other proteins implicated in neurodegeneration. Clearance of Aβ, tau, α-synuclein, and other proteins in the brain is facilitated by the and other proteins is facilitated by the increased flow of interstitial fluid in the brain, which is strongly associated with slow-wave sleep without rapid eye movements (REM). Focal and network problems associated with the spread of misfolded proteins and site-specific vulnerability in proteinopathies are the reason that different sleep phenotypes are associated with different neurodegenerative diseases. Targeting sleep disorders in the clinical practice may have neuroprotective value for mood disorders.

Conclusions: Excessive sleep may increase the risk of cognitive impairment in older individuals. It may be a suggestive sign of early neurodegeneration and may be a useful clinical tool to identify those at a higher risk of progressing to cognitive impairment.

Sleep and sleep disorders during pregnancy and postpartum: the Life-ON Study

M. Manconi[1], C. Garbazza[2], S. Riccardi[2,3], C. Cajochen[4], E. Zambrelli[5], S. Mondini[6], S. Baiardi[7], A. D'Agostino[5], A. Cicolin[8], F. Cirignotta[9,9]
[1]Mauro Manconi, Sleep Medicine Unit, Neurocenter of Southern Switzerland, Lugano, Switzerland, [2]Neurocenter of Southern Switzerland, Sleep Medicine Unit, Lugano, Switzerland, [3]Università della Svizzera Italiana, Unibern, Neurocenter of Southern Switzerland, Sleep Medicine Unit, Lugano, Switzerland, [4]Psychiatric Hospital of the University of Basel, Centre for Chronobiology, Basel, Switzerland, [5]ASST Santi Paolo e Carlo, San Paolo Hospital, Milan, Italy, [6]UOC NEUROMET IRCCS Institute of Neurological Sciences, Bologna, Italy, [7]University of Bologna, Department of Experimental Diagnostic and Specialty Medicine (DIMES), Bologna, Italy, [8]AOU Città della Salute e della Scienza, Turin, Italy, [9]University of Bologna, Bologna, Italy

Introduction: Sleep and pregnancy are reciprocally linked, with pregnancy inducing changes in sleep and related disorders, and sleep disorders affecting pregnancy and its outcome. Sleep disturbances are known to be very common during pregnancy and the postpartum period. Our aim was to prospectively assess sleep and sleep disorders during pregnancy and postpartum in a large cohort of women.

Methods: multicenter prospective Life-ON study, recruiting consecutive pregnant women at a gestational age between 10 to 15 weeks, from the local gynecological departments. The study included home polysomnography performed between the 23rd and 25th week of pregnancy and sleep-related questionnaires at 11 points in time during pregnancy and one year postpartum.

Results: 439 pregnant women (mean age 33.7±4.2 yrs) were enrolled. Poor quality of sleep was reported by 34% of women in the first trimester of pregnancy, by 46% of women in the third trimester, and by as many as 71% of women in the first month after delivery. A similar trend was seen for insomnia. Excessive daytime sleepiness peaked in the first trimester (30% of women), and decreased in the third trimester, to 22% of women. Prevalence of restless legs syndrome was 27%, with a peak in the third trimester of pregnancy. Sleep-disordered breathing had a prevalence of 4.2% and correlated positively with BMI. Polysomnographic data revealed that 24% of women slept less than 6 hours, and 30.6% of women had a sleep efficiency below 80%.

Conclusions: The Life-ON study provides the largest polysomnographic dataset coupled with longitudinal subjective assessments of sleep quality in pregnant women to date. Sleep disorders are highly frequent and distributed differently during pregnancy and postpartum. Routine assessment of sleep disturbances in the perinatal period is necessary to improve early detection and clinical management.

Sleep and the optimisation of musical performance

B. Pelletier[1]
[1]Hong Kong Baptist University, Music, Hong Kong, Hong Kong, SAR of China

Introduction: This in-progress study aims to quantify the impact that changes in measurable sleep markers have on key objective aspects of musical learning and performance. There exists a growing body of scientific studies supporting the idea that sleep has a powerful impact on cognitive function (Dinges, 2009), memory function (Tucker, 2011), and non-musical fine motor skills (Walker, 2002) (Fischer, 2002). Some additional research has probed the overlap of these findings and the routine tasks faced by music students (Allen, 2012), but the direct, measurable impact that sleep has on musical skills is widely under-represented in the literature. This study examines the impact that sleep status has on specific musical skills within a population of professional musicians and undergraduate music majors.

Materials and methods: A battery of tests has been developed to quantitatively measure three key musical skills - rhythmic integrity, sight-reading, and musical memorisation. For this sleep extension study, 50 participants were recruited and divided into two groups of 25. Both groups tracked their sleep via sleep diary and WHOOP band while undergoing the test battery multiple times across a 10-day span. One group, after establishing a baseline average sleep duration, extended their sleep opportunity by 60 to 90 minutes per day. Statistical modeling is being used to examine performance variances on the battery of musical skills tests between the control group and the sleep-extended group using regression analysis.

Results: The data collection phase of this study has just concluded. Although preliminary results indicate that sleep extension does have a statistically significant impact on specific musical skills test results, full results are not yet available. Results can be reported when the full statistical analysis has been completed - the estimated timeframe is 4-6 weeks.

Conclusions: Filling the current gap in knowledge within the fields of sleep research and music and the quantification of the role sleep has on musical skill acquisition has the potential to contribute to the way sleep researchers understand the impact sleep has on human performance, and revolutionise the way music students approach their learning, music educators optimise their teaching, and professional performers execute their concerts.

Sleep Characteristics and Their Association with Academic Performance among Medical Students in Southwest Nigeria

N. Aderinto[1], S. Afolabi[1], G. Olatunji[2], M. Edun[2], M. Abdulbasit[1], P. Olaniyi[1]
[1]Ladoke Akintola University of Technology, Ogbomoso, Nigeria, [2]University of Ilorin, Ilorin, Nigeria

Introduction: Sleep plays a crucial role in the overall well-being and academic performance of students. Medical students, in particular, face significant academic and lifestyle demands that can impact their sleep patterns and quality. This study aimed to investigate the sleep characteristics of medical students in Southwest Nigeria and explore their association with academic performance.
Materials and Methods: A cross-sectional study was conducted using an online questionnaire to collect data from 802 medical students enrolled in three universities. The questionnaire covered demographic information, sleep patterns, self-reported sleep quality, and academic performance. Statistical analysis, including Pearson correlation and Chi-square tests, was performed to identify any potential associations between sleep patterns, self-reported sleep quality, and academic performance.
Results: The study revealed that the majority of medical students obtained an average of 5.74 ± 0.995 hours of sleep per night. Sleep patterns indicated that most students went to bed between 10 pm and 12 am (54.6%) and woke up between 6 am and 8 am (62%). Additionally, 27.1% of respondents reported consuming coffee at night, and 24.3% used sleep medication. Self-reported sleep quality indicated that 29.9% of students reported good sleep quality, while 12.1% reported excellent sleep quality. Pearson correlation analysis identified significant positive associations between various sleep patterns and sleep quality factors. Moreover, there was a significant positive correlation between self-reported academic performance and sleep quality ($r=0.475$, $p=0.000$).
Conclusions: This study highlights important insights into the sleep characteristics of medical students in Southwest Nigeria and their potential impact on academic performance. It underscores the need for interventions and awareness programs to improve sleep quality among medical students, which may positively influence their academic achievements.
Acknowledgements: None

Sleep characteristics in subjects hospitalized for COVID-19 in a reference hospital from Peru

H. Rojas-Navarro[1], P. Tapia-Mantilla[1], T. Coba-Taboada[2], E. Herrera-Flores[1]
[1]Hospital Nacional Arzobispo Loayza, Neumologia, Lima, Peru, [2]Hospital Nacional Arbobispo Loayza, Neumologia, Lima, Peru

Introduction: Sleep disorders are common in the general population, but they are often underdiagnosed in several Latin American countries. These disorders have been linked to several cardiometabolic diseases, which are also associated with a higher risk of severe COVID-19. The objective of this study is to describe the sleep characteristics in patients hospitalized for COVID-19.

Materials and Methods: Clinical interviews were conducted to gather on sleep habits, symptoms of sleep disorders, and chronic diseases in patients hospitalized for COVID-19 between November 2020 and April 2021 in our COVID-19 Respiratory Care Unit. All hospitalized patients were included, but those who could not provide necessary information or who had altered consciousness were excluded.

Results: A total of 52 patients were interviewed and 7 were excluded. The median age was 59.11 years (IQR: 40.34 – 67.21), and 68.89% were men. Of these 45 patients, 31 (68.89%) were admitted for respiratory conditions, 25 of them with pneumonia (80.65%). Overweight or obesity was found in 29 (64.44%), hypertension in 9 (20%), and diabetes mellitus in 8 (17.78%) patients. Twelve patients (26.67%) required ventilatory support, and 03 were admitted to the ICU. Nocturnal snoring was reported by 26 (57.78%) patients, witnessed apnea by 07 (15.56%), nocturia by 30 (80.33%), insomnia by 18 (40%), non-restorative sleep by 13 (28.89%), daytime fatigue by 14 (31.11%), excessive daytime sleepiness (Epworth score ≥10) by 11 (24.44%), early morning headache by 9 (20%), sleep paralysis by 10 (22.22%), and restless leg symptoms by 10 (22.22%). Most patients went to bed between 10 pm and 11 pm (62.22%) and woke up between 6 am and 7 am (51.11%), the mean sleep time was 7.67 hours (±1.98), 28.89% slept less than 6 hours, the mean sleep latency was 32.18 minutes (±23.91), and 71.11% had a regular sleep schedule. Finally, 48.89% (22/45) reported good to very good sleep quality.

Conclusions: Among patients hospitalized for COVID-19, the majority had respiratory conditions, and a high frequency of overweight/obesity, hypertension, and diabetes mellitus was found. High frequencies of nocturia, nocturnal snoring, insomnia, sleep paralysis, sleep time less than 6 hours, non-restorative sleep, morning headache, daytime fatigue, excessive daytime sleepiness, and restless leg symptoms were also reported.

Sleep disturbances in patients with trigeminal neuralgia

G. Machado Alvares de Lima[1], M. Parise[1], N. Ribeiro Villela[1], N. Antônio de Souza Sampaio[2]
[1]Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro (UERJ), Departamento de Especialidades Cirúrgicas, Rio de Janeiro, Brazil, [2]Universidade do Estado do Rio de Janeiro (UERJ), Departamento de Matemática, Física e Computação, Resende, Brazil

Objectives: Assessing sleep quality in patients with trigeminal neuralgia (TN).
Materials and methods: 38 patients with a diagnosis of TN (according to the International Classification of Orofacial Pain criteria), assisted at the Pain Clinic of the Pedro Ernesto University Hospital from June 2020 to December 2022. Patients were evaluated through the Pittsburgh Sleep Quality Index (PSQI). Scores ≥6 were considered poor sleep quality.
Results: patients had a mean age of 64.4 years (47–77 years), and 26 were women (68.4%). Thirty-three patients (86.8%) had poor sleep quality (PSQI≥6). Twenty-four patients (68.5%) had nocturnal awakenings due to TN; where 6 (17.14%) waking up less than once a week, 8 (22.8%) waking up 1 or 2 times a week, and ten patients (28%) waking up three or more times. 29 patients (76.3%) had scores for daytime dysfunction. Nineteen patients (50%) had average pain considered mild (VAS 0-3) and the other 19 (50%) moderate or severe (VAS≥4), in the last 30 days. 34 patients (89.5%) have used carbamazepine, alone or in association.
Conclusions: Our results suggest that most TN patients have poor sleep quality, despite the use of pain control medications. The number of nocturnal awakenings caused by the painful paroxysms seems to influence poor sleep quality.

Sleep education in schools: a pilot experience in northeastern Brazil to enhance sleep quality and academic performance

J. Nascimento dos Santos[1,2]
[1]Federal University of Ceará, Master Program in Physiotherapy and Functioning, Fortaleza, Brazil,
[2]Expanded Center for Family Health and Primary Care - NASF TRAIRI, Trairi, Brazil

Introduction: Sleep plays a crucial role in the physical and psychomotor development of children and adolescents, making it vital for overall health. However, sleep deprivation can have detrimental effects on various aspects of life, including behavioral changes and academic performance. Sleep education programs have emerged as effective tools to increase public awareness and promote better sleep self-care and academic achievement. This study aims to describe the pilot experience of a sleep education workshop tailored to high school teenagers from state schools in the interior of Ceará, Brazil.
Methods: The study adopts an observational approach, presenting a report on the workshop experience. The workshop was conducted in two schools located on the coast of Ceará, approximately 124 km from the state capital. These schools exclusively cater to high school students aged between 15 and 20 years. Initially, teachers were engaged in awareness sessions to introduce the theme of sleep education. Subsequently, the workshop, lasting approximately 3 hours, was conducted with subgroups of 20-30 students. The workshop employed expository activities with audiovisual aids, group discussions, and student feedback.
Results: The workshops were held from March to May 2023, targeting adolescents who studied during the day. Encouraging active participation, students shared their personal experiences and perceptions of sleep's impact on their academic life. Common reports included insomnia, poor adaptation of sleep schedules to school schedules, and excessive sleepiness during classes. Topics covered during the workshop included sleep health, the detrimental effects of sleep deprivation, chronotypes, sleep regulation, and self-management during the school period. Additionally, the workshop addressed beliefs, myths, and the significance of sleep for learning, aimed at identifying harmful behaviors and presenting strategies to correct them, ultimately enhancing the relationship between sleep quality and school performance.
Conclusions: Upon completion of the workshop, participants gained valuable skills for managing their sleep during school life, with potential applications in their everyday routines. This pilot experience also facilitated the dissemination of a health-focused culture, emphasizing the importance of improving students' sleep quality within the educational environment. Moving forward, the development of structured sleep education programs centered on school environments and the evaluation of objective measures pertaining to sleep quality and academic performance are highly recommended. By prioritizing sleep education in schools, we can foster healthier habits and optimize academic achievements among students.
Keywords: Sleep. Education. School health.

Sleep Health and BMI among Hispanic/Latino Women in HCHS/SOL Baseline and Sueño Ancillary Study

J. Roncoroni[1], S. Whitaker[1], E. Heitman[2], R.J. Thorpe Jr.[3], S.R. Patel[4], P.C. Zee[5], S.S. Kaur[6], K.M. Perreira[7], D. Sotres-Alvarez[8], A.R. Ramos[6]
[1]University of Denver, Counseling Psychology, Denver, United States, [2]UT Southwestern Medical Center, School of Health Professions, Dallas, United States, [3]John Hopkins, Bloomberg School of Medicine, Baltimore, United States, [4]University of Pittsburgh, University of Pittsburgh, Center for Sleep and Cardiovascular Outcomes Research, Pittsburgh, United States, [5]Northwestern University, Center for Circadian and Sleep Medicine, Chicago, United States, [6]University of Miami, Leonard M. Miller School of Medicine, Miami, United States, [7]University of North Carolina, School of Medicine, Chapel Hill, United States, [8]University of North Carolina, Department of Biostatistics, Chapel Hill, United States

Introduction: Among Hispanic/Latino women, the largest group of minority women in the U.S., 78.8% are overweight/obese. Obesity among Hispanic/Latino women is increasing. Sleep is a likely precursor to obesity and other negative cardiometabolic outcomes among Hispanic/Latino women. Almost all existing studies on sleep among U.S. Hispanic/Latinos examine men and women together rather than isolating by self-reported sex. Hispanic/Latino women experience different barriers to healthy sleep than men that aggregated data may be masking. No large study to date has been conducted to understand the association of objectively measured sleep duration and quality and BMI specifically among Hispanic/Latino women. Our study evaluated the association between sleep quantity and quality with BMI among adult US-born (USB) and Foreign-Born (FB) Hispanic/Latino women.

Materials and Methods: The Hispanic/Latino Community Health Study/Study of Latinos (HCHS/SOL) is a community-based cohort of self-identified Hispanic/Latino adults from diverse backgrounds aged 18-74 years at screening from randomly selected households in four U.S. field centers. We conducted a secondary analysis of baseline (2008-2011) data from 1,119 Hispanic/Latino non-pregnant women who also had complete actigraphy data in the HCHS/SOL ancillary study Sueño (we excluded for shift work and moderate-to-severe sleep apnea). Our estimates account for weights and survey design. Linear regression was applied using survey weighted data to determine the association between the following variables: BMI in the Sueño dataset (continuous DV); actigraphy-measured: sleep duration, sleep fragmentation, sleep efficiency, and naps greater than 15 minutes taken per week (continuous IV); self-report: use of any over-the-counter, herbal, or prescription medication used to aid with sleep (aggregated; dichotomous yes/no, self-report IV). We controlled for nativity (U.S. Born = Born in 50 US States/DC vs Foreign Born = Born in a foreign country or U.S. territory), socio-demographic (education, income, age), depressive symptoms, and physical activity. We repeated the analyses separately for USB and FB Hispanic/Latino women to see if there were differences in the association of the IVS and DV by nativity, including the same covariates.

Results:
Sleep duration was a significant precursor to BMI, $F_{(10, 369)} = 4.68$, $p < .001$. Longer sleep was associated with lower BMI, B= -.016, SE_B=.004 (95% CI: -.02, -.007). Our model explains 8% of the variance in BMI. Daytime napping was also significantly associated to BMI, $F_{(10, 369)} = 3.71$, $p < .001$. Increased daytime napping was associated with higher BMI, B= 3.13, SE_B=1.58 (95% CI: .01, 6.25). Our model explains 7% of the variance in BMI. Sleep efficiency, sleep fragmentation, and use of sleep medication were not significantly associated to BMI in the whole group.Differences in these associations were observed for foreign-born and US-born Hispanic/Latino women.

Conclusions: This is the first study to assess the relation of objectively measured sleep duration and quality Hispanic/Latino women in the U.S. Results show that sleep is an important predictor of BMI among Hispanic/Latino women. Different sleep features have a differential impact on BMI for FB and USB Hispanic/Latino women. Future research may elucidate pathways between sleep and obesity.

Sleep health and its associations with sex, age, educational level, circadian preference, and chronic insomnia

B. Bjorvatn[1,2], S. Waage[2,3], S. Pallesen[2,3], D.J. Buysse[4], I.W. Saxvig[2]
[1]University of Bergen, Department of Global Public Health and Primary Care, Bergen, Norway,
[2]Haukeland University Hospital, Norwegian Competence Center for Sleep Disorders, Bergen, Norway,
[3]University of Bergen, Department of Psychosocial Science, Bergen, Norway, [4]University of Pittsburgh School of Medicine, Department of Psychiatry, Pittsburgh, United States

Introduction: Sleep health has been defined as a multidimensional pattern of sleep-wakefulness which can be measured both in individuals with and without sleep problems. In the present study we aimed to explore different dimensions of sleep health in the adult population in relation to sex, age, educational level, circadian preference, and chronic insomnia.

Materials and methods: A representative sample of 1028 Norwegians, aged 18+ years completed a web-based survey. Sleep health was measured with the RU_SATED v2.0 scale, which assesses the dimensions Regularity, Satisfaction, Alertness, Timing, Efficiency, and Duration. Insomnia symptoms were assessed with the Bergen Insomnia Scale. Data were analyzed with chi-square tests, t-tests, one-way ANOVAs, and regression analyses. Response rate was 33.5%.

Results: Sleep health was better in males, with increasing age, and with higher educational level, and poorer in evening types and participants with chronic insomnia, compared to their respective counterparts. When investigating the different sleep health dimensions, males scored better than females on Satisfaction (adjusted odds ratio (aOR)=0.69, 95% CI=0.51-0.93), Timing (aOR=0.66, 0.49-0.88), and Efficiency (aOR=0.68, 0.52-0.89), whereas no sex differences were detected for Regularity, Alertness or Duration. Higher age was associated with better scores on Regularity and Satisfaction, whereas young age was associated with better scores on Alertness and Duration. For Timing and Efficiency, the age group 45-59 years had highest scores. High educational level was associated with better scores on Alertness, Timing, and Duration. Evening types scored worse than morning types on Regularity (aOR=0.27, 0.18-0.41), Satisfaction (aOR=0.37, 0.26-0.53), and Timing (aOR=0.36, 0.26-0.51). Participants with chronic insomnia scored worse than participants without insomnia on all six sleep health dimensions, with Satisfaction showing the largest difference (aOR=0.04, 0.03-0.07).

Conclusions: Sleep health differed significantly in relation to sex, age, educational level, circadian preference, and chronic insomnia. However, the differences within groups were not evident on all the various sleep health dimensions.

Sleep health and its impact on nurses' carbohydrate and fat consumption

N. Izadi[1], M. Yazdan Panah[2], Y. Mokary[2], M. Cheraghi[1], A. Najafi[3]
[1]Tehran University of Medical Sciences, Center for Research on Occupational Disease, Tehran, Iran, Islamic Republic of, [2]Shahrekord University of Medical Sciences, Student Research Committee, Shahrekord, Iran, Islamic Republic of, [3]Tehran University of Medical Sciences, Occupational Sleep Research Center, Baharloo Hospital, Tehran, Iran, Islamic Republic of

Introduction: Various nutrients and foods are associated with both short and long sleep durations. Lower carbohydrate intake is associated with longer sleep duration, while higher fruit and vegetable intake is associated with the recommended sleep duration of 7–9 hours. Limited evidence exists among the working Iranian population in this regard. The purpose of the present study was to examine how sleep characteristics and work status affect diet in nurses.
Materials and Methods: It was a cross-sectional study and recruited nurses from September 2020 to March 2021. Individuals who were 18 to 65 years old and working in clinical settings for at least two years were included in the current study. Participants were asked about their occupational, diet, and sleep health characteristics and divided into high-fat and high-carbohydrate diets. Occupational features included work experience, shift work, daily work, and workplace; diet was assessed by the short food frequency questionnaire, and sleep health characteristics included delayed bedtime, sleep onset latency, difficulty maintaining sleep, and insomnia severity index. Univariate analysis, ANOVA, and chi-square tests were utilized, and regarding multivariate analysis, logistic regression was performed.
Results: A total of 1772 nurses were recruited in this study, of whom 373 (21%) were male. Shift work, delayed sleep onset, and ISI scores were associated with a high-fat diet (p-value < 0.05). However, shift work, ISI scores, difficulty maintaining sleep, and workplace were related to a high carbohydrate diet (p-value < 0.05).
Conclusions: Current study revealed that sleep and work issues could affect diet. This study indicated poor sleep health contributes to a high-fat and carbohydrate diet. Furthermore, shift work and the workplace were associated with a high-fat and carbohydrate diet. Hence, the present study emphasizes that nurses' sleep insufficiency compromises their nutrition, so they would need to be taught about sleep health to maintain their nutritional health. More strategies for sleep health awareness seem warranted in this population.

Sleep hygiene – what do we mean?

M. El Kazzi[1], C. De Pasquale[1], K. Sutherland[1], A.E. Shriane[2], G.E. Vincent[2], P.A. Cistulli[1,3,4], Y.S. Bin[1,3]

[1]University of Sydney, Charles Perkins Centre, Sleep Research Group, Sydney, Australia, [2]Central Queensland University, Appleton Institute, School of Health, Medical and Applied Sciences, Adelaide, Australia, [3]University of Sydney, Faculty of Medicine and Health, Sydney Medical School, Northern Clinical School, Sydney, Australia, [4]Royal North Shore Hospital, Department of Respiratory Medicine, Sydney, Australia

Introduction: The modern concept of sleep hygiene as a set of modifiable behaviours and environmental adjustments used to promote sleep dates back to the 1970s. Despite the ubiquity of sleep hygiene in research and practice for over half a century, there is no clear consensus as to what factors constitute sleep hygiene.

Materials and methods: We undertook a systematic search and review to examine the definition of sleep hygiene based on its use in published studies. Studies were included for consideration if they were primary research articles, included adult participants (ages 18+), included sleep hygiene as a main aspect of the methodology (e.g. exposure, outcome, intervention, or topic of qualitative or psychometric study), and were published in the English language. Four databases (MEDLINE, EMBASE, PsycINFO and CINAHL) were searched from inception until 31 December 2021 for the phrase "sleep hygiene" in the title or abstract.

Results: Search revealed 5,643 abstracts and from these 774 full-texts were scrutinised, with 548 studies eligible for inclusion: 250 observational and 298 intervention studies. A definition of sleep hygiene was provided in only 44% of studies and these converged on three themes: behavioural factors, environmental factors, and the idea of sleep hygiene being under individual control. Sleep hygiene was most frequently measured using the Sleep Hygiene Index in 28% of observational studies and most frequently derived from sleep diaries in 40% of intervention studies. Components most often considered part of sleep hygiene were caffeine intake, sleep timing, alcohol intake, exercise, light, smoking, sleep environment, wind-down routine, napping, noise, stress, other psychological factors, stimulus control, bed restriction, food intake, other substances, and sleep medications, although the specific details of each component varied greatly. Observational studies were clearer in defining what components constituted sleep hygiene, due to the use of standardised questionnaires. In contrast, although 65% of the intervention studies included sleep hygiene as (part of) an active intervention, only 26% of these studies actually measured sleep hygiene behaviours post-intervention. This review was restricted to studies in the English language, which may overlook cultural variations on the notion of sleep hygiene.

Conclusions: The term "sleep hygiene" should not be assumed to have a common and mutually shared meaning. The lack of consensus on the components that comprise "sleep hygiene" throws into question the replicability and generalisability of intervention studies that involve sleep hygiene. Lack of consistency in definitions likely also hinders communication between researchers, clinicians, and the public, and limit the utility of sleep hygiene advice. There is an urgent need to consider how to best communicate sleep hygiene advice in a clear, consistent, and useful manner, whether that is to develop comprehensive evidence-based consensus principles that can be used universally, or to devise clear indications for use in specific populations and contexts. Future research should consider whether consensus on what constitutes "sleep hygiene" is required, which components of sleep hygiene have the greatest impact on sleep, and which are most relevant to clinical and public health practice.

Sleep knowledge – what can we improve?

A. Ferreira[1], A. Loureiro[2], B. Conde[2], A. Vale[2], E. Matos[2], A. Mendes[2]
[1]CHTMAD - Centro Hospitalar de Trás-Os-Montes e Alto Douro, Pneumology, Vila Real, Portugal,
[2]CHTMAD - Centro Hospitalar de Trás-Os-Montes e Alto Douro, Vila Real, Portugal

Introduction: Sleep is fundamental to an individual's physical and mental health. Having healthy sleep habits and prioritizing sleep brings undeniable benefits at all levels. Knowledge on the subject of sleep is important for the adoption of and compliance with good practices. However, programs focused on sleep health are rare. There is a significant need for greater emphasis on sleep health in education, clinical practice, hospital and long-term care, public health promotion and workplace.
The main objective of this study is to assess the general knowledge of the Portuguese population on the topic "sleep".

Materials and Methods: A short questionnaire was applied over the internet, through social media and email, to a random sample.

Results: The survey had 708 completed answers. A large percentage of the respondents are female, and the average age is 34 years. All districts of mainland Portugal and islands are represented and 45.3% of respondents are graduates.
The questions that gathered the most consensus were about the importance of a regular bedtime and getting up (97.7%), number of recommended hours of sleep (99% answered correctly) and avoidance of screens before sleep (98.7% answered that they should be avoided). The population surveyed showed knowledge about substances that interfere with sleep (92.9% answered correctly), as well as knowledge of the professional to whom they should turn if there is difficulty with sleep. However, in this last question 3.5% answered that they did not know who to contact and 3.4% that they should resort to acupuncture or homeopathy, as an alternative to talking to the attending physician.
Almost 20% of the respondents answered that they were not sure about their knowledge of sleep functions and only 80% know for sure what sleep hygiene is. Almost 30% of respondents do not know what polysomnography is and the majority (more than 60%), is unaware of what positive pressure treatment is, as well as a large percentage do not know what cognitive behavioral therapy refers to. Finally, 15.7% misunderstands the relationship between physical exercise before bedtime and sleep quality and 28.5% did not know which sleep disorder was the most common in the general population.

Conclusions: The represented population seems to have a reasonable knowledge on the more general topics related to sleep (sleep hours and healthy habits) and greater difficulty in more specific topics, namely related to the diagnosis and treatment of some prevalent pathologies. However, there are still doubts on key issues such as sleep hygiene and good habits, such as avoiding physical exercise before bedtime.
It is considered that to promote public health and safety, widespread support is needed to increase sleep education.
We consider some limitations in this study, namely the low coverage in terms of educational background and the discrepancy in gender. A different method of administering the questionnaire is suggested in order to cover the older population.

Acknowledgements: To all the people who answered the survey, thank you.

Sleep patterns according to a genetically determined ethnicity in the population of São Paulo

P. Tempaku[1], J. Kondo[1], V. D´Almeida[1], V. Kakazu[1], M. Andersen[1], S. Tufik[1], D. Poyares[1]
[1]Universidade Federal de São Paulo, Psychobiology, São Paulo, Brazil

Introduction: Sleep is a behavior expressed differently for each individual. However, some populations express common sleep patterns, which can be observed in different ethnic groups. Previous studies have already shown the existence of sleep disparities in populations of different ethnicities. Most of these studies consider self-reported ethnicity and assess sleep subjectively. Therefore, the aim of this study was to evaluate sleep disparities in different ethnic groups based on an analysis of self-reported and genetic ancestry with objective sleep evaluation.

Materials and Methods: For this, we used data derived from the São Paulo Epidemiologic Sleep Study cohort, Brazil, which is known for its ethnic-racial diversity. All individuals answered questionnaires, underwent full polysomnography and had their blood collected for DNA extraction. After genotyping and defining the samples with high-quality DNA available for genetic analysis, 31 ancestry-informative markers (AIMs) were selected, which showed a high level of allelic frequency difference between the 3 founding populations of Brazilians (Europeans, West-Africans, and Native Americans) and it was estimated their genetic contribution for each participant. Based on that, a cluster analysis was performed via latent class analysis method defining 3 clusters that best classified the sample according to ethnic group: African (n=255), Caucasian (n=668) and Native American (n=83).

Results: The comparison between clusters and self-declared ethnicity showed a clear discrepancy between these analyses: in the African ethnic group cluster, 62.6% declared themselves as Black or Mulatto; in the Caucasian group, 76.1% self-identified as Caucasian; and in the Native American group, only 10.3% answered the questionnaire as Native American. Applying the adjusted model for the confounding variables (age, socio-economic class and sex), a statistically significant differences between ethnicities and sleep variables were found. Africans had higher sleep latency compared to the other groups (β=4.46, CI=1.18 to 7.74 and β=7.83, CI=3.50 to 12.15), while Caucasians had longer total sleep time (β=-16.47, CI=-29.94 to -2.99) and better sleep efficiency (β=-2.19, CI=-4.35 to -0.02) compared to Africans. Regarding the respiratory arousals index (β=-1.11, IC=-2.07 to -0.16) and periodic leg movements index (β=-7.48, CI=-12.08 to -2.88), both were higher among Caucasians compared to Africans.

Conclusions: Genetic ancestry might modulate sleep structure and the occurrence of sleep disorders.

Sleep quality among irregular shift working military police officers

S. Vasconcelos[1], J. Vilela dos Santos Gonçalves[1], A. Silva de Almeida Brito[1], G. Gadelha[1], P. Bezerra[1], E. Souza Gomes dos Santos[2], T. Nogueira Gonzalez[1]
[1]Federal University of Acre, Public Health Graduate Program, Rio Branco, Brazil, [2]Federal Institute of Acre, Rio Branco, Brazil

Introduction: Essential services such as public security use shift work to serve the population uninterruptedly. However, shift work is associated with negative outcomes in sleep patterns. Thus, this study aimed to evaluate the quality of sleep among military police officers.
Methods: Cross-sectional study carried out with military police officers in the city of Rio Branco, Acre. The sample consisted of male police officers who worked irregular shifts (day and night) of 12 hours. The information was collected through the application of a wide-ranging questionnaire that investigated sociodemographic and occupational characteristics, life habits, health conditions, and sleep. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). The instrument's total score ranges from 0 to 21 points and sleep quality is classified as good (score 0-4) or poor (score ≥ 5). Descriptive analysis was conducted to characterize the sample. Crude and adjusted measures of association (Odds Ratio) between sleep quality and the variables of interest were calculated. The significance level adopted was 5%.
Results: The sample was composed of 61 police officers with a mean age of 34.5 (SD ± 7.4 years). Most were married (59.0%) and had completed higher education (47.5%). The average time working as a police officer was 8.6 years (±7.2) and the average weekly workload was 40.8 hours (SD ±7.1). It is noteworthy that 41% worked 4 to 6 days a week. About 83% never smoked, 68.2% reported not practicing physical activity, more than 50% reported drinking alcohol and, according to the AUDIT, 73.2% were low risk users. Almost half of the sample (43%) reported a high level of stress in the last 12 months. The prevalence of poor sleep quality was 83.6% (95% CI 71.7; 91.1) and 38.6% of the police officers had excessive daytime sleepiness. In the crude analysis, the chance of poor quality sleep was higher in officers who worked 3 (OR = 13; p = 0.012) and 4 (OR = 8.5; p = 0.038) days a week and in those with high levels of stress (PSS) in the last 12 months (OR = 18.75; p = 0.021). After adjustments, no statistically significant associations were found.
Conclusion: In general, poor sleep quality is present in most military police officers. Sleep irregularity is linked to the work routine of these professionals, and thus it is necessary to develop promotion and prevention strategies that improve sleep quality and reduce health vulnerabilities in these workers.

Sleep quality and its predictors in Brazilian marines

G. Portugal[1,2], F. Ferreira[2,3], C. Costa[4], V. Damasceno[2], L. Doimo[2]
[1]Physical Education Center Admiral Adalberto Nunes, Research Laboratory of Exercise Science, Rio de Janeiro, Brazil, [2]Air Force University, Postgraduate Program in Operational Human Performance, Rio de Janeiro, Brazil, [3]Air Force Cadet Preparatory School, Barbacena, Brazil, [4]Federal Institute of Southeastern Minas Gerais, Rio Pomba, Brazil

Introduction: Sleep is a recurrent conduct, distinguished by transitory and reversible alterations in movement and, particularly, in consciousness, which is crucial for maintaining homeostasis. Alterations in its quantity or quality can hinder an individual's occupational performance. In the military context, it is observed that individuals often experience prolonged periods of inadequate sleep due to actual combat or even their work routine. Modifications in sleep quality can adversely affect the performance and homeostasis of the human body. Attaining sufficient, high-quality sleep for optimal performance is frequently challenging for military personnel due to the intense physical and psychological demands, as well as the inherent conditions of military work, such as light and noise. Therefore, the aim of this research was to evaluate sleep quality and associated factors in military personnel from the Brazilian Marine Corps (CFN).
Materials and Methods: The research was submitted to the Research Ethics Committee involving Human Subjects (CAAE: 53174321.7.0000.5256/Report: 5.202.697), and the volunteers who provided informed consent participated in the study. This study involved 1,248 CFN soldiers of both genders on active duty, serving under the Fleet Marine Force, stationed in the city of Rio de Janeiro. Five questionnaires were utilized: Pittsburgh Sleep Quality Index; Epworth Sleepiness Scale; International Physical Activity Questionnaire (IPAQ) - short version; Scale for assessing eating habits, proposed by Gabe & Jaime (2018); and the K10 Scale for psychological distress. All questionnaires were administered using LimeSurvey®. Additionally, an anamnesis was conducted to characterize the sample. Anthropometric assessments, carried out by the Military Aspect Program, were incorporated into the participants' results. Statistical analyses were performed using the Stata 14.0 software. Subgroup analysis (good vs. poor sleep) and Poisson regression with robust variance analysis were conducted to ascertain the factors associated with poor sleep quality.
Results: A total of 74.12% of the military personnel exhibited poor sleep quality. Disparities in sleep quality were identified concerning sociodemographic, behavioral, and professional factors. Age (PR 0.99 [95%CI: 0.98–0.99]), being an officer (PR 0.81 [95%CI: 0.67–0.98]) and physical activity (PR 0.92 [95%CI: 0.85–0.99]) served as protective factors, while living with young children (PR 1.10 [95%CI: 1.03–1.17]), nocturnal lifestyle (PR 1.12 [95%CI: 1.04–1.21]), excessive daytime sleepiness (EDS) (PR 1.14 [95%CI: 1.06–1.21]), severe EDS (PR 1.11 [95%CI: 1.04–1.19]), work-related issues (PR 1.26 [95%CI: 1.19–1.35]), psychological distress (PR 1.26 [95%CI: 1.16–1.37]), and regular eating habits (PR 1.09 [95%CI: 1.01–1.18]) predisposed individuals to poor sleep quality.
Conclusions: In conclusion, CFN soldiers in the Brazilian Navy demonstrate a high prevalence of poor sleep quality associated with personal, familial, and occupational factors contributing to this issue. These findings underscore the necessity for implementing health interventions that promote good sleep hygiene among these professionals.

Sleep quality and nutritional status of military policemen working in shifts

J. Vilela dos Santos Gonçalves[1], Â. Silva de Almeida Brito[1], G. Gadelha[1], S. Pedroza Vasconcelos[1], P. Caroline de Lima Bezerra[1], E. de Souza Gomes dos Santos[2], T. Nogueira Gonzalez[1]
[1]Universidade Federal do Acre, Rio Branco, Brazil, [2]Instituto Federal do Acre, Rio Branco, Brazil

Introdução: A qualidade do sono é uma necessidade biológica essencial que afeta diretamente a saúde. Devido ao trabalho em horários atípicos, os trabalhadores em turnos apresentam pior qualidade de sono. Estudos mostram maior frequência de sobrepeso/obesidade e distúrbios nutricionais e metabólicos em trabalhadores em turnos. O índice de massa corporal (IMC) é uma medida prática e eficaz para avaliar o estado nutricional. Nesse sentido, o objetivo deste estudo foi analisar a associação entre a qualidade do sono e o IMC de policiais militares que atuam em turnos na cidade de Rio Branco, Acre.

Materiais e métodos: Estudo transversal realizado em batalhões não especializados da Polícia Militar da cidade de Rio Branco, Acre. A amostra incluiu 65 policiais da ativa, do sexo masculino, com serviço operacional e jornada de trabalho de 12 horas, 24 horas de folga e 12 horas de folga e 72 horas de folga, em turnos rotativos. Foram coletados dados sociodemográficos, ocupacionais e de estilo de vida. O IMC foi utilizado para avaliar o estado nutricional. A qualidade do sono foi avaliada por meio do Índice de Qualidade do Sono de Pittsburgh – PSQI. A pontuação máxima do instrumento é de 21 pontos, e a qualidade do sono foi classificada em boa (0 a 5 pontos) e ruim (6 a 21 pontos). A análise estatística foi realizada por meio do programa SPSS, versão 20. A análise do qui-quadrado foi realizada para verificar as diferenças entre as variáveis categóricas, sendo considerado estatisticamente significante o valor de $p < 0,05$.

Resultados: Entre os policiais estudados, 85% (n=55) tinham menos de 40 anos, 60% (n=39) declararam-se pardos e 52% (n=34) ensino superior completo. Dentre os hábitos de vida, 37% (n=37) relataram consumir algum tipo de bebida alcoólica, 83% (n=54) relataram nunca ter fumado, 61,5% (n=40) não praticavam atividade física e 94% (n=61) utilizavam algum tipo de bebida estimulante. Dentre as jornadas de trabalho, 95,4% (n=62) trabalhavam nos turnos diurno e noturno. Quanto ao estado nutricional, 61% (n=39) dos policiais apresentavam sobrepeso, 20% (n=13) obesidade e 20% (n=13) eutróficos. Em relação à qualidade do sono, observou-se que 88% (n=57) apresentaram sono de má qualidade e 12% (n=8) de boa qualidade de sono. Não houve associação estatisticamente significativa (p=0,005) entre estado nutricional e qualidade do sono, mas observou-se maior prevalência de excesso de peso (65% n=37) nos indivíduos com má qualidade do sono.

Conclusão: **Conclusão**: A maioria dos policiais militares apresentava sobrepeso e má qualidade do sono. O teste do qui-quadrado revelou associação estatisticamente significativa entre o estado nutricional e a qualidade do sono, com maior percentual de indivíduos com excesso de peso apresentando má qualidade de sono. Os resultados indicam hábitos de vida pouco saudáveis, como consumo de bebidas alcoólicas, sedentarismo, problemas de sono e excesso de peso. Esses resultados evidenciam a importância de abordagens integradas de intervenção para melhorar a qualidade do sono e promover a saúde dos policiais militares.

Sleep quality and prevalence of mental disorders in healthcare university students of Brazil

C.M.C. Camerino[1], D.S.M. Lima[2], L.F.M. Nogueira[2], M.d.S. Teles[2], R.M.C.B. Craveiro[2], I.C. Lima[2]
[1]Federal University of Ceará, Fortaleza, Brazil, [2]Christus University Center, Fortaleza, Brazil

Introduction: Sleep is an essential physiological process for the body to remain ready to perform their functions. A low quantity or poor quality of sleep is associated to: autonomic dysregulation, low academic performance due to impaired attention and concentration, also decreasing the level of vigilance and increasing the incidence of mental disorders (anxiety, depression, burnout syndrome). Due to the sleep deprivation generated by the exhaustive routine of students in the healthcare area and the correlation between sleep disorders and mental disorders, the objective of this review is to evaluate the quality of sleep and the prevalence of mental disorders in university students of healthcare area in Brazil.

Materials and Methods: The research is a literature review study, based on articles published between 2018 and 2023 in databases (PubMed, National Library of Medicine, Scielo, Lillacs, Sciencedirect) and the following combining descriptors "mental disorders", "sleep disorders", "Brazil" and "college students". The reading and selection of articles in databases were through an evaluation of titles, abstracts and methodology. Original articles of the population of Brazilian university students affected by sleep disorders were included. Articles that did not meet the inclusion criteria such as reviews, case reports, dissertations and theses were excluded.

Results: A sample of 13 articles was found by title/abstract, 9 for full text analysis and 7 articles were selected to be included in the research. Students with double-shifts (work and study) have an average sleep time of 6 hours per night, with excessive sleepiness with reports of physical and mental overload. Students from the Midwest region of Brazil reported a high prevalence rate of poor sleep quality associated with daytime sleepiness and the population are composed of women, medical students, with sleep loss due to internet use, associated with a high prevalence of stress and depressive symptoms. In Rio de Janeiro, moderate or severe insomnia was reported by university students, with alcohol being the substance most frequently associated with men, in addition to the use of tobacco and marijuana. The overall incidence of depressive symptoms was 28.3%, with a higher prevalence of females in the initial years of graduation, with a higher incidence in women who reported concomitant use of alcohol and tobacco in relation to those who reported not smoking and not consuming alcohol. Regardless of gender, the severe stress level was associated with a higher risk of depressive symptoms when compared to the mild stress level. The risk of developing cardiovascular diseases, factors such as sedentary lifestyle, alcohol consumption, overweight and high cholesterol were found; associated with daytime sleepiness, stress, depressive symptoms and poor quality of life. The presence of painful temporomandibular disorders was also found in individuals with severe anxiety, sleep disorders and reduced quality of life.

Conclusions: The most prevalent risk factors for the development of mental disorders and associated with poor sleep quality found in university students were: sedentary lifestyle, temporomandibular disorders, double shifts, excessive daytime sleepiness, depressive symptoms, stress, alcohol and tobacco use.

Sleep quality characterization of individuals with cerebral palsy: preliminary data of the subjective and objective analysis

I. Meneses da Silva[1], M.C. Helena do Couto[1], N. Cristina da Silva[1], A.C. da Silva[2], M. Proença[2], L. Pinato[3]
[1]Unesp - São Paulo State University, Speech Language and Hearing Sciences, Marilia, Brazil, [2]Unesp - São Paulo State University, Physiotherapy, Marilia, Brazil, [3]Paulista State University, Speech Language and Hearing Sciences, Marilia, Brazil

Introduction: Cerebral palsy (CP) is characterized by permanent and non-progressive neurological changes caused by pre-, peri- or postnatal etiological factors that affect the brain, resulting in permanent disorders of tonus, posture, and movement at different levels (Bax et al., 2005). Although the motor characteristic is the most highlighted, sensory, perceptual, cognitive, and behavioral disorders can also manifest in CP (Rosenbaum et al., 2007). Among the behavioral aspects, sleep is often altered in this population. Generalized muscle tone abnormalities or abnormal neuromuscular control of the upper airways in these individuals can lead to sleep-disordered breathing, including Sleep Apnea (SA) (Kotagal et al., 1994). Considering that sleep disorders (SD) can lead to deficits in growth, motor and cognitive performance, mood swings, decreased motivation, and quality of life, the description of the main SD can help in therapeutic planning in this population. The study aimed to assess the presence of sleep disorders using the Sleep Disorders Scale in children and Sleep Apnea using type IV polysomnography (Biologix) in individuals with cerebral palsy.

Materials and methods: The sample consisted of 10 individuals diagnosed with CP, classified at levels V and IV in the Gross Motor Function Classification System (GMFCS), aged 7 to 15 years, median age of the group of 9(8-11) years. The SD were evaluated by Sleep Disorders Scale in Children (EDSC) answered by the guardians, and the presence of SA using a wireless high-resolution oximeter with a built-in accelerometer linked to a smartphone with automated cloud analysis (BiologixTM; Oxistar™, Biologix Sistemas Ltda., Brazil), considered as type IV polysomnography with good performance for SA diagnosis at home (Hasan et al., 2022).

Results: The investigation through the subjective analysis showed that 75% of the individuals evaluated indicated SD according to the total score of the scale, 75% having a latency to sleep longer than expected, 62% a Sleep breathing disorder (SBD), 25% Sleep Initiation and Maintenance Disorder (DIMS), 25% Sleep Hyperhidrosis (HS), 38% had sleep duration below the recommended for age. As for the objective measurements, all individuals had IDO indicating SA, with a median IDO of 4 (3-5)/hour; number of oxygen desaturations was 26 (23-32) per night; duration of snoring time was 34 (16-64)% of sleep time, the total sleep time was 7(6-8) hours and sleep latency was 22 (18-31) min. The sleep latency registered by the biologix was very close to the sleep latency related by the guardians 20 (16-55) min.

Conclusions: Individuals with CP have a high frequency of sleep disturbances, the most frequent being the sleep latency greater than acceptable, and SBD according to subjective results. Additionally, all of the children had poor sleep quality when analyzed objectively. These results highlights the importance of investigating and diagnosing SBD using subjective and objective measures in a complementary way in assessing the quality of sleep in this population.

Sleep quality in Chilean health workers during COVID-19 pademic

M.J. Elso[1], D. Zenteno[2], T. Muñoz[1], C. Pérez-Villalobos[3], C. Brevis[1]
[1]Universidad de Concepcion, Especialidades Medicas, Concepcion, Chile, [2]Universidad de Concepcion, Pediatria, Concepcion, Chile, [3]Universidad de Concepcion, Medicina, Concepcion, Chile

Introduction: Sleep disturbances were common during the COVID-19 pandemic. Healthcare workers were among the populations most affected during the pandemic. Sleep disturbances can result in excessive drowsiness throughout the day as a result of sleep deprivation, changes in sleep routines, durantion of sleep and poor quality of sleep.

Materials and methods: Descriptive and relational analytic study. 175 Chilean heathcare workers of Guillermo Grant Benavente Hospital answered a voluntary on line survey during 2021.Included Night shift workers and day shift Physicians of different health units. Sleep disturbances were assessed using Pittsburg Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS); habits as consumption of caffeine, tea, alcohol, energy drinks, sleep drugs, tobacco and time spent on screens; and history of COVID 19 infection.

Results: Of the 133 valid cases, it was found that physicians scored between 0 and 19.0 points on the PSQI, with an average of 7.98 (SD=3.26) and a median of 8.0. 55.64% (n=74) are women. 54.14% (n=72) were on the day shift, 45.86% (n=61) on the mixed shift, and none only on night shift. Of them, 87.22% (n=116) drank coffee, 81.20% (108) tea, 57.14% (n=76) cola, 21.80% (n=29) consumed energy drinks, 14.29% (n=19) smoked and 62.41% (n=83) drank alcohol. On the other hand, 45.86% (n=61) reported an increase in the use of substances to sleep, while another 13.53% (n=18) reported that said consumption had perhaps increased.

Similarly, 71.42% (n=95) reported an increase in screen use, while another 12.78% (n=17) reported that their use may have increased.

Finally, 36.84% (n=49) reported having been infected with COVID-19.

The regression model considering all the predictors was statistically significant, $F_{(11, 2)} = 2.37$; $p<0.01$, explaining 10.13% of the variance in sleep quality, and in which the only statistically significant predictor was sleepiness. However, the model considering only sleepiness as a predictor predicted 11.56%, being statistically significant, $F_{(1, 131)} = 18.25$; $p<0.001$.

Conclusions: In conclusion, although there are different consequences of sleep deprivation described in the literature, only daytime sleepiness was significantly correlated in our study group as a result of sleep deprivation during covid 19 pandemic. Shift work is also associated with poorer sleep quality. Both aspects, generate an interesting point of view to consider when implementing shift work systems and future studies.

Sleep quality in two populations exposed to toxic substances in Brazil

L. Teixeira[1], G. Coutinho[1], M.V. dos Santos[1], T. Azevedo[1], P. Vidal[1], A.P. Silva[1], L. de Carvalho[1], D. Mattos[1], F. Victorino[1], A.C. Rosa[1], A. Larentis[1], C.A. de Andrade[2], E. Gonçalves[1], I. Costa-Amaral[1], L. Gomes[1], M.d.F. Moreira[1], R. Borges[1], T. Pavesi[1], F.M. Fischer[3]
[1]Oswaldo Cruz Foundation, Center for Studies on the Worker's Health and Human Ecology, Rio de Janeiro, Brazil, [2]Oswaldo Cruz Foundation, Department of Epidemiology, Quantitative Methods in Health, Rio de Janeiro, Brazil, [3]University of São Paulo, Department of Environmental Health, Faculty of Public Health, São Paulo, Brazil

Introduction: Inadequate sleep has been linked to a variety of impairments in bodily functions. Furthermore, chemical exposure can significantly impact sleep quality through various mechanisms and molecular pathways. Therefore, this study aimed to analyze sleep quality across three populations exposed to chemicals according to health parameters.

Materials and Methods: A cross-sectional study was conducted with 189 residents in Volta Redonda, RJ and 66 endemic workers. Health, work, Pittsburgh Sleep Quality Index (PSQI), clinical and toxicological tests were performed. Sleep quality was evaluated using ActTrust for ten consecutive days. Cd, Pb, Ni, Mn, BZN, and TLN concentrations in blood and urine were determined by GFAAS and GC MS, and genotyping was carried out using PCR.

Results:

Study 1: A total of 47% of the participants were afternoon chronotype, 42% were indifferent, and 11% were morning chronotype. Higher urinary Mn levels were associated with the morning chronotype ($p < 0.01$). In turn, the evening chronotype was associated with poorer sleep quality, higher Pb levels in blood, and BZN and TLN levels in urine ($p < 0.01$) in non-occupationally exposed individuals ($p < 0.01$) as well as the highest BZN ($p < 0.01$) and TLN ($p < 0.01$) levels detected in residents from the influence zone 2. Moreover, most participants (57%) reported poor sleep quality, and higher Cd levels in urine in residents with higher scores for daytime dysfunction ($p = 0.01$) and sleep disturbance ($p < 0.01$); Mn ($p < 0.01$) and Ni ($p = 0.03$), for sleep disturbance; and TLN, for sleep duration ($p < 0.05$).

Study2: The average score of sleep quality was 7.8 points in the PSQI score and 60% of the population was classified as having unhealthy sleep (PSQI > 5). In addition to having a total sleep time between 5 and 6 hours, the efficiency of that sleep time was 80%, and the WASO was approximately 60 minutes. Stability and variability were 0.48 and 0.80 respectively, and positive correlation observed between the hormone Free T4 and total sleep time ($p < 0.05$). It is also found that intraday variability had a negative correlation with hormone levels.

Conclusion: Exposure to contaminants influenced sleep patterns and the different chronotypes in the population exposed to toxic substances. These contaminants potentially act as activators of the neural circadian system, affecting sleep quality.

Sleep quality of hospitalized patients in the Czech Republic: a multicenter cross-sectional study

D. Jarosova[1], H. Locihova[1], R. Zoubkova[2], J. Slonkova[2], K. Stuchlikova[2], K. Sonka[3], K. Maternova[3]
[1]University of Ostrava, Faculty of Medicine, Ostrava, Czech Republic, [2]University Hospital Ostrava, Ostrava, Czech Republic, [3]General University Hospital in Prague, Prague, Czech Republic

Introduction: Sleep is one of the basic physiological human needs. Studies in hospitalised patients indicate that sleep is affected during hospitalisation (confirmed change in both quality and quantity), which cannot be related to patient recovery.

Materials and Methods: A multicenter cross-sectional study was conducted in hospitalised 340 patients in the standard departments of 7 hospitals in the Czech Republic. Data were collected using two instruments: Ford Insomnia Response to Stress Test (FIRST) and Richards-Campbell Sleep Questionnaire (RCSQ) in the period September 2022 - January 2023. The statistical software SIMCA-P v.12.0 from Umetrics AB (Umeå, Sweden) was used for OPLS analysis. The estimation of the internal consistence was completed using Cronbach's α statistic following Spearman's correlations.

Results: The patients were found to have the worst sleep indicators on the first night hospitalisation, while the quality of sleep improved with the length of stay. Men slept better than women, the effect of age was proven (older people had better quality sleep than younger people), the higher the VAS values in the patients, the worse the quality of their sleep. At the same time, the relationship between the benzodiazepines used and the quality of their sleep was demonstrated in patients. In our study, the FIRST questionnaire did not prove to be a suitable tool to detect vulnerable individuals with sleep disorders.

Conclusions: The association between sleep quality and selected variables was statistically proven. It is necessary to look for other tools that would help identify people with sleep disorders.

Sleep quality of patients being followed up at the geriatric outpatient clinic

M. Força[1], T. Costa[1], L. Magno[1], I. Daher[1], N. Rodrigues[1], N. Santos[1], S. Conceição[1], C. Silva[1], H. Daher[1]

[1]Centro Universitário do Pará, Cemec, Belém, Brazil

Introduction: With the population aging process in Brazil, problems related to the health of aged have been gaining importance in the medical office. One of the main complaints of this patient are those related to sleep, as there are physiological changes in the sleep-wake cycle in senescence, which may or may not be accompanied by sleep disorders.

Materials and Methods: This study aims to evaluate the sleep quality of patients being monitored at the Elderly Health Clinic at the Center for Medical Specialties of CESUPA (CEMEC). A quantitative approach research was carried out on an outpatient basis within a private higher education institution in the city of Belém-PA. For data collection, the Pittsburgh Sleep Quality Index questionnaire was used and 112 patients were included in the research, aged between 60 and 104 years, the majority (75.9%) were female.

Results: Regarding the quality of sleep assessed by the PSQI, 15.2% of the patients had good quality (95%CI 9.3 – 23.5), 49.1% had poor quality (95%CI 39.6 – 58.7) and 35.7% sleep disorder (95%CI 27.0 – 45.4).

Conclusions: Based on the above, there is a need for health professionals to know how to address sleep-related complaints in elderly patients, since poor sleep quality has a negative impact on their expectation and quality of life.

Acknowledgements: Sleep; Aged; Aging; Quality of life.

Sleep regularity in a Brazilian population-based sample: findings from the EPISONO study

C.M.C. Scassola[1], J.R.S. Vallim[1], P.C. Silva[1], F.M. Louzada[2], S. Tufik[1,3], M.L. Andersen[1,3], V. D'Almeida[1]
[1]Universidade Federal de São Paulo, Department of Psychobiology, São Paulo, Brazil, [2]Universidade Federal do Paraná, Department of Physiology, Curitiba, Brazil, [3]Sleep Institute, São Paulo, Brazil

Introduction: Sleep regularity emerged as a significant aspect of health, being associated with increased risk for obesity, hypertension, cardiovascular diseases, depression, and even poor academic performance. Since it was first introduced by Phillips and colleagues (2017), the Sleep Regularity Index (SRI) has gained growing significance in comprehending the factors that influence sleep regularity, in order to enhance overall health outcomes. This index, ranging from 0 to 100, performs as a means to assess the daily fluctuations in sleep and wake states. Whilst this metric has no association with sleep quality or total sleep time, it emphasizes a relevant aspect of individual sleeping patterns. Our study aimed to evaluate the SRI from a population-based sample of the São Paulo city (EPISONO study), looking for correlations between the SRI and sociodemographic variables within this population.

Materials and methods: The sample was collected between 2018 and 2019 during the EPISONO study, which was performed using a probabilistic 3-stage cluster technique data collection. Sample consisted of men and women, aged between 18 and 81 years old, belonging to all economic classes. The SRI was calculated from actigraphy and sleep diaries data, encompassing records from 5 workdays and 2 free days. We tested the effect of age, gender, marital status, ethnic group, and circadian preferences (assessed using the Morningness-Eveningness Questionnaire; MEQ) on SRI scores. We also analyzed correlations between SRI, MEQ and age.

Results: We assessed actigraphy records from 563 volunteers (59.5% female, age [mean ± std. dev.]=49.7±14.8 years, range: 19 to 81). SRI presented a non-normal distribution ([mean ± std. dev.]=71.7±13.1, range: 0 to 95.1). Irregular sleepers presented an SRI of 51.5±10.2 (bottom quintile; range: 0 to 62.5), while regular sleepers of 86.9±2.8 (top quintile; range: 82.6 to 95.1). In comparison to other studies, we observed that our sample characteristics and results are in line with the ones already described in the literature. We observed a significant correlation between SRI and circadian preferences.

Conclusions: We observed a strong correlation between the SRI and the circadian preference, which is a novel finding in the literature. Since higher values of MEQ indicates morningness preference and higher values of SRI indicates a better sleep regularity, we can infer that morning individuals are less affected by sleep irregularity. Furthermore, since SRI is associated with high health risk factors, we can suggest that individuals with an eveningness preference would present a greater risk for health problems.

SleepRoutine as a validation method: a comparative study of fragranced cosmetics' impact on sleep

S. Kim[1], H. Kim[1], J. Hong[1], D. Lee[1], D. Kim[1], J.-W. Kim[2]
[1]ASLEEP CO., LTD, Seoul, Korea, Republic of, [2]Seoul National University College of Medicine, SNUBH, Seongnam-si, Korea, Republic of

Introduction: A sleep tracker can be employed to identify factors that affect sleep patterns. The SleepRoutine, a smartphone app based on sound signals, has gained popularity as a reliable tool for accurate sleep analysis. We have utilized SleepRoutine as a validation tool to investigate how fragrance affects sleep. Participants used cosmetics infused with specific fragrances that affect sleep while their sleep patterns were monitored using the SleepRoutine.The study involved 23 participants and spanned over a duration of two weeks, during which two types of cosmetics were used: Cosmetics A with sleep-enhancing fragrances and Cosmetics B without sleep-enhancing fragrances.
Materials and Methods: SleepRoutine was utilized to measure sleep efficiency and latency both prior to cosmetic application and after two weeks of consistent use. Participants were divided into two groups; one used only cosmetic B, while the other used both cosmetics A and B. For consistent results, guidelines were provided to participants. Moreover, SleepRoutine provided remote monitoring and statistical analysis, making it easy to obtain experimental data. A comparative analysis of the results was performed between the two groups to identify the differences in sleep quality.
Results: The results of the study revealed differences between the two cosmetic types. Participants who used only cosmetic B experienced a marginal 1.2% increase in sleep efficiency, while those who used both cosmetics A and B showed a substantial 5.6% increase. Similarly, the latency was reduced by 1.2 minutes for users of cosmetic B alone, whereas those who used both cosmetics A and B witnessed a significant 2.9 minute decrease, accounting for a 20% reduction compared to before application. Moreover, a comparative assessment of the results at the one-week and two-week marks after application revealed patterns. When participants used only cosmetic B, there was a lack of consistency in changes observed across sleep efficiency and latency. However, when both cosmetics A and B were used together, a cascading trend emerged, showing consistent improvements in sleep efficiency, along with a corresponding decrease in latency.
Conclusions: In this research, SleepRoutine can be effectively utilized when studying factors that influence sleep. Its convenience of non-contact usage with just a smartphone ensures consistent use, while its high accuracy ensures reliable results. Moreover, remote monitoring and statistical analysis ensured convenient research and result analysis. The exceptional remote and convenient sleep monitoring capabilities of SleepRoutine opens up new possibilities for research in sleep as well as product validation.

Sleep, sarcopenia and practice of physical activity: an analysis of the association with postural stability in elderly people

S. Aparecida Bratifische[1], J. Carvalho Tiburcio[2], A. Maculano Esteves[3], L. Pires Corona[4]
[1]Universidade Estadual de Campinas - UNICAMP, Faculdade de Ciências Médicas - Programa de Pós-graduação em Gerontologia, Campinas, Brazil, [2]Universidade Estadual de Campinas - UNICAMP, Faculdade de Ciências Aplicadas, Limeira, Brazil, [3]Universidade Estadual de Campinas - UNICAMP, Faculdade de Ciências Aplicadas - Laboratório do Sono e Exercício Físico, Limeira, Brazil, [4]Universidade Estadual de Campinas, Faculdade de Ciências Aplicadas - Laboratório de Epidemiologia Nutricional, Limeira, Brazil

Introduction: The loss of strength and muscle mass leads elderly people to sarcopenia, making them susceptible to postural instability, which may lead to an increased risk of falls and physical disability.
Objective: To analyze the association of sleep conditions, drowsiness, sarcopenia and physical activity on postural stability in elderly people.
Materials and methods: Cross-sectional study, approved by the Research Ethics Committee of the State University of Campinas (5.417.308), which had as a sample 167 individuals age ≥ 60 years, users of the primary care network of a municipality in the interior of the State of São Paulo. The research variables: the self-reported questionnaire SARC-F for sarcopenia screening; for sleep assessment, the Epworth sleepiness scale and the Pittsburgh scale for Sleep Quality were used. For the analysis of Physical Activity (PA), a short International Physical Activity Questionnaire (IPAQ) was used, and then, participants with at least 150 to 300 minutes of weekly physical activity were categorized as active, according to the World Health Organization (WHO) reference. The test used for Balance analysis was the Berg Balance Scale (BBS). Differences between groups were analyzed using the Mann-Witney test for continuous variables and the chi-square test for categorical variables, with a critical level of 5%.
Results: 67.7% of the sample were female, with an average age of 72, 7 years. The average sleepiness score was 5.4±4.8 points, and sleep quality was 7.8±4.2; in the BBS it was 48.4±7.2. 55.1% of the sample does not meet the WHO guidelines for the practice of PA. 76% of participants have poor sleep quality, 40.7% have poor sleep efficiency and daytime sleepiness. A statistically significant association was found between sleepiness and balance - of the elderly who showed daytime sleepiness, 18.8% had worse performance on the BBS, compared to 8.2% who did not show sleepiness (p=0.04). Drowsiness was also statistically associated with sarcopenia screening, on average, sleepy subjects scored 2.61 points on the SARC-F, compared to 1.67 points in non-sleepy subjects (p=0.009). A statistically significant difference was also observed in the mean SARC-F score in people who had good sleep (1.2 points) compared to those with poor sleep (2.32 points) (p=0.003). Of the participants considered to be good sleepers, 7.5% were at risk of having sarcopenia (SARC-F≥4 points), and among poor sleepers, the risk of sarcopenia was 29.1% (p=0.005).
Conclusions: It is concluded that elderly people who manifest daytime sleepiness and poor sleep quality are more likely to be at risk for sarcopenia, and elderly people with daytime sleepiness have worse balance, consequently compromising postural stability which, associated with the presence of sarcopenia, can lead to several negative functional outcomes. Therefore, it is important to screen these aspects in the health monitoring of elderly people to avoid compromising their balance.
Keywords: sleep; somnolence; sarcopenia; physical activity; balance.

Sleep screening initiative in Mexican medical residents

B. Chávez[1], J.G Garza[2], M. Torrecillas[1], N. Quirino[1], P. De la Garza[2], C. Martinez[2]
[1]University Hospital 'Dr. José E. Gonzalez', Neurology, Monterrey, Mexico, [2]University Hospital 'Dr. José E. Gonzalez', Psychiatry, Monterrey, Mexico

Introduction: Sleep problems among medical residents are widely acknowledged and significant, influenced by demanding training, heavy workloads, and stress, which profoundly impact sleep patterns and well-being. Literature highlights medical provider fatigue and sleep disorder prevalence among healthcare students. With that said, we stress the crucial importance of promptly screening sleep problems and prioritizing residents' well-being.

The University Hospital's 'Dr. José E. Gonzalez' is Mexico's sole hospital school, offering 45 accredited medical programs on a single site, and overseeing a diverse cohort of 500 medical residents across all training levels.

This screening initiative employs Professor Colin Espie's "Screening" algorithm to assess sleep issues among our residents.

Materials and Methods: The "Screening" algorithm assesses the risk of 5 sleep disorders other than insomnia, namely narcolepsy, OSA, PLMS/RLS, circadian rhythm sleep disorder, and parasomnia. Each section features a main question followed by 4-5 additional questions for further evaluation.

The study comprised several phases. Initially, we translated the "Screening" algorithm into Spanish using established document translation and validation methods. The next phase entailed executing the algorithm through the Google "Forms" platform, commencing with the neuroscience division, which included Neurology and Psychiatric, Initial entry residents.

Exclusions encompassed residents with preexisting sleep disorder diagnoses or undergoing hypnotic treatment.

Results: Thirty-three residents meet the criteria and completed the algorithm correctly.

Using the suggested formula to assess the risk of presenting any of the sleep disorders, our main results are that 21% of our screened residents have a risk of presenting Narcolepsy, 6% have a risk of presenting OSA without obesity, and 30% have a risk of presenting circadian rhythm sleep disorder.

Conclusions: Sleep disorders are a notably prevalent concern among our residents. The outcomes of our study serve as a clear indication of the importance of further implementing the screening algorithm among a broader spectrum of medical residents within our hospital. This initiative highlights the critical significance of early detection and proactive management of sleep-related problems, aiming to substantially enhance the overall sleep quality of our medical residents.

Moreover, our findings prompt us to propose a range of measures aimed at reducing the impact of sleep disorders on our residents. These measures encompass not only early intervention but also strategies to alleviate symptoms or triggers that might exacerbate these issues. By embracing a comprehensive approach that includes both detection and intervention, we are committed to fostering an environment where our medical residents can experience improved well-being and better sleep quality.

Sleepy state misperception in young adults

K. Sexton-Radek[1], M. Curtin[2], S. Rosado[2], T. Modluddin[2], E. Miller[2], I. Ibrahiam[2], S. Pandy[2], V. Heniabu[2], I. Vayser[2]
[1]Elmhurst University, Psychology, Riverside, United States, [2]Illinois School of Professional Psychology at National Louis University, Clinical Psychology, Chicago, United States

Introduction: The sleep disorder of Sleep State Misperception is characterized as a mismatch between actual and subjective view of the amount of hours of sleep. In young adults that are severely sleep deprived in general, this condition is underestimated and possibly part of their poor sleep hygiene. Regular wake up time, use of electronic devices in the evening, eating late at night are a few of the common variances from good sleep hygiene characteristic of poor sleep hygiene in young adults. The determination of students understanding of the importance of sleep and how to integrate sleep hygiene ideas would provide needed specificity on this topic and allow for the implementation of interventions.

Materials and Methods: A 14 item survey was designed to request the participants to comment on their level of understanding of their sleep hygiene. Sleep logs and self-report measures were also administered in order to further understand their sleep quality. The sampling was in person undergraduates participation for experimental units credit and responses from a posting on social media page during the months of August to April of 2022. 122 participants completed the questionnaire.

Results: The data was summarized using SPSS analyses to the dataset where each questionnaire item was treated as a separate variable. The demographics analysts indicated 64% female and 34% males with ages ranging from 18-29 years, median 20.7 years. The mean sleep efficiency for the 7 day collection was 62% for weekdays and 51% sleep efficiency for weekends. Participants, on average, were sleep deprived. 3% of the participants scored clinically relevant area on the PSQI. One participant scored in the clinically significant range on the BDI-2.

Conclusions: The participants' responses to self-report measures and sleep logging indicated moderate to severe sleep deprivation. The commonly found variance between weekday and weekend was found. Participants' sleepiness as reflected by these results provide additional evidence of mismatch between need for sleep or priority for sleep and the reality of the life experiences of young adults. Suggestions for interventions are presented.

SnoreFormer: Home snoring detection with deep neural networks

K. Son[1], D. Kim[1], H. Park[1], S. Kim[1], S. Kim[1], D. Lee[1], M. Lee[2], S.H. Moon[2], I.-Y. Yoon[2], J.-W. Kim[3]
[1]ASLEEP CO., LTD, Seoul, Korea, Republic of, [2]Seoul National University Bundang Hospital, Psychiatry, Seongnam-si, Korea, Republic of, [3]Seoul National University College of Medicine, SNUBH, Department of Otorhinolaryngology, Seongnam-si, Korea, Republic of

Introduction: Snoring is a common problem that is closely tied to sleep-related breathing disorders such as obstructive sleep apnea (OSA), hypertension, and cardiovascular diseases. Traditionally, polysomnography (PSG) is the gold standard for diagnosing snoring, employing multiple sensors to measure variables like airflow pressure and snoring sound. However, conducting PSG in a home environment is challenging due to the complexity of the setup and the requirement for multiple sensors. In this context, our main contribution is creating a method, SnoreFormer, that leverages easily accessible sound data recorded on a smartphone to diagnose snoring. SnoreFormer uses deep neural networks to explore the statistical relationship between sound and snoring. We validated our model in both a clinical environment and a home environment using only sound data recorded by smartphone.

Materials and Methods: Our model, SnoreFormer, can detect the presence of snoring based on 20 minutes of sound data, providing results in each of 30-second epoch. Initially, we transformed the raw sound data into Mel spectrograms. This widely-used feature representation technique in audio processing mimics a more human-like perception of sound. Consequently, the sound data for 20 minutes were converted into the sequence of 40 epochs of 30-second Mel spectrograms. Subsequently, the preprocessed data was fed into a Transformer, a state-of-the-art model architecture in machine learning, designed for sequence prediction tasks. The Transformer employs self-attention mechanisms that effectively capture the sequential and temporal dynamics of the snoring sound, hence enabling a more accurate detection model.

We utilized three distinct audio datasets: (1) audio data recorded by a solitary microphone chip during polysomnography in a clinical environment (Hospital PSG dataset, N = 1154), (2) audio data recorded by a smartphone during polysomnography in a clinical environment (Hospital smartphone dataset, N=327), and (3) audio data recorded by a smartphone during polysomnography in a home environment (Home smartphone dataset, N = 109). The home environment dataset was not used for training but only for testing the model's performance.

Results: SnoreFormer model was tasked to identify the presence or absence of a snoring event within 30-second epochs. The model achieved an accuracy of 82.9% in a clinical environment (sensitivity: 81.6%, specificity: 83.3%) and 81.0% in a home environment (sensitivity: 73.1%, specificity: 84.0%). These results indicate that the model performs well even in a noise-intensive home environment. Notably, the SnoreFormer model maintained robust accuracy across various demographic factors, achieving 81.5% accuracy for men and 85.1% for women, and there was no significant difference in accuracy across different BMI and age categories.

Conclusions: The proposed model, SnoreFormer, accurately detected snoring in both a clinical setting and a home environment. This result showed the potential of using sound-based models for diagnosing snoring, thereby offering more accessible and feasible diagnostic tools for home use. Moreover, our findings indicated that the model could enhance individuals' comprehension of their sleep, encouraging them to pursue necessary medical treatment and potentially mitigating long-term consequences such as hypertension and cardiovascular diseases.

Social class discrimination during adolescence as a mediator of socioeconomic disparities in actigraphy-assessed and self-reported sleep

T. Fuller-Rowell[1], E. Saini[2], M. El-Sheikh[1]
[1]Auburn University, Auburn, United States, [2]Pennsylvania State University, University Park, United States

Introduction: A higher prevalence of sleep-wake problems among less advantaged socioeconomic groups is well-documented and known to play an important role in cardiometabolic and mental health disparities. Elucidating the social determinants of socioeconomic status gradients in sleep is therefore a salient topic with implications for health disparities across the life span. That in recent decades socioeconomic inequities have become more pronounced in many countries around the world further underscores the importance of understanding mechanisms for socioeconomic status differences in health. Focusing on a sample of adolescents in the United States, the current study examined two measures of social class discrimination as mediators of the association between socioeconomic disadvantage and sleep (actigraphy-assessed and self-reported).

Materials and Methods: Sleep was assessed from established actigraphy (efficiency, long wake episodes, duration) and self-report (sleep/wake problems, daytime sleepiness) measures in 272 high school students in the Southeastern region of the United States (35% low income; 59% White, 41% Black, 49% female, Mean age = 17.3, SD = 0.8). Social class discrimination was assessed using the Social Class Discrimination Scale (SCDS; 22-items), and the Experiences of Discrimination Scale (EODS; 7-items). Socioeconomic disadvantage (SED) was measured as an aggregate of six indicators.

Results: The SCDS was associated with sleep efficiency, long wake episodes, sleep/wake problems and daytime sleepiness (but not sleep duration), and significantly mediated the socioeconomic gradient in each sleep outcome. Black males experienced higher levels of social class discrimination than Black females, White males, or White females. A race-by-gender moderation effect was evident for two of the five sleep outcomes (sleep efficiency and long wake episodes) suggesting a stronger association between social class discrimination and sleep problems for Black females than White females but no clear race differences among males. The EODS was not associated with objective sleep outcomes or SED but was associated with self-reported sleep and showed a similar pattern of moderation effects.

Conclusions: Findings suggest that social class discrimination may contribute to socioeconomic disparities in sleep problems, with some variability across demographic groups. Results are discussed in light of evolving trends in socioeconomic health disparities.

Social determinants of sleep problems among multiethnic Americans in the NIH all of us research program

J. Blanc[1], P. Barr[2], A. Seixas[1], M. Chery[3], M. Bernard[4], G. Jean-Louis[1], T. Bigdeli[2]
[1]University of Miami Miller School of Medicine, Department of Psychiatry and Behavioral Sciences, Miami, United States, [2]Downstate Health Science University, Department of Psychiatry & Behavioral Sciences, New York, United States, [3]University of Miami Miller School of Medicine, Department of Public Health Sciences, Miami, United States, [4]Saint Leo University, Orlando, United States

Introduction: Previous population-based studies show that the same social characteristics associated with good health, such as a high level of education, being married, and being employed, are associated with higher sleep quality and healthy sleep duration. In line with these findings, we leveraged the All of Us (AOU), an NIH initiative for population-scale research, to analyze the prevalence and sociodemographic covariates of sleep problem diagnoses.

Method: Phecodes for diagnoses derived from the ICD-9/10 billing codes in participants' electronic health records (EHRs). We used 0 phecodes of the parent category of *sleep disorders* (insomnia and sleep apnea) (phecode 327) in a person's EHR to classify individuals as not having a diagnosis and 2+ phecodes as having a diagnosis (those with only one instance in their EHR were dropped). This scheme is based on our prior work showing that 2+ codes on one's EHR are a decent proxy for a confirmed diagnosis. Logistic regression analysis was conducted to assess associations between sleep problems and race/ethnicity, sex, age, and education level using the *R* statistical framework.

Results: A total of 214, 206 participants were available for analysis; of whom 61.3% were female (mean [SD] age, 51.7 [16.6] years). Women were 1.27x more likely to have a diagnosed sleeping problem (95% CI: 1.31,1.23; $p=1.31\times10^{-61}$). We observed higher rates of sleeping problems in older individuals; compared to persons between 18-30 years old, those aged 65 years and older were 4.74 times more likely to have a diagnosed sleeping problem (95% CI: 3.83, 4.33; $p<10^{-300}$). We also observed a trend of greater education attainment corresponding to an increased likelihood of sleep problems; this was most extreme when comparing individuals with some college versus those who did not complete high school (OR=1.38; 95% CI: 1.30, 1.46; $p=3.65\times10^{-29}$). Individuals with reported income <25K/year were 1.44x more likely to be diagnosed than those earning >100K (95% CI:1.51, 1.37; $p=1.05\times10^{-51}$). We found that individuals identified as Black were least likely to have a diagnosis (OR=0.52; 95% CI: 0.50, 0.54; $p=2.2$ that 2×10^{-208}).

Conclusions: Among All Of Us populations, self-identified Blacks, men, young adults, higher-income, and non-college-educated patients are less likely to have recorded insomnia or sleep apnea diagnoses. Some of these unexpected within-group differences could be due to self-report versus clinically recorded diagnoses and access to healthcare. Planned analyses aim to further explore social determinants of health by incorporating geospatial (e.g., zipcodes) and other available self-report data on exposures.

Keywords: Insomnia, Sleep Apnea, All Of Us Research, SDOH.

Sodium intake and health outcomes: a systematic review of systematic reviews

C. Drachenberg[1], D. Garcia[2], S. Mettam[3], S. Candler[4], S. Kakar[5], P. Yassa[5], S. Singh[6], H.N. Viswanathan[1], L.A. Surkin[7,8]
[1]Jazz Pharmaceuticals, Palo Alto, United States, [2]Eversana Life Sciences LLC, Cape Breton, Canada, [3]Jazz Pharmaceuticals, Oxford, United Kingdom, [4]Jazz Pharmaceuticals, Philadelphia, United States, [5]Eversana Life Sciences LLC, Burlington, Canada, [6]Eversana Life Sciences LLC, Ottawa, Canada, [7]Empire Sleep Medicine, New York, United States, [8]American Academy of Cardiovascular Sleep Medicine, Greenville, United States

Introduction: On average, Americans exceed the recommended sodium upper daily limit (2300 mg/day) by ~1100 mg/day through diet alone. Certain chronic medications (eg, effervescent paracetamol) can lead to substantially higher sodium consumption; some narcolepsy medications contain up to 1640 mg sodium per 9 g nightly dose. Excess sodium intake has been linked with adverse health outcomes. A systematic review (SR) of SRs was conducted to synthesize the literature on the relationship between sodium intake and clinical outcomes.

Materials and methods: This SR adhered to PRISMA guidelines. Ovid Medline, Embase, and EBMR databases were searched 1/1/2012–2/28/2023. Based on prespecified PICOS eligibility criteria, SRs assessing the association between different levels of sodium intake, or salt replacement, and health outcomes were included. SRs reporting a quantitative relationship (eg, meta-analysis) between salt reduction and ≥1 clinical outcome(s) in adults were of greatest interest. The most comprehensive SRs among those reporting multiple meta-analysis outcomes were identified based on methodological quality per AMSTAR-2 assessment, publication date, study objective and eligibility criteria, number of included studies, and whether quantifiable differences between different sodium intake levels were evaluated.

Results: Of 4327 records screened, 103 SRs met eligibility criteria, 42 of which reported meta-analyses for clinical outcomes in adults. Statistically significant associations between sodium intake and several clinical outcomes were reported. Relative to higher intake, lower sodium intake was significantly associated with blood pressure decrease (eg, systolic blood pressure, mean difference [MD]= −3.39 mmHg, 95% CI: −4.31 to −2.46; diastolic blood pressure, MD= −1.54 mmHg; 95% CI: −2.11 to −0.98; mean blood pressure, weighted MD= −3.56 mmHg, 95% CI: −4.07 to −3.06). Relative to lower sodium intake, higher sodium intake was significantly associated with higher odds or risk of esophageal cancer (odds ratio [OR]= 1.97, 95% CI: 1.49 to 2.61), overweight/obesity (OR= 1.74, 95% CI: 1.43 to 2.13), stroke mortality (risk ratio [RR]= 1.63, 95% CI: 1.27 to 2.10), nephrolithiasis (RR= 1.38; 95% CI: 1.21 to 1.56), metabolic syndrome (OR= 1.37, 95% CI: 1.31 to 1.42), coronary heart disease mortality (RR= 1.32, 95% CI: 1.13 to 1.53), type 2 diabetes (OR= 1.27, 95% CI: 1.15 to 1.41), stroke (RR= 1.24, 95% CI: 1.08 to 1.43), hypertension (RR= 1.21, 95% CI: 1.06 to 1.37), chronic kidney disease (RR= 1.21, 95% CI: 1.06 to 1.38), osteoporosis (OR= 1.20, 95% CI: 1.02 to 1.41), gastric cancer (RR= 1.12, 95% CI: 1.02 to 1.23).

Conclusions: A substantial body of evidence demonstrates higher sodium intake is associated with higher risk of numerous adverse clinical outcomes (eg, cardiovascular, cardiometabolic, cardiorenal, certain cancers). Findings support the recommendations of major health organizations to remain within the Recommended Dietary Allowance by reducing daily sodium consumption to protect short- and long-term health. Since modest reductions in sodium intake may be beneficial, lowering chronic sodium burden may further reduce certain health risks in narcolepsy patients.

Spring forward and Fall back: effects of biennial time change on parents' stress and sleep

M. Lucchini[1], S. Thakur[1], T. Anders[2], M. Kahn[3], N. Barnett[1]
[1]Nanit Lab, New York, United States, [2]Brown University, Warren Alpert Medical School, Rhode Island, United States, [3]Tel Aviv University, School of Psychological Sciences, Tel Aviv, Israel

Introduction: Although a time shift of one hour might seem innocuous, it often takes more than one week for children to adapt to Daylight Saving Time (DST) changes. This could be "double trouble" for parents, as their own bodies try to adjust while caring for their children who struggle to sleep. Despite the fact that in the past couple of years this biennial time change has been at the center of much research and discussion in the political arena, there has been no study that has characterized the impact of the DST time change on parental stress and sleep. This is a very significant gap since new parents are already at risk for poor sleep and high stress, and this time change could act as a trigger leading to sleep and mental health deterioration. To address this gap in the literature, this study inquired about parents' stress levels regarding the DST time change and how the DST time change impacted their sleep duration.
Methods: Among Nanit baby monitor users, we recruited 510 parents in the Fall of 2022 and 389 parents in the Spring of 2023 with children aged 4-24 months. Parents rated their stress level regarding the impact of the DST time change on their baby's sleep and reported on their own sleep habits using the Pittsburgh Sleep Quality Index (PSQI) one week before and one week after the time change.
Results: Before the Fall time change, 23% of parents felt fairly/very stressed, 45% a little stressed and 32% not at all stressed regarding the potential impact of DST time change on their infant's sleep. In Spring, 18% felt fairly/very stressed, 49% a little stressed and 33% not at all stressed, with no significant differences in levels of stress between Fall and Spring ($\chi2=2.62$, $p=0.27$). In the Fall, parents reported sleeping 6.5 ± 1.07 hr before and 6.5 ± 1.09 hr after the time change ($Z=-1.14$, $p=0.25$), while in Spring they reported sleeping 6.7 ± 1.02 hr before the time change and 6.8 ± 1.04 hr after ($Z=-1.08$, $p=0.3$), but the change wasn't significant. When stratified by age, we found that following the Spring time change parents of older infants (13-24 months) slept 10 minutes more on average compared to before the time change ($p=0.02$).
Conclusion: Results show that biennial time changes lead to significant stress for parents both in Spring and Fall. Nonetheless, there was no significant change in self-reported sleep duration for the week before and after the time changes, except for parents of 13-24 month old children in Spring. This is in line with other results from our group, which highlighted that 13-24 month old children shift their sleep midpoint ~10 minutes later after the Spring time change, which might allow parents to sleep longer in the morning.

Standardising the recruitment of good sleepers: development and validation of the good sleeper scale-15 items

J. Manners[1], S.L. Appleton[2], A.C. Reynolds[2], Y.A. Melaku[3], T.K. Gill[4], N. Lovato[2], A. Sweetman[2], K. Bickley[2], R. Adams[2], L. Lack[2], H. Scott[2]
[1]Flinders University, College of Education, Psychology and Social Work, Adelaide, Australia, [2]Flinders Health and Medical Research Institute, Sleep Health, Flinders University, College of Medicine and Public Health, Adelaide, Australia, [3]Cancer Council Victoria, Cancer Epidemiology Division, Melbourne, Australia, [4]The University of Adelaide, Adelaide Medical School, Adelaide, Australia

Introduction: 'Good sleepers' are routinely recruited as an important group in sleep research, yet there are no standardised criteria to identify a good sleeper. Existing approaches do not adequately capture all elements of a good sleeper, and this unstandardised definition results in misguided research findings and inconsistent conclusions across studies. Thus, the present study aimed to develop and validate the Good Sleeper Scale – 15 items (GSS-15), a questionnaire for identifying good sleepers for recruitment in research.

Materials and Methods: Data were derived from a survey of Australian adults ($n = 2,044$). Twenty-three questions from the original survey were chosen, based on existing frameworks, for possible inclusion in the final questionnaire. Initial factor identification and item reduction were completed via exploratory factor analysis (EFA) using 10% of the survey data ($n = 191$). Model fit was evaluated via confirmatory factor analysis (CFA) on the remaining 90% ($n = 1,853$). Cut-off scores were derived using receiver operating characteristic (ROC) analyses, and associations with sleep, daytime functioning, health, and quality of life outcomes were evaluated using correlations and ROC analyses.

Results: Six factors were identified via EFA: Insomnia, Timing, Duration, Regularity, Adequacy, and Perceived Sleep Problem. Model fit via CFA was high, and comparable to other sleep instruments, X^2 $(63) = 378.22$, $p < .001$, root mean square error of approximation = 0.05, with acceptable internal consistency ($\alpha = 0.76$). GSS-15 scores were consistently associated with outcomes reflecting good sleep such as reported frequency of "a good night's sleep" ($r = 0.7$), waking feeling un-refreshed ($r = -0.59$), and sleepiness ($r = -0.51$), $p < .001$. Two cut-off scores were derived to represent moderate and high confidence levels of the respondent being a good sleeper. These cut-offs demonstrated a maximum false-positive rate of 16.9% for the moderate cut-off and 3.9% for the high cut-off in identifying the best sleepers of the sample data (i.e., "*always* getting a good night's sleep", "*never* waking feeling un-refreshed", etc.).

Conclusions: The GSS-15 is a robust questionnaire that will assist in identifying good sleepers for the purpose of sleep research. Adoption of this questionnaire will ensure valid and appropriate recruitment of this essential research population. Future work will test relationships with other sleep measures in community and clinical samples.

Study of OSA biomarkers based on proteomics

W. Huang[1,2,3], J. Guan[1,2,3], H. Yi[1,2,3], S. Yin[1,2,3]
[1]Shanghai Sixth People's Hospital Affiliated to Shanghai Jiao Tong University School of Medicine, Department of Otorhinolaryngology, Head and Neck surgery, Shanghai, China, [2]Shanghai Key Laboratory of Sleep Disordered Breathing, Shanghai, China, [3]Otolaryngology Institute of Shanghai Jiao Tong University, Shanghai, China

Objective: Obstructive sleep apnea (OSA) is a complex and heterogeneous disease with great harm. The current diagnosis and treatment system of OSA still has great limitations. It is a hot topic in the field of sleep medicine to determine the risk of OSA and related multi-system injuries and to distinguish the subtypes of subjects most likely to benefit from OSA treatment. The study of OSA biomarkers can promote the development of precision sleep medicine. The purpose of this study is to explore the stage heterogeneity characteristics of biomarkers in OSA, so as to provide new methods for disease risk assessment, early injury warning and curative effect prediction.

Methods: Through rigorous experimental design and research (including the discovery set of 90 samples, the internal validation set of 225 samples, the validation set with continuous positive airway pressure [CPAP] treatment cohort of 208 samples, and the external validation set of 150 samples as series validations). We combined the cross-sectional study with the cohort study. According to the proteomic test results of serum samples, bioinformatics analysis was used to explore the biomarkers of OSA. The diagnostic ability of biomarkers was confirmed in the training set and test set. The predictive ability of biomarkers on prognosis and efficacy was observed in intervention and non-intervention cohorts.

Results: In the proteomics study, we revealed that the distinctive protein combination and protein expression of OSA subjects were different at each severity stage and at each treatment stage of CPAP, namely stage heterogeneity characteristics. Biomarkers screened by proteomics had high accuracy in the diagnosis of OSA with different severity. At the same time, in non-intervention and intervention cohorts, molecular typing based on proteomic biomarkers was carried out, reflecting different susceptibility to OSA-related multi-system injury, blood pressure reactivity and mini-mental state examination improvement after CPAP treatment. These results have important implications for clinical identification of high-risk populations and prediction of treatment benefits, so as to explain the heterogeneity of disease. Growth and differentiation factor-associated serum protein 1 (GASP-1), as a key biomarker screened and verified, had a significant negative correlation with AHI and a significant positive correlation with genioglossal muscle compensatory response index reflecting genioglossal muscle function.

Conclusion: According to the proteomic results of serum samples, combined with bioinformatics analysis, the new combination of heterogeneous biomarkers in OSA stage was identified, and the heterogeneity characteristics of pathophysiology of the disease were further analyzed comprehensively from the molecular level. The combination of biomarkers can carry out disease diagnosis and risk identification with high accuracy. The molecular typing based on this provides a new method for disease risk assessment, early injury warning and curative effect prediction. At the same time, we preliminarily verified the potential biological function of factor GASP-1 found in proteomics research that is significantly related to the severity of OSA, and provided theoretical basis for further exploring the mechanism of biomarkers.

Acknowledgements: All of the authors are grateful to the staff in our sleep center and all of the subjects.

Study on the mechanism of executive function in children's sleep initiation problems

R. Su[1], Z. Yang[1], M. Chen[1], T. Rong[1], G. Wang[1], F. Jiang[1]
[1]Shanghai Jiaotong University, Shanghai, China

Introduction: Executive function in preschool age may play an important role in bedtime resistance problems, but the current research on both is insufficient and the corresponding methodological basis is lacking. Therefore, the purpose of this study was to use EEG technology to explore the incidence of executive function and sleep problems in children aged 4-6 years, and to explore their relationship.
Materials and Methods: A total of 24 children were recruited. Parents completed the Behavior Rating Scale of Executive Function-Preschool Version (BRIEF-P) and the Children's Sleep Habits Questionnaire (CSHQ) to report daily executive function and sleep problems of children. Children were divided into normal and abnormal groups according to the CSHQ's bedtime resistance subscale, and the differences of executive function and resting brain activity were analyzed. In addition, we investigated the relationship between EEG activity and executive function in children with closed eyes in resting state conditions and reported multiple brain rhythms in frontal and posterior regions.
Results: The results indicated that children with bedtime resistance showed lower emotional control, shift and flexibility index measured by the BRIEF-P. In addition, the power of theta, alpha and beta bands in the frontal and posterior brain regions of children with bedtime resistance were lower than those without bedtime resistance, but no significant difference was found due to the small sample size.
Conclusions: Our study found that children with bedtime resistance problems may be due to insufficient executive function, suggesting that executive function intervention may be an effective way to improve sleep problems in preschool children. However, because this study is cross-sectional research, it cannot explain the causal relationship.

Subjective health is associated with neurobehavioral performance - a cross-sectional study on physicians' work-style reform surveillance

Y. Kameda[1], H. Wada[1], M. Miyakawa[1], M. Hosokawa[2], Y. Ueda[1], Q. Zhu[3], T. Morisawa[4], I. Yamamoto[5], E. Sano[6], Y. Kodama[7], H. Nakano[8], T. Tanigawa[1]
[1]Juntendo University, Department of Public Health, Tokyo, Japan, [2]Juntendo University, Department of Epidemiology and Environmental Health, Tokyo, Japan, [3]Juntendo University, Public Health, Tokyo, Japan, [4]Juntendo University, Department of Physical Therapy, Tokyo, Japan, [5]Juntendo University Hospital, Department of Nursing, Tokyo, Japan, [6]Kyorin University, Department of Nursing, Faculty of Health Science, Tokyo, Japan, [7]Juntendo University, Division of Respiratory Medicine, Tokyo, Japan, [8]Fukuoka National Hospital, Sleep Disorders Center, Fukuoka, Japan

Introduction: The extended working hours of physicians have become a social issue in Japan, and a cap on working hours will be in force in April 2024 to maintain physicians' health.
Self-Rated Health (SRH) is a subjective assessment of one's health status, and it has been found to be related to mortality. Psychomotor Vigilance Test (PVT) provides an objective assessment of neurobehavioral performance in the case of sleep deprivation and workload. Sleep deprivation has been reported to be associated with SRH. However, there is no study that has clarified the association between SRH and neurobehavioral performance.
To investigate the association between SRH and neurobehavioral performance, we conducted a study to clarify the relationship between SRH and PVT metrics among physicians working at the university hospital.
Materials and Methods: We administered a questionnaire and PVT to 836 physicians at Juntendo University Hospital. In total, 435 physicians (52.0%) responded, of whom 359 (42.9%, M/F 254 (70.8%) /105(29.2%)) were analyzed for PVT after work. The response to the questions regarding SRH included "very healthy", "healthy", "not very healthy", and "unhealthy", with the first two defined as "healthy" and the latter two as "unhealthy" in this analysis. Question for sleep deprivation was assessed in a three-level scale: "sufficient", "somewhat insufficient", and "insufficient". The only missing values in the analysis were five responses to the question about sleep deprivation, but the missing values were complemented with the mode. Multivariate logistic regression analyses were conducted to investigate the association between sleep deprivation-related PVT metrics and SRH. Adjustments were made for age, sex, BMI, presence of smoking, alcohol intake, exercise, snoring, caffeine intake, sleep deprivation, night shift work and the lapse of PVT, a count of reaction time which was 355 msec or over (lapse355). Statistical significance was defined as $p < 0.05$. Statistical analyses were conducted by Python 3.11.3 (https://www.python.org) with pandas and statsmodels library.
Results: Descriptive statistics showed a mean age of 39.9 years (Standard Deviation 9.90), BMI of 22.3 (3.26), PVT lapse355 of 12.5 times (12.6). In response to a question of sleep deprivation, 87 (24.2%) participants claimed "sufficient", 194 (54%) "somewhat insufficient", 78 (21.7%) " insufficient", whereas 317 (88.3%) were categorized in "healthy", and 42 (11.7%) unhealthy in response to the SRH question. Multivariate-adjusted logistic regression analysis showed an association of SRH with sleep deprivation and PVT lapse355 (β=0.61 [95% confidence interval (CI) = 3.33-13.81, p=0.025] for sleep deprivation, β=0.0373 [CI=0.013-0061, p=0.002] for PVT lapse355).
Conclusions: Subjective health is associated with neurobehavioral performance assessed by PVT in physicians at the university hospital.

Subjective sleep analysis of eSports players and sedentary behavior

V. Sanz-Milone[1], A. Silva[2], M.T. de Mello[2], A. Maculano Esteves[3]
[1]Universidade Estadual de Campinas (UNICAMP), Campinas, Brazil, [2]Universidade Federal de Minas Gerais, Belo Horizonte, Brazil, [3]Universidade Estadual de Campinas (UNICAMP), Limeira, Brazil

Introduction: In contrast to traditional sports, eSport basically depends on cognitive ability, so players are required to maintain attention for long periods. Cognitive capacity is directly related to sleep, periods of 7 days of sleep deprivation or restriction may be responsible for decreasing cognition, impair reaction time, attention, and memory. Also, exposure to artificial light are responsible for delaying sleep onset and decreasing total sleep time. The objective was to realize a descriptive evaluation of the sleep quality and physical activity pattern of eSports players.

Materials and methods: The sample consisted of 117 players. Players were eligible if they were of legal age and played at least 2 hours a day, three times a week. Data collection was through google forms using questionnaires: Anamnesis, Pittsburgh Sleep Questionnaire Index (PSQI), Epworth Sleepiness Scale (ESS), chronotype questionnaire (Horne & Osterberg), Athlete Sleep Behavior Questionnaire (ASBQ-BR) and the International Physical Activity Questionnaire (IPAQ short version).

Results: Players averaged 28,55±7,7years, 83,26±19,33Kg, 1,74±0,08meters, the main gaming platform used were PCs with 56% of players, 26% played on consoles and 18% on mobile, regarding the IPAQ 58% were active or very active, while 42% were sedentary or irregularly active. When analyzing the sleep questionnaires, we found that the mean chronotype of the players was 45,99±11,97, with 38% being evening type, the ESS score was 7,77±3,51, the PSQI latency of 27,84±25,19minutes, efficiency of 90,00±10,78%, the score for sleep complaints of 6,02±2,9 and the ASBQ-BR score 36,35±6,89. When analyzing players who played more or less than 3 days a week, we observed that players with more than 3 days had lower latency (24,57±21,08 and 44,73±36,53minutes respectively) (p=0,0022), lower PSQI score (5,74±2,8 and 7,47±3,00) (p=0,012), younger players used to play more than 4 hours straight per day compared to older ones (26,16±6,41 and 29,94±8,16years) (p=0,011). As for the gaming platform, we observed that console players had higher PSQI score than mobile players (6,29±3,03 and 4,76±2,04) (p=0,034). There was statistical difference between players classified as having poor sleep (7,43±2,55) and good sleep (3,20±1,00) in the PSQI, players with poor sleep had a lower chronotype (44,21±11,34 and 43,53±12,55) (p=0,028), higher latency (32,15±25,48 and 19,23±13,40) (p=0,0048), lower efficiency (87,26±11,65 and 95,48±5,79) (p<0,05) and higher score in the ASBQ-BR (37,33±7,31 and 34,38±5,57) (p=0,043). When analyzing players who prefer to play competitively or not, we observed that those who compete are younger (26,07±6,50) (p=0,0081), with lower chronotype (42,83±1,53) (p=0,0451) and higher efficiency (92,97±2,25) (p=0,032).

Conclusions: In conclusion the eSports players had good subjective sleep quality, there was also higher prevalence of players with evening chronotype, also, the younger ones were the ones who spent more time playing.

Sudarshan Kriya Yoga (SKY) and its effects on stress/anxiety/well-being: a systematic review

H. Kowdley[1], G. Kowdley[1], P. Castro[2], Z. Hameem[1], D. Daquila[1], R. Joyner[3]
[1]TidalHealth Hospital Peninsula Regional, Surgery, Salisbury, United States, [2]Philadelphia College of Osteopathic Medicine, Philadelphia, United States, [3]TidalHealth Richard A. Henson Research Institute, Salisbury, United States

Introduction: Stress and anxiety are common problems that can result in decreased well-being and sleep quality. Sudarshan Kriya Yoga (SKY), is a rhythmic breathing technique reported to reduce anxiety and stress while promoting increased well-being in many studies. Our aim was to conduct a systematic review looking at the effects of SKY on reducing stress/anxiety. We hope to apply the knowledge described here as a potential intervention to promote higher quality sleep through reductions in stress/anxiety and improvement of well-being.

Materials and Methods: The review procedure followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology. Articles of interest were identified using PubMed, Cochrane Review, and expert recommendation. The search terms used were SKY, Sudarshan Kriya, stress, anxiety, wellness, well-being, wellbeing, breathing, and meditation. Covidence software was used to manage the review. A total of 1102 articles were initially identified with 857 in PubMed, 202 in CINAHL, and 43 through citation searching. 127 duplicates were removed, leaving 975 articles to screen. Of these, 923 were eliminated through article title/abstract review. The remaining 52 publications underwent independent review by each author. Inclusion criteria required the use of SKY as an intervention with stress/anxiety/wellness/well-being being the measured outcomes. Articles not written in English, had a targeted pathology (e.g. dementia), had participants aged less than 18 or greater than 60 years, and were published prior to March 18, 2013 were excluded. Following the review process, 5 additional articles were eliminated because they were identified as irrelevant. The remaining 25 articles were included for data extraction and analysis. There were 14 non-randomized studies, 1 randomized uncontrolled study, 2 surveys/interviews/questionnaires, 5 randomized controlled trials, 2 cross-sectional studies, and 1 community program intervention.

Results: Stress/Anxiety/Well-Being were assessed using various measures such as the CESD (Depression Scale), the PSS (Perceived Stress scale), the EDM (Emotional Dysregulation scale), and surveys on anxiety, happiness, and well-being. All 25 articles showed some beneficial effects of SKY on reducing stress and anxiety. 2 articles noted improvements in reaction times and performing working memory tasks when assessing stress. 4 articles that measured sleep noted decreased sleep disturbances over time and improvements in sleep collectedness. 3 articles noted improvements in blood pressure levels after participants were given a SKY intervention.

Conclusions: Data suggests SKY is an effective, instantly available, non-pharmacological intervention to reduce stress/anxiety. All studies displayed improvement in well-being after participants were trained in SKY. Further prospective studies in which SKY is used as an intervention to combat stress/anxiety and promote well-being, are needed to look at its effects on these important areas. In doing so, we believe sleep quality will also be improved.

Symptom network analysis and comparison of the sleep disorders diagnostic criteria based on the ICSD-3 and the DSM-5 diagnostic manuals

J.-A. Micoulaud-Franchi[1], C. Gauld[2], R. Lopez[3], V. Martin[1], K. Guichard[1], P. Desvergnes[1], J. Coelho[1], P.-A. Geoffroy[4], P. Philip[1]
[1]Université de Bordeaux, Bordeaux, France, [2]Université de Lyon, Lyon, France, [3]Université de Montpellier, Montpellier, France, [4]Université de Paris, Paris, France

Introduction: The third edition of the International Classification of Sleep Disorders (ICSD-3) and the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) are used for the diagnosis of sleep disorders. An important issue of sleep nosology is to better understand the relationship between symptoms found in conventional diagnostic manuals and to compare classifications. Nevertheless, to our knowledge, there is no specific exhaustive work on the general structure of the networks of symptoms of sleep disorders as described in diagnostic manuals.
Materials and Methods: The general aim of the present presentation was to use symptom network analysis to explore the diagnostic criteria in the ICSD-3 and DSM-5 manual. The ICSD-3 and DSM-5 diagnostic criteria related to clinical manifestations were systematically identified, and the units of analysis (symptoms) were labelled from these clinical manifestation diagnostic criteria using three rules ("Conservation", "Splitting", "Lumping").
Results: The global measure of the sleep symptoms network shows that it can be considered as a small world, suggesting a strong interconnection between symptoms in the ICSD-3 or in the DSM-5. Local measures show the central role of three kinds of bridge sleep symptoms in both diagnostic manuals: daytime sleepiness, insomnia, and behaviour during sleep symptoms.
Conclusions: Such a symptom network analysis provide a framework for better systematising and organising symptomatology in sleep medicine and to better compare classifications.

Systematic item content and overlap analysis of self-reported generic and specific sleep disorders screening questionnaires in adults

J.-A. Micoulaud-Franchi[1], C. Gauld[2], R. Lopez[3], M.-M. Sanchez-Ortuno[1], V. Martin[1], K. Guichard[1], J. Coelho[1], S. Baillieul[4], J.-L. Pépin[4], P. Philip[1]
[1]Université de Bordeaux, Bordeaux, France, [2]Université de Lyon, Lyon, France, [3]Université de Montpellier, Montpellier, France, [4]Université de Grenoble, Grenoble, France

Introduction: Sleep disorders are defined on the basis of diagnostic criteria presented in medical classifications. However, no consensus has emerged on the exact list of operational symptoms that should be systematically investigated in the field of sleep medicine.

Materials and Methods: We propose a systematic analysis of sleep symptoms that figure in a set of self-reported screening questionnaires adult populations, for multiple sleep disorders (generic questionnaires), for obstructive sleep apnea (OSA) and insomnia disorder (specific questionnaires). We identify the content overlap of symptoms that probe the presence of central sleep symptoms, and to highlight the potential level of heterogeneity among sleep disorder questionnaires. The method comprises three steps: (i) the selection of self-reported screening questionnaires adult populations; (ii) item extraction and selection; (iii) the extraction of symptoms from items. Frequency of sleep symptoms and content overlap (Jaccard Index) are analyzed.

Results: We will present the extracted items and the different symptoms provided from the sectioned questionnaires. The sleep symptoms found in all the questionnaires will be discussed.

Conclusions: The mean overlap heterogeneity among questionnaires underline the need to standardize sleep symptom contents for sleep medicine in order to enhance the practicability, reliability, and validity of sleep disorder diagnoses.

Acknowledgements: Marie Pelou and Poeiti Abi-Saab for the analysis of the data.

Telemonitoring mode of CPAP treatment for OSAS children in China under the COVID-19 epidemic

D. Liu[1], X.-Q. Luo[1], S. Qiu[1], L. Yang[1]
[1]Shenzhen Hospital, Southern Medical University, Department of Pediatric Otolaryngology, Shenzhen, China

Introduction: In the past two years, our medical behavior has been restricted because of the COVID-19 epidemic. With the development of the internet, we explored a telemonitoring mode that can be used for OSAS children's CPAP treatment - instant messaging software combined with the remote monitoring system on the CPAP device, to understand whether this mode can improve the short-term adherence of children's CPAP treatment.

Materials and methods: 46 OSAS children treated with CPAP were analyzed retrospectively from January 2021 to December 2022 （the average age of 5 years). In the first year, 22 subjects were followed up for 2 months with usual care (UC group), which refers to telephone follow-up (the first week, one month and two months after CPAP initiation). In the second year, 24 subjects were followed up for 2 months with telemedicine(TM group), which refers to instant messaging software combined with the remote monitoring system on the CPAP device(the first day, third day, one week, every one week after CPAP initiation). In the TM group, the subjects are divided into two groups. More questions group(n=12) and Fewer questions group(n=12), respectively, on the basis of the number of questions we collected. The adherence of both groups were compared in the first, second week and remaining days.

Results: Six of 22 patients stopped CPAP therapy in the UC group vs. one of 24 in the TM group(p=0.037). In the TM group, we collected 87 questions, including mouth breathing(35.7%), snoring(12.7%), nightmare(21.8%), nasal discomfort(13.8%), rhinorrhagia(4.6%), mask leakage(3.4%), eye discomfort(4.6%), condensing water(3.4%). Compared with more questions group, there was a significantly higher adherence in the fewer questions group in the first week(average usage 5(2.8,5.9)vs 8.5(8.1,8.8)hours:p<0.001; 4.5(2.2,6)vs7 of days ≥ 4 h:p=0.001). There were no significant difference in the second week and the remaining days. In addition, the average usage(h) of the first, second week and remaining days in more questions group is gradually increasing.

Conclusions: The telemonitoring mode is effective for short-term adherence of OSAS children with CPAP treatment. Although poor in the first week, adherence begins to improve in the second week after the effective remote intervention.

Temporal eating patterns during covid-19 pandemic: Interfaces of eating-window with sleep quality in adults

L. Menezes-Junior[1], F. Almeida[1], G. Machado-Coelho[1], A. Meireles[1]
[1]Federal University of Ouro Preto, Ouro Preto, Brazil

Introduction: The eating-window is when food is consumed during the day. A high eating-window of more than 12 hours can affect circadian rhythm, metabolism, inflammation, and oxidative stress, which are related to sleep health and quality. Several factors, such as hormonal fluctuations, inflammatory responses, neurotransmitter levels, and brain activity, can influence sleep quality. The eating-window or its effects may modulate some of these factors. However, only some studies have investigated the association between the elevated eating-window and sleep quality in a representative population sample. Moreover, the eating-window may vary according to people's eating habits and lifestyles. Therefore, we aimed to evaluate the association between the high eating-window and sleep quality in a sample of Brazilian adults.

Methods: We conducted a cross-sectional, population-based study with 998 adults stratified by multistage probabilistic conglomerate sampling from October to December 2020 in Ouro Preto, Minas Gerais, Brazil. From a total of 998 individuals evaluated, those with active phone lines were selected to perform the food intake assessment, resulting in a subsample of 250 individuals. Of these, 150 responded to a 24-hour food recall, and 91 responded to both, which was the final sample of this study. Sleep quality was measured by the Pittsburgh Sleep Quality Index (PSQI), being considered poor when > 5. Two 24-hour dietary recalls were performed, on alternate days, from the multi-method strategy to increase the accuracy and validity of information on food intake. From this, we calculated the eating-window from the first and last eating episode and classified it as high when equal to or greater than 12 hours. We assessed the association between the eating-window and sleep quality by a Poisson model with robust variance to model the dichotomous variable of sleep quality (good or poor sleep), estimating the prevalence ratio of poor sleep quality (PSQI > 5) in individuals who had a high food window. We adjusted the model for age, sex, scholarly, physical activity level, and the day the 24-hour recall was evaluated (typical or atypical). Furthermore, we used a directed acyclic graph to assist with model fitting.

Results: Of the individuals evaluated, 66.5% were female, 47.1% were 18 to 34 years old, 79.4% were black or brown, 44.5% had at least a high school education, and 44.3% had family income below two minimum wages. The mean of eating-window was 11.42h (10.99-11.84), and the PSQI was 5.46 (4.32-6.60). The prevalence of individuals with eating-window > 12h was 38.1%, and poor sleep quality was 38.5%, higher in individuals with eating-window > 12h (53.8% versus 46.2%). In multivariate analysis, individuals with eating-window > 12h had a prevalence ratio of poor sleep quality 1.83 times higher than those with eating-window < 12h (RP:1.87;95%CI:1.01-3.43).

Conclusion: This study showed that a high eating-window ($\geq$ 12 hours) is associated with poor sleep quality in Brazilian adults. These findings suggest that restricting the eating-window may improve sleep quality and, consequently, people's health and well-being. Further studies are needed to confirm this association and elucidate the mechanisms involved.

The acute physiological stress responses after total sleep deprivation in health individuals: a systematic review

M. Benfica[1], R. Messa[1], L. Ribeiro[1], E. Alves[1,2]
[1]Universidade Estadual de Santa Cruz (UESC), Health Sciences, Ilhéus, Brazil, [2]Griffith University, Health Sciences and Social Work, Gold Coast, Australia

Introduction: Observational studies have provided evidence that a short sleep duration increases the risk of chronic diseases. A possible mechanism that explains this increased risk would be changes in the stress responses. However there is not a consensus in the literature if sleep deprivation would exaggerate or blunted the autonomic nervous system (ANS) and the hypothalamic-pituitary-adrenal (HPA) axis responses after an acute psychological stress. In light of these concerns, this systematic review aims to evaluate and summarize the findings from clinical trials that examine physiological responses to acute stress following total sleep deprivation in healthy individuals, comparing them to a control condition.

Materials and Methods: We conducted a systematic review of experimental studies investigating the acute physiological stress responses after total sleep deprivation. This study was performed according to the latest Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. The protocol was registered on the International Prospective Register of Systematic Reviews – PROSPERO (CRD 42022293857). We performed a comprehensive search on PubMed, PsycINFO and Web of Science using "Sleep Deprivation", "Psychological Stress" and "Physiological Response" related terms. We included clinical trials (randomized, non-randomized and crossover) and excluded observational studies. The study selection was performed using Rayyan, and data extraction was executed by two independent reviewers (RM and ESA) with consensus from MB. The risk of bias assessment was conducted using the ROB 2 and ROBINS-1 tools.

Results: After removing duplicates, 269 studies remained for title and abstract screening, with 10 included. The participants (n=419) had an average age of 22 years, with a male-to-female ratio of 53.95% to 46.05%, respectively. Total sleep deprivation ranged from 24 to 82 hours. The most explored acute stress protocol was the Standardized Trial Social Stress Test, used in three studies. Moderately studied contexts included the Cold Pressure or Cold Air Test (two studies), while less frequently studied contexts included the Stroop Task, Psychosocial Stress, the Maastricht Acute Stress Test, and the combination of the Stroop Task with the Speech Task or Cold Pressor Test and a mental stress task (one study each). Cortisol excretion was assessed in 50% of the studies, while 30% measured heart rate. Blood pressure, catecholamines, Electrodermal activity, and salivary alpha amylase were measured in 20% of the studies. Heart rate variability, forearm vascular conductance and muscle sympathetic nerve activity were evaluated in a single study. Sleep deprivation increases physiological stress responses (N=4), while blunted responses are linked to cortisol levels (N=2). No changes were observed in catecholamines (N=2), heart rate (N=2), alpha amylase concentration (N=2) and cortisol (N=2), or heart rate variability (N=1). Concerns were raised about the randomized control trials assessed using the ROB 2 tool. In non-randomized clinical trials evaluated with ROBINS-I, three studies received a moderate rating.

Conclusions: Based on these findings, we conclude that there is limited evidence, with inconsistent results, regarding the acute physiological response to stress following sleep deprivation compared to a normal sleep condition.

The effect of low dose CO2 on sleep quality in healthy subjects

S. Liang[1], D. Lu[1], Q. Wei[1], B. He[1], L. Wu[1], Y. Wu[1], J. Steier[2], Y. Luo[3]
[1]Guangzhou Medical University, State Key Laboratory of Respiratory Disease, Guangzhou, China, [2]Lane Fox Respiratory Unit/Sleep Disorders Centre, London, United Kingdom, [3]Harvard Medical School, Division of Sleep and Circadian Disorders, Brigham and Women's Hospital, Boston, United States

Introduction: Inhalation of low-dose CO_2 (for example 2.5% CO_2) using a traditional tightly fitting mask could eliminate central sleep apnea in patients with heart failure. However, the reduction of central sleep apnea events with CO_2 inhalation is associated with increased arousal index, greater sleep disturbance and increased sympathetic nervous activity. It is not known whether these side effects associated with CO_2 therapy are because of hypercapnia or intolerance of the mask.

Materials and Methods: We recently invented a device including a novel open mask which is able to supply CO_2 in accurate concentration comfortably. Two overnight full polysomnography studies during inhalation of room air or 2.5 % CO_2 were performed in seventeen healthy subjects (aged 36 ± 12 years, BMI 21.7 ± 2.7 Kg/m^2) in random order. Arteria blood gases were also performed in the morning in 10 of seventeen subjects.

Results: As expected, end-tidal CO_2 during inhalation of 2.5% CO_2 was significantly higher than that during breathing room air (41.4 ± 2.9 mmHg vs 38.3 ± 3.3 mmHg, $p<0.001$). Sleep duration during inhalation of 2.5% CO_2 was longer than that during inhalation of room air (411 ± 48 vs 389 ± 51 minutes, $p<0.05$). The sleep efficacy during inhalation of 2.5% CO_2 also improved significantly ($91.8 \pm 5.0\%$ vs $87.0 \pm 5.0\%$, $p<0.05$). However, sleep structure including sleep latency, arousal index, respiratory rate, sensation of breathing difficulty, heart rate and blood pressure between inhalation of 2.5% CO_2 and room air were similar.

Conclusions: This study shows that inhalation 2.5%CO_2 by using the novel device including an open mask has no obvious side effects in healthy adults.

The effects of lifestyle improvement on sleep quality and daytime mood in night owl students who previously skipped breakfast

M. Ohira[1], M. Ishii[1]
[1]Shiga University, Otsu, Japan

Introduction: In recent years, Japanese university students have exhibited a significant shift in wake-up time, with a high tendency to skip breakfast. One reason for this is a delay in bedtime because of activities such as nighttime part-time jobs, watching videos on smartphones, and interpersonal communication. Among university students, night owls tend to adopt a morning-oriented lifestyle and routine only on necessary days, especially when job hunting or internships begin. However, adjusting the internal body clock and changing the daily rhythm typically takes several weeks. Conversely, can a few days of living affect mood and sleep quality on specific days differently than usual? This study examined the changes in daytime mood and sleep when evening-oriented students skipped breakfast, transitioned to a morning-oriented lifestyle, and started consuming breakfast, with the objective of validating the effects of this transition on their daily experiences.

Materials and Methods: The participants included 10 individuals (20.1±1.0 years) with poor lifestyle habits who responded in a preliminary survey that they had "no habit of eating breakfast" and "regularly went to bed after midnight during the lecture period." The group with poor lifestyle habits underwent a two-day lifestyle intervention, including going to bed by midnight, getting 7.5–8 hours of sleep, and consuming breakfast. The levels of sleepiness, sleep perception, sleep variables calculated using polysomnography tests, and daytime mood were compared between the pre-intervention and intervention days. Additionally, a control group including 11 individuals (20.8±0.7 years) with good lifestyle habits who responded that they "ate breakfast every day" and "went to bed by midnight during the lecture period" was established. This study was approved by the Ethics Review Committee of Shiga University.

Results: Among students with poor lifestyle habits, the intervention led to significantly increased sleep duration and total sleep time (p=0.001, 0.024); however, subjective sleepiness upon awakening intensified (p=0.005). No significant changes were observed in the other sleep variables, sleep perception, or daytime mood.

Conclusions: The two-day lifestyle intervention for evening-oriented students who skipped breakfast significantly increased their sleep duration and total sleep time, suggesting that the intended effect of improving lifestyle habits was achieved. However, subjective sleepiness upon awakening increased, and no significant changes were observed in daytime mood, which may be due to students living a night-oriented lifestyle experiencing disruption in their usual rhythms due to the intervention. Disturbances in circadian rhythms, which regulate fundamental physiological activities such as sleep and wakefulness, can lead to various physiological dysfunctions. Results of the morningness-eveningness questionnaire indicated that the poor lifestyle habits group tended towards a night-oriented lifestyle. The enforced intervention, which deviated from the inherent circadian rhythm, may have caused a disturbance in the circadian rhythm and increased morning sleepiness. However, daytime moods can also be influenced by sleep, daily schedules, and learning conditions. As this study did not control for daytime activities, the influence of these confounding factors could not be ruled out. Therefore, it is evident that short-term improvements in lifestyle habits do not necessarily have positive effects.

The effects of physical interventions on sleep in the perioperative period: a systematic review

G. Taylor[1], C. Linh[1], A. Kowdley[2], R. Mahmud[3], J. Buzalewski[2], G. Kowdley[2], R. Joyner[4]
[1]Philadelphia College of Osteopathic Medicine, Philadelphia, United States, [2]TidalHealth Hospital Peninsula Regional, Surgery, Salisbury, United States, [3]Cooper Medical School of Rowan University, Camden, United States, [4]TidalHealth Richard A. Henson Research Institute, Salisbury, United States

Introduction: Poor sleep quality after surgery can lead to adverse outcomes including increased postoperative pain, increased recovery time, and prolonged length of stay. Nonpharmacologic interventions have been described as alternatives to sleep-promoting medications. These include interventions such as eye masks and ear plugs, progressive muscle relaxation, breathing exercises, and acupressure/reflexology, among others. We aimed to conduct a systematic review of various physical interventions and their effects on sleep in the perioperative period.

Materials and methods: A systematic review was conducted utilizing the PRISMA 2020 guidelines to explore non-pharmaceutical modalities to improve sleep in post-operative patients. English language articles published within the past 10 years were identified through key word searches. Keywords included: perioperative AND Surgery AND Sleep NOT (sleep apnea); postoperative sleep disturbances NOT (sleep apnea); Surgery AND Sleep NOT (sleep apnea); Surgery AND Sleep NOT (sleep apnea). Searches provided 2678 articles from the following databases: 843 – Embase; 623 – PubMed; 568 – Scopus; 394 – Web of Science; 250 – CINAHL. Duplicates were removed (928) leaving 1750 studies to screen. Inclusion and exclusion criteria required of a focus on sleep disturbance in the post-operative period with non-pharmacologic interventions and excluded a focus on sleep apnea or diagnosis of delirium/dementia. Two independent reviewers voted on inclusion of an article used in data extraction or exclusion from the review, and in cases of voting conflict, consensus was obtained by all reviewers. Articles focusing on physical interventions were selected. Of the 64 remaining publications, 30 were classified as physical interventions. There were 29 randomized controlled trials and 1 non-randomized experimental study.

Results: Multiple sleep parameters in the identified studies used scales such as the Richards-Campbell Sleep Questionnaire (RCSQ), Pittsburgh Sleep Quality Index (PSQI), Athens Insomnia Scale (AIS), Epworth Sleepiness Scale (ESS), and bispectral index (BIS) and mega view sleep monitoring detection which are both objective measurements. Twenty-eight of 30 articles showed a positive impact on sleep quality. Two articles did not show significant impact on sleep, however they had low compliance (<65%) with the intervention. In articles with satisfactory compliance there was a positive impact on sleep quality compared to control groups. In addition to improving sleep quality, 8 articles demonstrated a decrease in postoperative pain, 4 noted lower postoperative anxiety, 2 reported less incidence of postoperative nausea, and 1 noted lower levels of proinflammatory cytokines IL-6, TNF-α, and higher levels of anti-inflammatory cytokine IL-10.

Conclusions: Physical interventions are shown to have a positive impact on sleep quality following surgery. In addition to improving overall sleep quality and decreasing sleep disturbances, some physical interventions have been shown to alleviate several negative outcomes, including postoperative pain, anxiety, and nausea. Additional studies will need to be performed to increase the strength of this finding.

The impact of caffeine and exercise on dreams and nightmares

A. Mills[1], J. Cruickshank[1], T. Eller[1], L. De Peralta[1], O. Crawford[1], J. Jones[1], D.B. Kay[1]
[1]Brigham Young University, Psychology, Provo, United States

Introduction: Caffeine, a widely consumed psychoactive substance, and exercise, a foundation for healthy living, have both been recognized as activators that influence sleep patterns and overall well-being. In recent years, studies have increasingly focused on how caffeine intake and exercise routines have affected sleep quality and quantity, but little research has been conducted on the interplay between these factors with dreams and nightmares. Thus, this study was conducted to investigate how caffeine and physical activity might impact the occurrence of dreams or nightmares during sleep.

Materials & Methods: Participants from a larger study were asked to fill out morning and evening diaries about their sleep for 10-20 days. These 59 participants were a sample with and without sleep disturbances or suicidality. The evening diary asked participants if they had any caffeine during the day and to what amount, and if they exercised and for how long. The morning diary asked the participant how many times they woke up during the night, if their awakening was due to a nightmare, the severity of their nightmare and how many dreams they had.

The data gathered was used to run a logistic regression model in Stata which examined the relationship between disturbing dreams and nightmares with caffeine intake along with exercise. We then ran a multilevel mixed-effects logistic regression to predict these dream disturbances using caffeine and exercise, while controlling for day and clustering for participants.

Results: From the logistic regression model, disturbing dreams and nightmares were significantly associated with caffeine (β=0.66, $p<0.033$) while insignificantly associated with exercise (β=0.26, $p<0.23$). The multilevel mixed-effects logistic regression showed that by controlling for day and clustering for participants, neither caffeine or exercise were significant in predicting disturbing dreams and nightmares (β=0.52, $p<0.22$); (β=0.13, $p<0.69$).

Conclusion: Based on the outcomes derived from our logistic regression model, it was established that caffeine intake displayed a significant link with troubling dreams and nightmares. However, exercise did not exhibit such an association. Conversely, when employing a multilevel mixed-effects logistic regression model while adjusting for day effects and considering participant clustering, neither caffeine intake nor exercise turned out to be influential predictors of disturbing dreams or nightmares. These findings propose that the relationship between caffeine intake and unsettling dreams or nightmares may possess more intricacies than initially presumed. Further investigation is warranted to validate these discoveries as well as unravel the underlying mechanisms involved.

The impact of COVID-19 pandemic on sleep visits among veterans

J. Razjouyan[1], A. Sharafkhaneh[2], S.T. Kuna[3]
[1]Baylor College of Medicine, HSR, Houston, United States, [2]Baylor College of Medicine, Medicine, Houston, United States, [3]Perelman School of Medicine of the University of Pennsylvania, Medicine, Philadelphia, United States

Introduction: Due to coronavirus 2019 (COVID-19) pandemic, public health policies recommended social distancing and staying-at-home. In this study, we evaluated the impact of the pandemic on sleep test utilization, i.e. home sleep apnea testing (HSAT) and in-laboratory polysomnography (PSG), among veterans.

Materials and Methods: We conducted an observational before and during the pandemic study using the national Veteran Healthcare System (VHA). Electronic medical records from 01/2019 to 09/2022 were gathered for all veterans born after 10/01/1972. HSAT and PSG utilization were defined based on Current Procedural Terminology (CPT) codes. Following intervals defined as pre-pandemic (PRE-P, 01/2019 to 02/2021, 14 months), Pandemic-moratorium (PMor, 4/2020 to 6/2020, 3 months), pandemic-pre-vaccination opening (PnoVax, 7/2020 to 12/2020, 6 months), pandemic vaccination (P-Vax, 1/2021 to 5/2021, 5 months), and pandemic post vaccination (P-PVax, 06/2021 to 09/2022, 15 months). We compared the mean sleep test utilization using univariant analysis.

Results: Over the 45 months, 247,817 HSAT and 123,456 PSG were performed. In HSAT, compared to PRE-P (5,669 visit/month) as a reference, we observed a significant drop in P-Mor (-70%, $P<0.001$), P-noVax (-7%, $P=0.166$), P-Vax (+9%, $P=0.067$). However, P-PVax did not differ significantly in average monthly HSAT compared to PRE-P (+6%, $P=0.103$). In PSG, compared to PRE-P (3,994 visit/month) as a reference, we observed a significant drop in P-Mor (-92%, $P<0.001$), P-noVax (-61%, $P<0.001$), P-Vax (-44%, $P<0.001$), and P-PVax (-32%, $P<0.001$). By 09/2022, the in-laboratory PSG per month did not recover to pre-pandemic levels, while the HSAT per month increased, but not to a level that compensate for the reduction in PSG.

Conclusions: The COVID-19 pandemic markedly impacted use of sleep testing services in veterans. While HSAT was resilient and increased during the pandemic, the increase did not off-set the shift away from in-laboratory PSG. Future research is needed to better understand the reasons (e.g., professional staff availability , equipment resources, and provider and patient preferences) for this change in clinical practice.

The impact of ethnicities on sleep duration in a multiethnic population: data from ELSA-Brasil study

S. Giatti[1,2], R.B. Santos[2,3], A.N. Aielo[1,2], B.K. Parise[1,2], W.A. Silva[1,2], L.F. Cunha[1,2], S.P. Souza[3,2], P.A. Lotufo[1,2], I.M. Bensenor[1,2], L.F. Drager[1,3,2]
[1]Universidade de São Paulo, Faculdade de Ciências Médicas, São Paulo, Brazil, [2]Universidade de São Paulo, Hospital Universitário da Universidade de São Paulo, São Paulo, Brazil, [3]Universidade de São Paulo, Instituto do Coração, São Paulo, Brazil

Introduction: Sleep duration (SDUR) has declined continually since the second half of the twentieth century. However, it is conceivable that several factors may influence (SDUR). Growing evidence suggests that race/ethnicity may influence SDUR. Sleep may not only be modulated by life habits and genetic factors, but there might be social factors that lead to changes in sleep behavior. This study aimed to investigate the association between SDUR and quality, and ethnicity in a large sample of adults, using cross-sectional data from the ELSA-Brasil.
Materials and Methods: This is a cross-sectional study that recruited participants from the Sao Paulo center of the ELSA-Brasil cohort. Each participant was interviewed and visited the research center for clinical and physical examination according to standard protocols. The ethnicity was obtained by self-report at the interview. SDUR was measured by using an Actiwatch model 2™ over a period of 7 consecutive days and nights on the nondominant wrist during a typical week. We also performed an overnight home sleep study using the Embletta Gold™ to investigate the presence of obstructive sleep apnea, OSA (using the cut-off of ≥15 events/hour). A linear regression analysis was performed adjusting for age, gender, body mass index, diabetes mellitus, hypertension, chronic kidney disease, heart failure, education, retired, per capita income, children, smoking, working hours, and physical activity.
Results: Over two years, 2,561 participants were invited to perform the sleep assessment. A total of 1,816 participants were included in the final analysis (age 49±8 years; 43.4% men; 11% retired; 33% with OSA). The mean SDUR was 395±59 minutes. Stratifying the SDUR by race/ethnicity, we have observed that as compared to the Whites (400±56 minutes), Blacks (379±60 minutes) and Asian (380.12±57.86 minutes) had lower SDUR (P<0.001). And compared to Whites (83.95±6.45%), the sleep efficiency was lower when compared to Mixed (81.79±7.29) and indigenous (78.70±5.22%), p<0.001. After adjustments, Blacks (β-0.10, IC-27.23 -9.43, p<0.001) and Asians (β-0.09, IC-37.20 -11.23) were independently associated with lower SDUR.
Conclusions: Our results suggest that the difference founde in the shorter SDUR in Blacks and Asians may not be explained by the typical habits and comorbidities.

The influence of sleep apnea surgery on incidence of cardiovascular diseases: insights from a national database

C. Maciel de Oliveira[1], S. Marques[1], M. Abdelwahab[1], S.C. de Freitas[2], L.F.P. Southier[2], E.E. Scalabrin[2], L.F. Drager[3], R. Capasso[1]
[1]School of Medicine, Stanford University, Division of Sleep Surgery, Department of Otolaryngology–Head and Neck Surgery, Stanford, United States, [2]Pontifícia Universidade Católica do Paraná, Graduate Program in Informatics (PPGIa), Curitiba, Brazil, [3]University of São Paulo Medical School, Hypertension Unit, Instituto do Coracao, Sao Paulo, Brazil

Introduction: Recently, the utilization of real-world evidence (RWE) has gained prominence in enhancing clinical decision-making by providing valuable insights into the usage, potential benefits, and risks associated with medical treatments or products in delivering high-value care. The aim of the study is to investigate the risk of developing specific cardiovascular diseases in patients who underwent obstructive sleep apnea(OSA)-related surgery compared to those who did not.
Materials and Methods: The EVERSANA database comprises anonymized electronic health records of patients in the USA, facilitating access to a comprehensive range of treatment modalities and long-term outcomes. From 2010 to 2023, all individuals (>18 years) included in this study underwent at least one sleep study, specifically polysomnography, as indicated by Current Procedural Terminology (CPT) codes. Moreover, all patients had received at least one physician-assigned diagnosis of OSA according to the International Classification of Diseases (ICD-9 and ICD-10). ICD codes were also used to define the phenotypes related to cardiovascular diseases (CVD). As exclusion criteria, we considered patients with any of the following conditions, referred to as a CVD composite when taking into account together: hypertension, cardiac arrhythmia, congestive heart failure (CHF), myocardial infarction (MI), stroke, and peripheral vascular disorders (PVD). Initially, the population consisted of an estimated 104 million patients. After applying the elegibility criteria, the study cohort was stratified into two categories: individuals who underwent OSA-related surgery (n=3,911) and those who did not (downsampled to 25,000 patients). To reduce potential biases and ensure more comparable groups, Propensity Score Matching (PSM) was employed. Then, we carried out time-to-event analyses to evaluate the cardiovascular outcomes.
Results: At baseline, the surgical group displayed distinct characteristics compared to the control group. The surgical group had a higher proportion of males (60% vs 51%), a significantly lower mean age (41.4±14 vs 48.2±13.3 years, $p<0.05$), and a lower average comorbidity score (0.9±1.4 vs 1.2±1.4). The incidence rate, over an average follow-up period of 3.8 years, was lower in the surgical group compared to the control group for all the cardiovascular diseases analyzed: CVD composite (20.4% vs 32.4%, $p<0.05$), hypertension (13.1% vs 25.3%, $p<0.05$), cardiac arrhythmia (9.1% vs 9.9%), PVD (1.7% vs 3.7%), CHF (1.3% vs 3.0%), MI (1.0% vs 2.6%), and stroke (0.5% vs 1.0%). After PSM and time-to-event analyses, the surgical group showed a lower risk for developing the following CVD such as hypertension [HR=0.69 (IC 95% 0.58 - 0.82), $p<0.001$], CHF [HR=0.53 (IC 95% 0.3 - 0.92), p=0.02], PVD [HR=0.64 (IC 95% 0.42 - 0.98), p=0.04], and also the CVD composite [HR=0.75 (IC 95% 0.65 - 0.86), $p<0.001$].
Conclusions: This study highlights the importance of OSA-related surgery in improving overall cardiovascular health. Patients who underwent this surgical intervention showed a reduced risk for some cardiovascular outcomes when compared to the control group. These include hypertension, congestive heart failure, peripheral vascular disease, and a composite measure of all cardiovascular events analyzed.

The lower risk of developing cardiovascular outcomes in patients submitted to Obstructive Sleep Apnea-related surgery at Stanford health care center

C. Maciel de Oliveira[1], S. Marques[1], M. Abdelwahab[1], L.F. Drager[2], R. Capasso[1]
[1]School of Medicine, Stanford University, Division of Sleep Surgery, Department of Otolaryngology–Head and Neck Surgery, Stanford, United States, [2]University of São Paulo Medical School, Hypertension Unit, Instituto do Coracao, Sao Paulo, Brazil

Introduction: Utilizing Propensity Score Matching (PSM) enables the adjustment of a predefined set of covariates, effectively reducing biases and facilitating a more precise comparison between the groups under investigation. By effectively mitigating the influence of confounding variables, PSM enhances the reliability and validity of the assessment of treatment effectiveness, patient outcomes, and other pertinent measures. Then, this research aims to investigate the difference between groups, considering Obstructive Sleep Apnea (OSA)-related surgery, in the incidence of cardiovascular outcomes in a disease-free cohort.

Materials and Methods: This study included individuals aged 18 years and older who met the criteria of receiving at least one physician-assigned diagnosis of obstructive sleep apnea (OSA) based on the ICD-9 and ICD-10 codes (International Classification of Diseases) and simultaneously underwent one or more polysomnography sleep studies, as indicated by CPT codes (Current Procedural Terminology), from 2010 to 2023. The cohort, consisting of 6,661 participants, was categorized based on whether they underwent OSA-related surgery. Various cardiovascular diseases (CVD), such as hypertension, arrhythmia, peripheral vascular disorders, congestive heart failure, myocardial infarction, and stroke, were individually considered for analysis. Furthermore, a CVD composite measure was established, encompassing any of those specified conditions. Logistic regression was used as a tool for analyzing the relationship between independent variables and the incidence of CVD, while controlling for confounding factors. Time-to-event analysis was done for newly diagnoses of CVD and survival analysis was also employed.

Results: We conducted the analysis considering those who underwent OSA-related surgery (2,281 patients) and those who did not (4,380 patients) in a mean follow-up period of 5.3 years. In the baseline, the surgery group showed a lower proportion of females (34.1% vs 46.5%, $p<0.05$), and also a lower mean age (39.6 ±13.1 vs 45.9±16.2, $p<0.05$). Considering the outcome events, the incidence of CDV composite (26.4% vs 13.1%) and hypertension (18.1% vs 8.3%) were superior in the non-surgical group ($p<0.05$). However, when performing propensity score-matched analysis, significant findings showed the benefit of surgery over non-surgery with a lower risk of development of hypertension [OR=0.48 (IC95% 0.31 - 0.74)], CVD composite [OR=0.59 (IC 95% 0.42-0.82)], and also arrhythmia [OR=0.61 (IC 95% 0.39 - 0.97)].

Conclusion: In the Stanford Health Center cohort , the risk of developing arrhythmia, hypertension, and a cardiovascular outcomes composite was significantly lower in patients that underwent OSA-related surgery.

The organization of sleep-wake patterns around daily schedules in college students

S. Lu[1], J. Stone[1], E. Klerman[2,3,4], A. McHill[3,4,5], L. Barger[3,4], R. Robbins[3,4], D. Fischer[6], A. Sano[7,8], C. Czeisler[3,4], S. Rajaratnam[1,3,4], A. Phillips[1,3,4]
[1]Monash University, Turner Institute for Brain and Mental Health, School of Psychological Sciences, Melbourne, Australia, [2]Massachusetts General Hospital, Department of Neurology, Boston, United States, [3]Brigham and Women's Hospital, Division of Sleep and Circadian Disorders, Departments of Medicine and Neurology, Boston, United States, [4]Harvard Medical School, Division of Sleep Medicine, Boston, United States, [5]Oregon Health & Science University, Sleep, Chronobiology, and Health Laboratory, School of Nursing, Portland, United States, [6]German Aerospace Center, Department of Sleep and Human Factors Research, Institute for Aerospace Medicine, Cologne, Germany, [7]Rice University, Department of Electrical and Computer Engineering, Houston, United States, [8]Massachusetts Institute of Technology, Affective Computing Group, Media Lab, Cambridge, United States

Introduction: The amount of time available in a day is fixed, and consequently, sleep is often sacrificed for waking activities. For college students, daily activities, comprised of scheduled classes, work, study, social and other extracurricular events, can be detractors to sufficient and good-quality sleep. We investigated how the timing and intensity of daily schedules (including day-to-day changes) related to daily sleep-wake patterns of college students.

Materials and Methods: 223 undergraduate students (age: 18-27 years, 37% females) from a single United States university were monitored for approximately 30 consecutive days. Sleep onset time, wake time, and sleep duration were determined from actigraphy analysis and corroborated with self-reported data from daily online morning surveys. Daily scheduled events were documented using daily online evening diaries where participants provided information on the number and timing of academic (including classes, sections, seminars, labs, study groups), exercise-based (including sports, gym, cycling), and extracurricular (additional activities beyond academic and exercise-based commitments) activities. Additionally, participants reported the total amount of time spent studying outside of class each day.

Results: Linear mixed models were used to quantify associations between daily schedule and sleep-wake timing between-person and within-person. Later schedule start time predicted later sleep onset (between and within: $p<.001$), longer sleep duration on the previous night (between: $p=.22$, within: $p<.001$), and later wake time (between and within: $p<.001$). Initiating the day with an exercise-based activity, relative to initiating with an extracurricular activity, predicted earlier wake time (within: $p<.001$). Later schedule end time predicted later sleep onset (between: $p=.11$, within: $p<.001$) and shorter sleep duration that night (between: $p=.23$, within: $p<.001$). For every 1 hour that recorded activities extended beyond 10 pm, sleep onset was delayed by 15 minutes at the within-person level and 40 minutes at the between-person level, and sleep duration was shortened by 6 and 23 minutes, respectively. Concluding the day with an academic activity, relative to an extracurricular activity, predicted later sleep onset (within: $p<.05$). Increased daily documented total activity time predicted earlier wake (between: $p<.01$ and within: $p<.001$), later sleep onset that night (between: $p=.37$, within: $p<.01$), and shorter sleep duration (between: $p=.09$, within: $p<.001$).

Conclusions: Daily schedules are an important factor in shaping sleep timing and duration in college students. Acute changes in daily schedules can induce corresponding changes in sleep-wake timing. While previous research has primarily focused on the impact of academic scheduling on sleep, our study took a more holistic approach by considering exercise and extracurricular activities within students' daily schedules. This allowed us to independently determine the effects of multiple schedule parameters, including the effects of different activity types and their timing. This is valuable information for those seeking to promote healthy sleep behaviours. Previous research has shown the importance of time management, for instance, in predicting sleep behaviour. Future research may explore the interrelationships between time management skills, schedules, and sleep behaviour in students.

The relationship between burden and caregiver's sleep disturbances in dementia

B. Monteiro[1], M.C. Dourado[1], T.T. Belfort[1], M. Nogueira[1]
[1]Universidade Federal do Rio de Janeiro, Center for Alzheimer's Disease - Institute of Psychiatry, Rio de Janeiro, Brazil

Introduction: The worldwilde population is becomening more older and consequently the number of people with dementia (PWD) are increasing significantly. In most cases the caregiver of PWD is a family person or someone close, beeing this persons responsable for many tasks that they don't have knlowloge. Caregiver burden is the perception of negative impacts of caregiving in all aspects of life. A significant number of caregivers present insomnia e other significant number present some impact in sleep quality.

Caregivers of PWP also presents pshychiatric symptomns such as depression, anxiety and high stress levels. Sleep quality is suposed to impact and be impacted by this symptoms affecting the social, emotional and physical health of the caregiver. Impacts in sleep are also related with higher rates of cardiovascular diseases in this population, beeing also a predictor to cognitive impairments across the years.

Materials and methods: The present research was conducted folowwing the Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA). Were collected data from articles published in the last 5 years using PUBMED, WEB OF SCIENCE and MEDLINE. To garantee the confiability of the results was used the Mixed Methods Appraisal Tool (MMAT, version 2018).

Results: Results show that caregiver sleep is directly impacted by the caring, beeing more severe impacted when the patient with dementia has some nightime behavior disturbance. All studies that included the Pittsburgh Sleep Quality Index (PSQI) showed that sleep quality is impaired in caregivers. Sleep disturbances are strictly correlated with depression and anxiety symptomns, beeing cause and consequence of impacts on mental health. Caregivers with sleep disturbance present higher rates of stress, correlating sleep quality with de degree of burden.

Conclusions: Caregivers of PWD present significants impacts in sleep quality and can present sleep disorders. Impacts on sleep health impacts caregiver burden, stress and psychiatric symptoms, affecting the quality of caring given. It's extremely important to better understand the mechanism of impact, the correlation between all factors involved in caregiver burden and how the sleep of this population can be improved, understanding that it reflects in the quality of caring the PWD will receive.

The relationship between sleep and patient-reported outcomes in children with rheumatic diseases

B. Shen[1], H. Cui[1], J. Xv[1], H. Chen[2], P. Fan[3]
[1]Shanghai Children's Medical Center, Shanghai, China, [2]Nantong Second People's Hospital, Jiangsu, China, [3]Shanghai Jiaotong University, Shanghai, China

Introduction: Children with rheumatic diseases typically experience symptoms such as pain, fatigue, and limited physical activity. These issues can potentially have a significant impact on their sleep quality and overall quality of life. This study aims to focus on patient-reported outcomes (PROs), listen to the real experiences of children with rheumatic diseases, analyze their current status and related factors, and provide a basis for developing targeted management models and intervention measures for multiple symptoms and physical functions.

Materials and Methods: A general demographic questionnaire, Children's Sleep Habits Questionnaire (CSHQ), and Pediatric Patient-Reported Outcomes Measurement Information System (PROMIS Pediatric-25 Profile V2.0) were employed to collect patient-reported outcomes (PROs) of children aged 8-17 with rheumatic diseases at Shanghai Children's Medical Center from June 2022 to May 2023. Statistical methods including t-tests, analysis of variance (ANOVA), and linear regression were used to analyze the factors related to these outcomes.

Results: A total of 100 cases were included in the sample, with 45 males and 55 females. The scores for the six dimensions of the PROMIS Pediatric-25 Profile, including depression, fatigue, pain, anxiety, peer relationships, and physical functioning-mobility, were 46.32 ± 9.23, 45.94 ± 8.99, 42.90 ± 7.44, 46.07 ± 8.49, 40.95 ± 12.29, and 25.21 ± 4.57, respectively. The results of the univariate analysis showed that gender, family structure, caregiver's education level, caregiver's education level, and the use of hormonal medications did not have statistically significant differences ($P > 0.05$). However, family income showed significant differences in the dimensions of depression ($F = 3.44$, $P < 0.05$) and pain ($F = 3.58$, $P < 0.05$). Additionally, the first-time use of hormones showed a significant difference in the dimension of physical functioning-mobility ($t = 2.00$, $P < 0.05$). The linear regression analysis revealed that the sleep habits score did not have statistical significance in models for other dimensions ($P > 0.05$), but it had statistical significance in the model for physical functioning-mobility ($\beta = 12.28$, 95% CI: 0.039-0.451, $P < 0.05$).

Conclusions: The family environment, initial use of hormonal medications, and sleep conditions may have an impact on the self-reported symptom outcomes of children with rheumatic diseases. In clinical practice, it is important to pay attention to the real experiences of these children and provide them with sufficient support and care. Close attention should also be given to their sleep conditions. These findings provide a basis for developing targeted nursing interventions for adverse symptoms in children with rheumatic diseases.

Acknowledgments: The authors would like to acknowledge all the children and their caregivers who are involved in this study.

The role of intermittent hypoxia on metabolic, inflammation and coagulation markers in men with OSA

G. Vaitukaitiene[1], T. Balsevicius[2], S. Miliauskas[1]

[1]Lithuanian University of Health Sciences, Department of Pulmonology, Kaunas, Lithuania, [2]Lithuanian University of Health Sciences, Department of Otorhinolaryngology, Kaunas, Lithuania

Introduction: In the era of Covid-19 coagulation and obstructive sleep apnea (OSA) relation became relevant again. OSA is closely related to obesity and metabolic changes causing inflammation. Although there are several convincing theories for how the pathophysiological consequences of OSA might result in increased coagulation (…), there is only limited quality evidence on a direct causative relationship between OSA and a procoagulant state [1]. Intermittent hypoxia is one of the primary proposed mechanisms of hemostatic alterations in OSA [1]. Oxygen desaturation index (ODI) is considered to be a marker of intermittent hypoxia. The aim of the study was to evaluate the role of intermittent hypoxia on metabolic and coagulation markers in men with OSA.

Materials and Methods: This is unpublished data and new analysis of the protocol P1-48/2004, version 4, 2010. Newly diagnosed subjects with OSA having normal lung function and normal daytime oxygen saturation, nonsmokers and having no other comorbidities being treated with medication, were included. Arterial hypertension has been diagnosed in some of the subjects, but not under the treatment. Snorers, with the same inclusion criteria and apnea hypopnea index (AHI) < 5 events/hour of sleep served as a control group. Anthropometric parameters were measured and blood samples for high sensitivity C reactive protein (hc-CRP), lipid profile, fasting glucose and coagulation markers were taken in the morning after the diagnostic polysomnography. All the subjects were divided into groups according to ODI (3 % desaturation): ODI 0-<5, 5-<15 and ≥15 events/hour of sleep, as it was classified in the Circulatory Risk in Communities Study [2]. The *Kruskal–Wallis* test and *Jonckheere–Terpstra* test were used. The level of statistical significance was set at a p-value <0,05.

Results: The sample included 73 men, mean age 43.9 ± 10.3 years, body mass index (BMI) 31.68 ± 6.28 kg/m² and Epworth sleepiness scale 10.5 ± 5.6. Apnea hypopnea index correlated with ODI (r=0.88, p<0.01). Hs-CRP, high density lipids, triglycerides, glucose and fibrinogen concentrations were increased gradually with the augmentation of ODI. The gradual increase was also demonstrated in BMI, waist and neck circumferences, *Mallampati* index. There was no difference in D-dimmer, prothrombin time and activated partial thromboplastin time in the three groups.

Conclusions: Metabolic markers (high density lipids, triglycerides, glucose), inflammation marker hs-CRP and fibrinogen were increased gradually with the augmentation of ODI, but anthropometric parameters showed the same tendency. Fibrinogen acting as an acute phase protein could show the role of inflammation in OSA, but not refer directly to increased coagulation.

References:

1. Bikov A, Meszaros M, Schwarz E I. Coagulation and fibrinolysis in obstructive sleep apnoea. *International Journal of Molecular Sciences* 22.6 (2021): 2834.
2. Muraki I, Tanigawa T, Yamagishi K, Sakurai S, Ohira T, Imano H, Kitamura A, Kiyama M, Sato S, Shimamoto T, Konishi M, Iso H; CIRCS Investigators. Nocturnal intermittent hypoxia and C reactive protein among middle-aged community residents: a cross-sectional survey. Thorax. 2010;65(6):523-7.

The role of religiosity/spirituality in the association of anxiety symptoms with sleep quality during the COVID-19 pandemic

T. Mayara dos Santos[1], L. Menezes-Junior[1], J. Carraro[1], G. Machado-Coelho[1], A. Meireles[1]
[1]Federal University of Ouro Preto, Ouro Preto, Brazil

Introduction: Religiosity/spirituality are part of people's social repertory and can help in dealing with adverse conditions. In healthcare, to promote religious-spiritual care may be important for dealing with illness and developing care protocols responsive, especially at times when religiosity can contribute to reflections about isolation, social distance, sleep quality and mental health. Therefore, the objective was to evaluate the role of religiosity/spirituality in the association of anxiety with sleep quality during the covid-19 pandemic.

Methods: Cross-sectional analysis included 1762 adults from a multistage sampling survey in two cities in Brazil. Religiosity was evaluated by self-report on some creed or religion (yes or no). Anxiety symptoms defined by General Anxiety Disorder-7 (GAD7 $\geq$ 10 points). Poor sleep quality defined by Pittsburgh Sleep Quality Index (PSQI > 5). Poisson's regression, adjusted for sex, age, education, and income, was performed to verify the association of anxiety and religious with sleep. Furthermore, additive interaction analysis was performed to verify the interaction between religiosity and anxiety on sleep.

Results: Among the individuals evaluated, 51.9% were female, 87.4% had some religion, 23.4% had symptoms of anxiety, and 52.5% had poor sleep quality. In multivariate analysis, non-religiosity and having anxiety were associated with sleep quality [Non-religiosity=PR:1.39(95%CI:1.06-1.84); [Anxiety=PR:1.55(95%CI:1.20-2.00)]. In additive interaction analysis, compared to individuals with religiosity and no anxiety, greater prevalence-ratio for poor sleep quality was from individuals with non-religiosity and anxiety (PR:2.09;95%CI:1.63-2.68), followed by individuals with religiosity and anxiety (PR:1.55;95%CI:1.20-2.00), and individuals with non-religiosity and no anxiety (PR:1.39;95%CI:1.05-1.84).

Conclusion: Our results show that religiosity is an important factor associated with sleep quality, and non-religiosity exacerbates the association of anxiety symptoms with poor sleep quality during the covid-19 pandemic. Therefore, knowledge of the interfaces of religiosity with sleep quality and mental health in the context of the pandemic may provide evidence for thinking about religious-spiritual care.

The role of sleep and screen consumption and childhood obesity

R. Lopes[1], J. Origuela[1], L. Meinberg[1], M.E. Oliveira[1], R. Vecci[1], R. Armando[1], N. Mota[1]
[1]UFLA - Universidade Federal de Lavras, Lavras, Brazil

Introduction: Childhood obesity looms as a mammoth public health predicament, with multiple factors catalyzing its emergence. One facet of intrigue is the impact of sleep on screen consumption and its ramifications for childhood obesity. Sleep quality and duration are known to influence diverse health outcomes, including obesity, and screen time has emerged as a potential risk factor for excessive weight gain in children. This literature review aims to disentangle the relationship between sleep, screen consumption, and childhood obesity by collating pertinent studies in the field.

Materials and Methods: We scoured electronic databases like PubMed, Google Scholar, and Scopus to unearth studies on the influence of sleep on screen consumption and childhood obesity. We deployed keywords like "sleep," "screen time," "childhood obesity," "weight status," and "dietary factors." We included studies published in the last five years, conducted on children or adolescents, examined the link between sleep, screen consumption, and childhood obesity, and furnished quantitative data on the outcomes of interest.

Results: A slew of studies have delved into the nexus between sleep, screen consumption, and childhood obesity. Bejarano et al. unearthed that the interactive effects of physical activity, screen time, and sleep were more potent than the individual effects of these behaviors on pediatric obesity. Morrissey et al. accentuated the impact of screen device usage and sugar-sweetened beverage consumption on children's weight status through the sleep-obesity nexus. Hale et al. underscored the exigency for interventions that counteract the effects of screen media consumption on sleep, which, in turn, engenders weight gain in childhood. Pastor-Fajardo et al. revealed that high screen time, short sleep duration, and low physical activity were linked to elevated BMI in children. Pietra and Petrov et al. bolstered the association between screen viewing, sleep, and obesity in children. Furthermore, Delahunt et al. surfaced that inadequate sleep and poor eating habits were linked to a higher risk of childhood overweight and obesity. Glover et al. identified screen time and insufficient sleep as risk factors for childhood obesity, along with poor nutrition and lack of exercise. Goncalves et al. emphasized the role of excessive screen time in reducing physical activity, increasing unhealthy food consumption, and decreasing sleep duration, all of which contribute to childhood overweight and obesity. Eftychia et al. stressed the importance of sleep promotion in childhood obesity interventions.

Conclusions: The literature review paints a robust association between sleep, screen consumption, and childhood obesity. Inadequate sleep, excessive screen time, and unhealthy eating habits have emerged as risk factors for childhood overweight and obesity. Future research should zero in on interventions that target these factors to prevent and manage childhood obesity effectively. Sleep promotion should be a pivotal component of childhood obesity interventions, and researchers should explicitly address sleep in their approaches to intervention programs. By addressing the impact of sleep on screen consumption and childhood obesity, healthcare professionals and policymakers can fashion targeted strategies to foster healthy sleep habits and reduce excessive screen time in children, ultimately contributing to the prevention and management of childhood obesity.

The use of alarm clock and snoozing behavior – a population study among Norwegian adults

S. Waage[1], I. Saxvig[2], B. Bjorvatn[3]
[1]University of Bergen, Department of Psychosocial Science, Bergen, Norway, [2]Haukeland University Hospital, Norwegian Competence Center for Sleep Disorders, Bergen, Norway, [3]University of Bergen, Department of Global Public Health and Primary Care, Bergen, Norway

Introduction: Waking up to an alarm can feel unpleasant because of sleep inertia - the feeling of grogginess experienced when waking. Some people claim that snoozing the alarm clock makes the wake-up process easier. Use of alarm clock and snoozing behavior is to a little extent studied in terms of different characteristics such as sex, age, circadian preference, and sleep problems.

Materials and Methods: A representative sample of 1028 Norwegians (50.4% men), mean age 48.6 years (range 18-89), completed a web-based survey during spring 2022. Response rate was 33.5%. The survey included questions on use of alarm clock and snoozing behavior, circadian preference, and chronic insomnia (Bergen Insomnia Scale, BIS).

Results: Of the total sample, 66.9% (n=688) used an alarm clock on weekdays. There were differences in alarm clock use in relation to age (87.4% in adults 18-35 years vs. 15.5% in adults 66+ years, $p<.001$) and circadian preference (76.5% of evening types vs. 60.3% of morning types, $p<.001$). There were no differences in alarm clock use in relation to sex ($p=.535$) or chronic sleep problems ($p=.979$). Of those using alarm clock on weekdays, snoozing was reported by 54.6% (n=376). Amongst those who snoozed; 39.9% reported snoozing once, 25.0% snoozing twice, and 35.1% snoozing three times or more on weekdays. Snoozing was more prevalent among women (58.8%) compared to men (49.4%, $p=.014$), and among the two younger age groups compared to the oldest (64.6% (adults 18-35 years), 66.0% (adults 36-50 years) vs. 13.3% (adults 66+ years), $p<001$). More evening types compared to morning types were snoozing (69.9% vs. 35.1%, $p<.001$), and more people with insomnia were snoozing compared to individuals without insomnia (61.2% compared to 51.8%, $p=.033$).

Conclusions: The use of alarm clock and snoozing behavior were related to sex, age, circadian preference, and insomnia.

The utilization of circadian rhythm features to improve sound-based AI sleep staging

S. Park[1], E. Cho[1], H. Park[1], J. Jung[1], D. Lee[1], D. Kim[1], J.-W. Kim[2], K.-Y. Jung[3]
[1]ASLEEP CO., LTD, Seoul, Korea, Republic of, [2]Seoul National University College of Medicine, SNUBH, Seongnam-si, Korea, Republic of, [3]Seoul National University College of Medicine, Seoul, Korea, Republic of

Introduction: Due to the increased interest in sleep and its significance to public health, studies have been conducted to develop simple and easy ways to assess sleep quality using smartphones. One such approach involves utilizing sleep sounds to predict sleep stages. Although sleep sounds provide valuable information concerning respiratory patterns and muscle movements, circadian rhythms can supply additional insights into temporal dynamics and regulatory mechanisms of sleep. Hence, this study aims to enhance sound-based AI sleep diagnosis algorithms by incorporating circadian rhythm features.

Materials and Methods: We developed a deep neural network model that inputs sleep sounds and circadian rhythm components. This AI model classifies sleep into four stages: Wake, REM, Light, and Deep. Three circadian rhythm features as inputs for the model were derived from the two-process model of sleep regulation: (i) melatonin cycle, (ii) sleep pressure, and (iii) time in sleep. The melatonin cycle was modeled using the cosine function, mimicking the natural melatonin cycle, where it captures the increase at the beginning of sleep, the peak in the middle of the night, and the subsequent decrease to low levels by early morning. The sleep pressure, which is known to exponentially decrease since the onset of sleep, was modeled using an exponential decay function. The time in sleep, which is represented by the elapsed time since the onset of sleep to inform the model of the relative position during whole night, is characterized by a linear function. A pre-trained model called MobileViTv2 was first developed and fine-tuned with a cross-entropy loss function. A labeled hospital dataset (PSG and audio, N=2,574) was used to train and validate the model, and the trained model was evaluated on the labeled data recorded on a smartphone at home (PSG and audio, N=128).

Results: The final model achieved an accuracy of 70.44% and a Macro-F1 score of 0.6686 for sleep staging in a home environment. In the absence of circadian rhythm features, the model only reached an accuracy of 67.00% and a macro-F1 score of 0.6395. There was a performance improvement of 3.44%p and 2.91%p in accuracy and macro-F1 score, respectively. These results emphasize the substantial contribution of circadian rhythm features in improving sleep stage prediction, even with simple modeling. Furthermore, ablation studies were conducted to examine the individual impact of each circadian rhythm feature. Among the three features, sleep pressure demonstrated the highest accuracy, reaching 69.02%. When only two out of the three features were used with different combinations, the sleep pressure-melatonin cycle pair yielded the highest accuracy of 69.43%. Overall, the model with all three circadian rhythm features exhibited the best results in sleep stage analysis.

Conclusions: To enhance the stage predicting sleep sound-based AI model, the basic concepts of the circadian rhythm were employed. This easy-to-use and accurate sleep staging model will be the first step to help improve sleep-related issues, leading to better overall health outcomes.

Time to wake up! Adolescents get short sleep on both schooldays and weekends/holidays when awoken by an alarm or family member

R.S. Charoenthammanon[1], J.J. Gooley[1,2]
[1]Duke-NUS Medical School, Neuroscience and Behavioural Disorders, Singapore, Singapore,
[2]National University of Singapore, Institute for Applied Learning Sciences and Educational Technology, Singapore, Singapore

Introduction: Many adolescents get insufficient sleep on schooldays because they need to wake up early. It is often assumed that students can sleep in longer on non-schooldays (weekends and holiday periods) to recover their sleep debt. However, few studies have explored whether adolescents are given the freedom to extend their nocturnal sleep. Here, we investigated how often adolescents are awoken by an alarm or family member on schooldays and non-schooldays, and we tested the associated effects on nocturnal sleep.

Materials and methods: Adolescents aged 13-18 years (n=133) wore an actigraphy watch (Actigraph wGT3X-BT) and completed daily diaries for 7 days during their school and holiday periods. Each morning, students indicated their reason for having woken. Actigraphy-derived sleep parameters included sleep onset, sleep offset, and the nocturnal sleep period. Simple effect sizes (e.g., mean difference in sleep period) were calculated for schooldays versus non-schooldays, and for days waking up to an alarm or family member versus other reasons.

Results: Adolescents' nocturnal sleep was about 1.7 hours shorter on schooldays (mean=6.23h, 95% CI=6.05h-6.42h) compared with non-schooldays (mean=7.90h, 95% CI=7.70h to 8.09h) because they woke up much earlier. Students were awoken by an alarm or family member on 84% of schooldays, and this was associated with shorter nocturnal sleep compared with waking up for other reasons (mean difference in sleep period=-0.87h, 95% CI=-1.24h to -0.50h). By comparison, adolescents were awoken by an alarm or family member on 44% of non-schooldays. In such instances, students obtained shorter sleep by more than 1 hour (mean difference in sleep period=-1.32h, 95% CI=-1.52 h to -1.12h) and slept less than the recommended amount for their age group (mean sleep period=7.15h, 95% CI=6.99h to 7.30h).

Conclusions: Adolescents' nocturnal sleep was frequently interrupted by an alarm or family member on both schooldays and non-schooldays. Chronic sleep restriction extends beyond schooldays if adolescents are not allowed to wake up naturally on their 'free days'. This may have deleterious effects on students' performance and wellbeing.

To see the effect of obstructive sleep apnea in Indian women with polycystic ovary syndrome

S. Prakash[1], V. Hadda[1], R. Guleria[1]
[1]All India Institute of Medical Sciences, Ansari Nagar, Department of Pulmonary, Critical Care and Sleep Medicine, New Delhi, India

Background and objectives: Central and abdominal obesity, body composition and systemic inflammation have been documented in obstructive sleep apnea (OSA). In this study, we aimed to investigate the association between metabolic, body composition, anthropometric, inflammatory markers, and cardiovascular risk factors in women with polycystic ovary syndrome (PCOS) who also had obstructive sleep apnea (OSA), compared to PCOS women without OSA.
Methods: A total of 180 obese female participants were recruited for the study, out of which 75 had OSA and 105 did not have OSA. We recorded demographic and clinical details, as well as anthropometric measurements of the participants. We also measured various biological markers including fasting insulin, homeostatic model assessment of insulin resistance (HOMA-IR), high-sensitive C-reactive protein (Hs-CRP), leptin, estradiol, follicle-stimulating hormone (FSH), luteinizing hormone (LH), ghrelin, prolactin, testosterone, resistin, visfatin, interleukin-6 (IL-6), and tumor necrosis factor α (TNF-α) levels in PCOS subjects with OSA.
Results: The results of the study showed that obese subjects with OSA had significantly higher values of abdominal obesity, percentage of body fat, metabolic markers, and insulin resistance compared to PCOS women without OSA. The levels of Hs-CRP, leptin, estradiol, FSH, LH, ghrelin, prolactin, testosterone, resistin, visfatin, IL-6, and TNF-α were significantly associated with OSA in PCOS subjects. These markers may potentially serve as biomarkers for OSA in women with PCOS.
Conclusions: Overall, the study provides evidence for the association between OSA, metabolic abnormalities, body composition, and inflammatory markers in PCOS women. These findings highlight the potential impact of OSA on the health of women with PCOS and suggest the importance of considering OSA screening and management in this population.

Translation and validation of the Sleep Problem Acceptance Questionnaire (SPAQ) with a Brazilian sample

M. Machay Indio do Brasil do Carmo[1], L. Paulos-Guarnieri[1], M.L. Nogueira Pires[2], R. El Rafihi-Ferreira[3,1]

[1]Universidade de São Paulo, Instituto de Psiquiatria do Hospital das Clínicas da Faculdade de Medicina, São Paulo, Brazil, [2]Private Practice in Sleep Psychology, São Paulo, Brazil, [3]Universidade de São Paulo, Instituto de Psicologia, São Paulo, Brazil

Introduction: Acceptance is essential as a therapeutic process for dealing with sleep problems. The Sleep Problem Acceptance Questionnaire (SPAQ) is an 8-itens psychometric instrument that measures the acceptance of sleep difficulties. The SPAQ contains the subscales "Activity Engagement" and "Willingness," with four items composing each factor; respondents rate them on a 7-point scale, where 0 means "Disagree," and six indicates "Completely agree." This study developed a Brazilian-Portuguese of the Sleep Problem Acceptance Questionnaire, examined its factor structure, reliability, and construct validity.

Materials and Methods: Data were collected from 1352 participants with and without insomnia symptoms, who completed questionnaires related to sleep behaviors, cognitions about sleep, and psychological distress. The SPAQ was translated into Portuguese by three independent translators. The translations were synthesized into a single version by a committee composed of insomnia experts. A pilot study with 15 participants demonstrated that the target population understood the content of the scale. Using a Confirmatory Factor Analysis, we fitted the original two-factor structure to our data.

Results: The 2-factor model showed a good fit [(19) = 170.4, RMSEA = 0.077 [0.066, 0.088]; CFI = 0.999; TLI = 0.998] and factor loadings ranging from .75 to .96. Internal consistency was excellent for Activities Engagement (= .94) and Willingness (= .90) factors. Both factors were negatively correlated to insomnia severity, anxiety, depression, and psychological inflexibility with moderate to strong strength. Moreover, we found that the SAPQ factor structure, factor loadings, and intercepts were invariant across 14 days and across groups of good and bad sleepers.

Conclusions: These findings suggest that the SPAQ is a valid tool for assessing the acceptance of sleep with a Brazilian-Portuguese speaking population.

Unpacking the enigma of long sleep and cardiovascular disease in South African adults

P. Forshaw[1], A. Correia[1], A. Luke[2], B. Layden[3,4], S. Reutrakul[3], S. Crowley[5], E. Lambert[1], L. Dugas[2,6], L. Roden[7], D. Rae[1]
[1]Health through Physical Activity, Lifestyle and Sport Research Centre and Division of Physiological Sciences, University of Cape Town, Department of Human Biology, Faculty of Health Sciences, Cape Town, South Africa, [2]Public Health Sciences, Parkinson School of Health Sciences and Public Health, Loyola University Chicago, Maywood Illinois, United States, [3]Division of Endocrinology, Diabetes and Metabolism, University of Illinois Chicago, Illinois, United States, [4]Jesse Brown Veterans Affairs Medical Center, Illinois, United States, [5]Rush University Medical Center, Department of Psychiatry & Behavioral Sciences, Biological Rhythms Research Laboratory, Illinois, United States, [6]Division of Epidemiology and Biostatistics, School of Public Health, Faculty of Health Sciences, University of Cape Town, Cape Town, South Africa, [7]Centre for Health and Life Sciences, Coventry University, Coventry, United Kingdom

Introduction: Low-income South African adults of African-origin report long sleep durations (8-10h per night). Both long sleep durations and low socio-economic status (SES) settings are associated with worse cardiovascular disease (CVD) risk. Since low SES individuals of African descent are disproportionately affected by non-communicable diseases, specifically CVD and present with striking gender differences between CVD risk factors, a better understanding of the relationship between long sleep and CVD risk in this population is required.

Methods: As part of the Modelling the Epidemiological Transition Study (METS)-Microbiome, habitual sleep was measured with actigraphy and sleep diaries for at least seven days. Participants (n=201: 107 women, 94 men, 23% employed, 39±7.9 years old) with at least 5 valid nights of actigraphy were used. Participants completed questionnaires detailing their demographics and lifestyle behaviours. CVD risk was determined using the BMI-modified Framingham 10-year CVD risk score. Actigraphy-derived sleep variables included sleep onset and offset, duration (onset to offset time), total sleep time, sleep efficiency, wake after sleep onset (WASO) and sleep fragmentation index (SFI).

Results: In the men, mean($\pm$SD) sleep duration and sleep time were 9.5h±1.6h and 7.7h±1.5h, respectively; median(IQR) sleep onset was 22:30(21:23-23:10), sleep offset was 08:01(07:18-08:37), sleep efficiency was 80%(74-85%), WASO was 104min(77-136min) and SFI was 33.8(27.4-40.5). In the women, mean sleep duration and time were 8.7h±1.3h and 7.2h±1.3h, respectively; median sleep onset was 22:34(21:56-23:10), offset was 07:44(07:04-08:46), sleep efficiency was 82%(77-85%), WASO was 84min(68-105min) and SFI was 28.6(24.0-34.8). After adjusting for sleep apnoea, linear regression models indicated that CVD risk was higher among men with higher SFIs (β:0.22, 95% confidence interval (CI): 0.02-0.42,p=0.030) and more WASO (β:0.001, 95%CI: 0.00-0.01,p=0.010). Among the women, those with earlier sleep offset times had higher CVD risk (β:-1.02, 95%CI: -1.8- -0.19,p=0.015). No relationships were found between longer sleep duration (>9h) and CVD risk in either the men or women. Longer sleep duration (>9h) did, however, moderate the relationship between SFI and CVD risk such that men sleeping longer than 9h with greater sleep fragmentation had higher CVD risk (β: 0.02, 95%CI: 0.00-0.03,p=0.014) compared to those sleeping <9h. Longer sleep duration also moderated the relationship between sleep offset and CVD risk such that women who slept longer than 9h and had earlier sleep offsets had higher CVD risk (β:-1.06, 95%CI: -1.89- -0.22,p=0.014).

Conclusions: Data from this study show objectively-measured long, but poor quality and disturbed sleep among low-income South Africans of African-origin. Among the men, one pathway by which longer sleep duration increases CVD risk might be through fragmented sleep. Among the women, the increased CVD risk among longer sleepers with earlier wake-up times suggests a role for circadian misalignment in the development of CVD. Collectively, these results reinforce current thinking in the field which suggests that rather than focussing on isolated sleep variables, interactions between variables or composite sleep variables should be considered when examining relationships between sleep and health outcomes.

Validation of a fully automated scoring of polysomnograms: a new machine learning approach performs equally well as human operators

S. Lomba[1], L. Köhler[2], E. Mignot[3], O. Sum-Ping[3]
[1]Stanford University, Division of Sleep Medicine, Department of Psychiatry and Behavioral Health, Redwood City, United States, [2]Somnomedics, Bavaria, Germany, [3]Stanford University, Redwood City, United States

Introduction: The standard process for interpretation of polysomnography is a laborious task requiring time-consuming visual inspection. The emergence of machine learning algorithms to automate the scoring of polysomnography represents an opportunity to significantly improve the efficiency and reliability of scoring. One particular challenge facing such algorithms is the ability to perform well across the breadth of pathology seen in sleep clinics. This work is an interim analysis of a study to validate a machine learning algorithm developed between Stanford and SOMNOmedics for staging polysomnography in a pathologically diverse holdout set.

Materials and Methods: A machine learning algorithm was developed between Stanford and SOMNOmedics. Data utilized included 1240 overnight recordings from 5 different clinics (randomly selected blocks of 80 epochs were used; 27,532 for training and 3,197 for validation) and incorporated into SOMNOmedics ' Domino software. One hundred studies out of a holdout set have thus far been analyzed including 80 selected at random and 20 selected for specific features consisting of pediatrics and the presence of type 1 narcolepsy, REM behavior disorder, central sleep apnea, and obesity hypoventilation syndrome. Each of the holdout studies have been scored independently by three experienced registered polysomnographic technologists and the majority vote was used as the gold standard.

Results: The SOMNOmedics autoscoring system demonstrated similar staging performance to each individual technologist with accuracy of 80.9% (compared to values of 80.6%, 82.5%, and 82.6% for the technologists), Cohen's Kappa of 0.736 (compared to values of 0.733, 0.753, and 0.747 for the technologists), and F1 score of 0.816 (compared to values of 0.816, 0.822, and 0.822 for the technologists).

Conclusions: In this interim analysis, the machine learning model demonstrated similar staging performance compared to individual sleep technologists in a validation set including a diversity of sleep pathology. These results suggest that the system can perform sufficiently well in a real-world sleep clinic population and might pave the way for a broader use of such algorithms in the future.

Validity, reliability, and responsiveness of the Brazilian version of the instrument World Health Organization Disability Assessment Schedule (WHODAS 2.0) for individuals with obstructive sleep apnoea

C.C.C.d. Souza[1], A.C.S.d. Oliveira[1], A.B.V. Junior[1], L.C. Zacarias[1], J.P.d.S. Bezerra[1], M.A.S. Neto[1], C.F. Leite[1]
[1]Federal University of Ceara, Fortaleza, Brazil

Introduction: Obstructive sleep apnea (OSA) is the most common sleep-disordered breathing, characterized by recurrent episodes of total or partial upper airway (UA) obstruction during sleep, usually associated with awakenings and a drop in oxyhemoglobin saturation, with losses not restricted to the period of sleep, with significant repercussions during wakefulness. The International Classification of Functioning, Disability, and Health (ICF), based on a biopsychosocial model, proposes to identify whether a person is capable of carrying out their activities of daily living, considering not only the disease, but also the functions of the organs or systems and structures of the body, as well as activities and social participation in the environment in which the individual lives. Following the theoretical conceptual framework of the ICF, the WHO developed the World Health Organization Disability Assessment Schedule (WHODAS 2.0), a generic instrument created specifically to measure functioning and disability. The 36-item version addresses functioning according to the domains of cognition, mobility, self-care, getting along, life activities and participation. WHODAS 2.0 has been translated into several different languages and, in 2015, this instrument was translated into Brazilian Portuguese. For the sample of subjects with OSA, the WHODAS 2.0 version translated into Brazilian Portuguese has not yet been validated. Purpose: This study aims to evaluate the psychometric properties of the Brazilian version of the WHODAS 2.0 in individuals with OSA.
Methods: One hundred individuals with OSA responded to the WHODAS 2.0 version of 36 items, the Epworth Sleepiness Scale (ESS), the Pittsburgh Sleep Quality Index (PSQI), and the 12-item health survey (SF-12). The psychometric properties tested were internal consistency (through Cronbach's alpha), convergent validity (through Spearman's correlation coefficient, considering ESS, PSQI and SF-12 as auxiliar instruments), discriminative validity of OSA severity (mild, moderate and sevre, according apnea and hypopnea index) using the Kruskal-Wallis test and responsiveness to CPAP therapy, using the Wilcoxon test.
Results: The internal consistency value was considered satisfactory ($\alpha = 0.76$) considering the total score of the WHODAS 2.0 domains, except for the self-care domain, which showed unsatisfactory consistency ($\alpha = 0.52$). Convergent validity indicated an excellent correlation ($r = -0.80$) between the domains of functioning and quality of life. Discriminative validity showed no association between OSA severity and functioning ($p = 0.90$), and responsiveness to CPAP treatment showed a large effect size ($r = 0.82$; $p < 0.05$).
Conclusion: The WHODAS 2.0 instrument is valid, reliable, and responsive for assessing individuals with OSA.
Keywords: Obstructive sleep apnoea; International Classification of Functioning, Disability, and Health; Validation study; Disability; Psychometry.

Who is at risk for dropout from a virtual-agent based digital therapy for insomnia?

M.M. Sanchez-Ortuno[1,2], F. Pecune[1,3], J. Coelho[1,3,4], J.A. Micoulaud-Franchi[1,3,4], N. Salles[3,5,1], M. Auriacombe[1,3,6], F. Serre[1,3,6], Y. Levavasseur[1,3], E. de Sevin[1,3], P. Sagaspe[1,3,4], P. Philip[1,3,4]
[1]University of Bordeaux, SANPSY, UMR 6033, Bordeaux, France, [2]University of Murcia, School of Nursing, Murcia, Spain, [3]CNRS, SANPSY, UMR 6033, Bordeaux, France, [4]University Hospital, Sleep Medicine Service, Bordeaux, France, [5]University Hospital, Department of Clinical Gerontology, Bordeaux, France, [6]University Hospital and Charles Perrens Hospital, Addiction Treatment Services, Bordeaux, France

Introduction: The high dropout rates associated with digital cognitive-behavioural treatments (CBT) remains the biggest challenge to their successful implementation in real-world settings. Identifying predictors of dropout is important to design strategies to maximize the reach of effective treatments. The purpose of this study was to pinpoint the factors influencing early dropout in a sample of self-selected users of a virtual-agent based behavioural therapy for insomnia.
Materials and methods: Case series study of individuals using a fully-automated behavioural treatment for insomnia, conducted by a virtual agent, freely available in France, during January 2021 to December 2022. From 10889 individuals who downloaded and completed the phase 1 interview, 4949 dropped out and did not return using the app for continuing filling in sleep diaries for a second day, 46%. Of those, 4295 had either subclinical of clinical insomnia symptoms and, hence, could have benefited from the intervention. The primary outcome for this study was a binary variable: dropout after treatment initiation (early dropout) or having completed all the treatment phases. Multivariable logistic regression analysis was used to identify, among a set of sociodemographic, clinical, sleep diary variables and user's perceptions of the treatment program (Acceptability of the treatment and Trust in the virtual agent), factors associated with increased or decreased chances of early dropout.
Results: Data from 4846 users with clinical or subclinical insomnia symptoms (4295 dropped out and 551 completed all treatment phases) were included in the present analyses. The mean age was 47.95 years (SD: 15.21) and 65.1% were women. Younger age, lower education level, poorer nocturnal sleep (lower sleep efficiency and more nocturnal awakenings, as derived from one night of sleep diary), as well as more severe depression symptoms were statistically significant predictor variables of dropping out in both groups of users, those having clinical and those having subclinical insomnia symptoms. Including in the multivariable model measures of app's perceptions and users' experience with new technologies revealed that positive perceptions about the credibility of the virtual agent decreased the odds of dropout (Adjusted OR=0.91, 95% CI: 0.85- to 0.97, P=0.004)
Conclusions: As in traditional face-to-face CBT for insomnia, perceptions of treatment credibility, as well as the presence of more severe depression symptoms, play an important role in treatment dropout. Including personalized feedback on depression for insomnia sufferers showing severe depression symptoms, and adding features to enhance the virtual agent's credibility represent targets to increase the reach of fully-automated behavioural insomnia therapy.

Hypersomnia

Cardiovascular burden of patients diagnosed with idiopathic hypersomnia: Real-World Idiopathic Hypersomnia Total Health Model (CV-RHYTHM)

R. Saad[1], P. Lillaney[1], D. Profant[1], D.S. Fuller[2], T. Alvord[3], P. Prince[3], M. Whalen[2], W. Macfadden[2], W. Ni[4], J. Black[4,5]
[1]Former employee of Jazz Pharmaceuticals, Palo Alto, United States, [2]Jazz Pharmaceuticals, Philadelphia, United States, [3]Aetion, New York, United States, [4]Jazz Pharmaceuticals, Palo Alto, United States, [5]Stanford University Center for Sleep Sciences and Medicine, Palo Alto, United States

Introduction: Idiopathic hypersomnia is a rare neurologic sleep disorder characterized by excessive daytime sleepiness, sleep inertia, prolonged nighttime sleep, long and unrefreshing naps, and cognitive dysfunction. Before calcium, magnesium, potassium, sodium oxybates product (low-sodium oxybate) was approved by the US Food and Drug Administration in August 2021, no medications were indicated to treat idiopathic hypersomnia in the United States. Excessive daytime sleepiness previously has been implicated in increased cardiovascular risk. However, limited research has assessed the cardiovascular health of patients diagnosed with idiopathic hypersomnia. This study compared the cardiovascular burden of patients diagnosed with idiopathic hypersomnia with matched non–idiopathic hypersomnia controls.

Materials and Methods: Merative MarketScan administrative claims between December 31, 2013 and February 29, 2020 were analyzed. Eligible patients were aged ≥18 years upon cohort entry and had 365 days of continuous medical coverage (gaps of ≤30 days allowed) before and after cohort entry. Patients with idiopathic hypersomnia entered the cohort upon their earliest medical claim having an idiopathic hypersomnia diagnosis code in any position, and had no history of cataplexy; non–idiopathic hypersomnia controls were matched 5:1 to patients with idiopathic hypersomnia on age, sex, region, payer type, and cohort entry date. Unconditional logistic regression was used to compare prevalence estimates of cardiovascular conditions during the 2-year analysis period; covariates used in the model were the same as those used for matching. Differences were reported as odds ratios (ORs) with 95% CIs.

Results: Final cohorts included 11,428 patients with idiopathic hypersomnia and 57,138 non–idiopathic hypersomnia controls. Median age was 45 years; most participants were female (65.0%) and commercially insured (75.0%). Compared with non–idiopathic hypersomnia controls, patients with idiopathic hypersomnia experienced more than twice the odds of cardiovascular disease (OR, 2.26 [CI, 2.14-2.38]), major adverse cardiovascular events (OR, 2.08 [CI, 1.89-2.30]), stroke (OR, 2.07 [CI, 1.87-2.29]), and hypertension diagnosis or antihypertensives use (OR, 2.02 [CI, 1.93-2.12]). Furthermore, the odds of heart failure were 97% (OR, 1.97 [CI, 1.76-2.20]), atrial fibrillation 91% (OR, 1.91 [CI, 1.66-2.20]), myocardial infarction 74% (OR, 1.74 [CI, 1.42-2.12]), coronary revascularization 58% (OR, 1.58 [CI, 1.12-2.17]), and cardiac arrest 44% (OR, 1.44 [CI, 0.91-2.20]) greater for patients with idiopathic hypersomnia compared with non–idiopathic hypersomnia controls.

Conclusions: Patients diagnosed with idiopathic hypersomnia experienced a greater burden of a spectrum of cardiovascular illnesses, including chronic and acute cardiovascular events. These findings are consistent with observational studies in patients diagnosed with narcolepsy. Clinicians should carefully monitor the cardiovascular health of their patients with idiopathic hypersomnia and consider therapies that effectively treat idiopathic hypersomnia symptoms while avoiding further cardiovascular risk.

Characteristic of novel sleep EEG biomarkers with central disorders of hypersomnolence

T. Bi[1], F. Han[2], M. Younes[3]
[1]Peking University People's Hospital, Department of Respiratory Medicine and Intensive Care Unit, Beijing, China, [2]Peking University People's Hospital, Sleep Medicine Center, Beijing, China, [3]University of Manitoba, Sleep Disorders Centre, Winnipeg, Canada

Introduction: Diseases in Central disorders of hypersomnolence present with multiple sleep abnormalities and has not been explored in detail. In this study, we use novel biomarkers of sleep depth to study the continuous and dynamic Electroencephalography (EEG) characteristics in narcolepsy type 1 (NT1), type 2 (NT2) and idiopathic hypersomnia (IH).

Materials and Methods: Participants were 16- to 64- year old and drug free: 103 subjects with NT1, 28 with NT2, 19 with IH and 77 controls. We compared the following novel biomarkers from polysomnogram (PSG) recordings among each hypersomnolence disorder and controls: a continuous index of sleep depth (odds-ratio-product, ORP), agreement between right and left sleep depth (R/L coefficient), dynamics of sleep recovery following arousals (ORP-9) and continuous sleep microarchitecture based on the frequency in different sleep depth levels. The relationship between sleep depth and the level of cerebrospinal fluid (CSF) orexin was investigated by multiple linear regression.

Results: NT1 patients had significantly higher ORP values in all sleep stages, as well as ORP-9, and remarkable right shift sleep microarchitecture: less deep sleep, more wake-sleep transitional state and higher sleep propensity during wakefulness than other groups. NT2 also had higher ORP values, decreased deep sleep and increased transitional state compared with controls, but not as severe as in NT1. In IH group, only the higher ORP values in N3 stage and reduced deep sleep were abnormal. The analysis of ORP types suggests that both sleep fragmentation and non-restorative sleep are present in NT1 patients, however, NT2 and IH patients mainly presented with non-restorative sleep. CSF orexin level was strongly related to ORP values in the Central disorders of hypersomnolence groups.

Conclusions: NT1, NT2 and IH have special nocturnal sleep features compared to healthy people, but only NT1 demonstrate remarkably light sleep depth and abnormal sleep architecture. The level of CSF hcrt-1 was associated with a significant decrease in ORP in central hypersomnia group, supporting that the pathogenesis of disrupted nighttime sleep (DNS) in NT1 is related to the deficiency of hypocretin.

Characterization of EEG biomarker of narcolepsy type I and idiopathic hypersomnia in polysomnographic recordings

A. Le Coz[1], R. Vollhardt[2], S. Leu-Semenescu[2], P. Dodet[2], A. Gales[2], D. Oudiette[1], I. Arnulf[2], T. Andrillon[1]
[1]Paris Brain Institute, Paris, France, [2]Sleep Pathology Unit, Pitié Salpêtrière Hospital, Paris, France

Introduction: Hypersomnias are neurological disorders characterized by excessive daytime sleepiness (EDS), leading to a significant burden at the individual and societal levels. In narcolepsy type 1 (NT1) irresistible bouts of sleep occur several times a day, together with cataplexy, REM sleep behavior disorders, hypnagogic hallucinations, and sleep paralysis considered markers of REM sleep boundary dyscontrol. In idiopathic hypersomnia (IH), continuous low alertness is accompanied by long, unrefreshing naps, and normal or long nights.
We aimed to test the hypothesis of a disruption of the boundaries between wakefulness and sleep (i) wake-REM in NT1 and (ii) wake-NREM in IH with new electroencephalography (EEG) biomarkers.
Materials and methods: We analyzed the nocturnal polysomnography (PSG) recordings of 50 participants with NT1, 100 with HI, and 50 healthy participants (CTL). We extracted features characterizing sleep quantity and quality at different time scales : (1) features based on the hypnogram scored by sleep experts across the entire night (sleep stage durations, hypnodensity, probability distribution), (2) periodic and aperiodic spectral features computed on 30s-long epochs, (3) complexity features (Entropy, Kolmogorov Complexity) computed on 30s-long epochs, and (4) features related to sleep microstructure based on the automated detection of slow waves and sleep spindles.
Results: Preliminary results based on spectral features show that NT1 is characterized by a waking state that is more REM sleep-like and, reciprocally, REM sleep that is more wake-like than in controls. In wakefulness, patients with NT1 and IH have less alpha power and patients with NT1 have more theta power compared to CTL. In REM sleep, patients with NT1 have more alpha-theta power than CTL and IH. In NREM sleep, patients with IH have more sigma power than NT1 and CTL, whereas patients with NT1 show an increase in theta power compared to IH and CTL. Furthermore, the dynamics of sleep were also perturbed in NT1 patients but weren't in IH. Wakefulness was less stable (decrease wake-wake transition probabilities) in NT1 and IH compared to CTL. In NT1, this resulted in an increased probability of transition from wakefulness to NREM and REM sleep compared to CTL whereas IH showed only an increased probability of transition from wakefulness into NREM.
Conclusions: Using EEG features extracted from single-night recordings, we found that patients with NT1 displayed a mix of wakefulness and REM sleep. These results further suggest that the EDS felt by patients with NT1 is reflected in their brain activity, and could be explained by intrusions of REM activity during wake recordings. By exploring the neurophysiology of hypersomnia, we can explore the neurophysiological underpinnings leading to excessive daytime sleepiness.

Clinical comorbidities of patients with idiopathic hypersomnia and narcolepsy: a US claims-based analysis

R. Saad[1], P. Lillaney[1], D. Profant[1], D.S. Fuller[2], E. Poole[3], T. Alvord[4], P. Prince[4], S. Desai[4], M. Whalen[2], W. Macfadden[2], W. Ni[3], J. Black[3,5]
[1]Former employee of Jazz Pharmaceuticals, Palo Alto, United States, [2]Jazz Pharmaceuticals, Philadelphia, United States, [3]Jazz Pharmaceuticals, Palo Alto, United States, [4]Aetion, New York, United States, [5]Stanford University Center for Sleep Sciences and Medicine, Palo Alto, United States

Introduction: Two central disorders of hypersomnolence—idiopathic hypersomnia and narcolepsy—are rare, chronic neurologic sleep disorders primarily characterized by profound excessive daytime sleepiness. The characteristics of these disorders are similar but distinct; those of narcolepsy include fragmented nocturnal sleep and REM-associated symptoms (sleep paralysis and hypnagogic/hypnopompic hallucinations), whereas idiopathic hypersomnia is characterized by long nocturnal sleep, unrefreshing naps, and sleep inertia. This study describes the clinical profile of patients with idiopathic hypersomnia and narcolepsy.

Materials and Methods: Merative™ MarketScan® administrative claims were analyzed (study period, 12/31/2013–2/29/2020; index period, 12/31/2014–3/1/2019). Eligible patients were ≥18 years old with 365 days of continuous enrollment (≤30-day gaps allowed) before and after cohort entry. Patients were excluded from the idiopathic hypersomnia cohort if they had ever received a cataplexy diagnosis. Patients with idiopathic hypersomnia or narcolepsy entered their respective cohorts on receipt of their earliest medical claim with a diagnosis code for idiopathic hypersomnia or narcolepsy in any position. Comorbidity outcomes were assessed over a 2-year period (365 days before to 365 days after cohort entry) and are described (means and percentages) for both cohorts.

Results: In total, 11,426 patients with idiopathic hypersomnia and 31,214 with narcolepsy were included. Most patients were female (idiopathic hypersomnia, 65.0%; narcolepsy, 64.9%) and had commercial insurance (75.0%, 70.7%). Mean age was 44.3 years for patients with idiopathic hypersomnia and 43.0 years for patients with narcolepsy. Mean number of comorbid medical conditions was 15.4 and 14.6 for patients with idiopathic hypersomnia and patients with narcolepsy, respectively. The most common conditions, observed in over 50% of patients in either cohort, were nervous system diseases (idiopathic hypersomnia, 83.8%; narcolepsy, 100.0%), respiratory system diseases (83.6%, 79.1%), endocrine, nutritional, and metabolic diseases and immunity disorders (80.4%, 77.0%), musculoskeletal system and connective tissue diseases (78.4%, 77.2%), mental illness (69.0%, 70.1%), circulatory system diseases (67.2%, 65.4%), pain (66.4%, 66.0%), infectious diseases (64.2%, 62.8%), sleep apnea (62.8%, 52.1%), genitourinary system diseases (58.4%, 58.1%), skin and subcutaneous tissue diseases (52.0%, 50.6%), and digestive system diseases (51.6%, 50.2%). Hypertension diagnosis or antihypertensive use was reported in 45.7% of patients with idiopathic hypersomnia and 42.9% of patients with narcolepsy.

Conclusions: Patients with idiopathic hypersomnia and narcolepsy experience a broad range of comorbid medical conditions across different organ systems. Although their sleep pathologies are distinct, patients in both groups experience a similarly high burden of comorbid conditions, including hypertension. Given these similarities, physicians should consider comorbid conditions when utilizing therapies that can effectively treat idiopathic hypersomnia and narcolepsy while avoiding the onset or exacerbation of these conditions.

Clinical comorbidities of patients with idiopathic hypersomnia and narcolepsy: a US claims-based analysis

R. Saad[1], P. Lillaney[1], D. Profant[1], D.S. Fuller[2], E. Poole[3], T. Alvord[4], P. Prince[4], S. Desai[4], M. Whalen[2], W. Macfadden[2], W. Ni[3], J. Black[3,5]
[1]Former employee of Jazz Pharmaceuticals, Palo Alto, United States, [2]Jazz Pharmaceuticals, Philadelphia, United States, [3]Jazz Pharmaceuticals, Palo Alto, United States, [4]Aetion, New York, United States, [5]Stanford University Center for Sleep Sciences and Medicine, Palo Alto, United States

Introduction: Idiopathic hypersomnia and narcolepsy are rare, neurologic, sleep disorders primarily characterized by profound excessive daytime sleepiness. The characteristics of these disorders are similar but distinct, with patients with idiopathic hypersomnia more commonly experiencing sleep inertia, unrefreshing naps, and long sleep duration. Few studies report healthcare resource utilization (HCRU) in patients with idiopathic hypersomnia, but evidence suggests HCRU in patients with narcolepsy is higher than in those without narcolepsy. This study described clinical characteristics, HCRU, and medical costs for patients with idiopathic hypersomnia and narcolepsy.

Materials and Methods: Merative MarketScan claims were analyzed (study period, 12/31/2013-2/29/2020; index period, 12/31/2014-3/1/2019). Eligible patients were ≥18 years old with 365 days of continuous enrollment (≤30-day gaps allowed) before and after cohort entry. Patients were excluded from the idiopathic hypersomnia cohort if they had ever received a cataplexy diagnosis. Patients with idiopathic hypersomnia and narcolepsy entered their respective cohorts on receipt of their earliest medical claim with a diagnosis code for idiopathic hypersomnia or narcolepsy, in any position, respectively. Clinical characteristics, HCRU, and medical costs were identified and described for both cohorts. HCRU and medical costs were reported by care setting: inpatient (IP), outpatient (OP), emergency department (ED). Outcomes were assessed over a 2-year period (1 year before and after cohort entry) and presented as per patient per year (PPPY).

Results: In total, 11,426 patients with idiopathic hypersomnia and 31,214 patients with narcolepsy were included. Most common comorbid conditions reported for patients with idiopathic hypersomnia and narcolepsy, respectively, were mental illness (69.0%, 70.1%), pain (66.4%, 66.0%), infectious disease (64.2%, 62.8%), and sleep apnea (62.8%, 52.1%). About half of patients in both cohorts had ≥1 ED visit, and 60% in both cohorts had ≥1 OP visit with respective diagnoses in the primary position. In the idiopathic hypersomnia cohort, 2.8% and 1.2% of total median all-cause medical costs ($4856 PPPY) were from claims with idiopathic hypersomnia in any position and the primary position, respectively. In the narcolepsy cohort, 9.4% and 1.6% of total median all-cause medical costs ($4518 PPPY) were from claims with narcolepsy in any position and the primary position, respectively.

Conclusions: Patients with idiopathic hypersomnia and narcolepsy experience a range of comorbid conditions; mental illness and pain are most often reported. Patients with an idiopathic hypersomnia or narcolepsy diagnosis code in the primary position may have more severe disease or utilize services with higher costs, thereby appearing to incur higher medical costs. Results enhance knowledge of HCRU and medical costs in these patients. More research is needed to understand how novel therapies with demonstrated risk-benefit profiles for both conditions may reduce the clinical and economic burden in this population.

Higher healthcare resource utilization and costs among patients with idiopathic hypersomnia compared with matched controls

R. Saad[1], P. Lillaney[1], D. Profant[1], D.S. Fuller[2], E. Poole[3], T. Alvord[4], P. Prince[4], S. Desai[4], M. Whalen[2], W. Macfadden[2], W. Ni[3], J. Black[3,5]
[1]Former Employee of Jazz Pharmaceuticals, Palo Alto, United States, [2]Jazz Pharmaceuticals, Philadelphia, United States, [3]Jazz Pharmaceuticals, Palo Alto, United States, [4]Aetion, New York, United States, [5]Stanford University Center for Sleep Sciences and Medicine, Palo Alto, United States

Introduction: Idiopathic hypersomnia (IH) is a chronic neurologic sleep disorder primarily characterized by excessive daytime sleepiness, severe sleep inertia, and long, unrefreshing naps. Literature describing healthcare resource utilization (HCRU) and medical costs in patients with IH is limited. This study compared HCRU and medical costs for patients with IH and matched non-IH controls.

Materials and Methods: Merative MarketScan administrative claims were analyzed (study period, 12/31/2013-2/29/2020; index period, 12/31/2014-3/1/2019). Eligible patients were ≥18 years of age and had 365 days of continuous medical coverage (≤30-day gaps allowed) before and after the index date. Patients with IH entered the cohort on receipt of their earliest medical claim with a diagnosis for IH (ICD-9-CM, 327.11, 327.12; ICD-10-CM, G47.11, G47.12) in any position, and without cataplexy. Patients with IH were matched 1:5 with non-IH controls on age, sex, region, insurance type, and index date. For HCRU, binary and count outcomes were assessed with logistic regression and negative binomial models, respectively. For medical costs, a linear regression model with an identity link function was used to calculate regression coefficients. HCRU and medical costs were reported overall and by care setting: inpatient (IP), outpatient (OP), and emergency department (ED). Outcomes were assessed over a 2-year period (365 days before and after cohort entry) and are presented as per patient per year (PPPY).

Results: In total, 11,412 patients with IH and 57,058 matched non-IH controls were included in the analysis. During the 2-year period, patients with IH vs non-IH controls had a higher percentage (IP, 10.2% vs 8.5%; OP, 100% vs 96.1% [visit required for IH diagnosis]; ED, 46.6% vs 34.3%) and mean number (IP, 0.07 vs 0.05; OP, 28.21 vs 14.99; ED, 0.83 vs 0.52) of medical visits PPPY across care settings. Further, median total medical costs PPPY ($4854 vs $1348) and out-of-pocket medical costs PPPY ($822 vs $242) were higher for patients with IH than for non-IH controls.

Conclusions: This study found that, compared with matched non-IH controls, patients with IH have higher HCRU and medical costs. High HCRU and medical costs may place a significant economic burden on patients with IH. More research is needed to understand the direct costs of treating this underlying sleep disorder, compared with the numerous comorbidities that such patients experience.

Minimal clinically important difference for the Visual Analog Scale for Sleep Inertia using data from a phase 3 trial of low-sodium oxybate for idiopathic hypersomnia

R.K. Bogan[1], D.S. Fuller[2], M. Whalen[2], C. Casstevens[2], W. Macfadden[2], L. Schneider[3]
[1]University of South Carolina School of Medicine, Columbia, United States, [2]Jazz Pharmaceuticals, Philadelphia, United States, [3]Stanford University Center for Sleep Sciences and Medicine, Palo Alto, United States

Introduction: Idiopathic hypersomnia is a debilitating neurologic sleep disorder. Sleep inertia (difficulty awakening) is a common symptom that can significantly impair functioning and quality of life. The visual analog scale for sleep inertia (VAS-SI) is useful for monitoring the severity of sleep inertia; to date, however, the minimal clinically important difference (MCID) for VAS-SI has not been determined. Using the Patient Global Impression of Change (PGIc), an established subjective measure of overall change with treatment, as an anchor, this post hoc analysis proposes an MCID for VAS-SI.

Materials and methods: Eligible participants from a phase 3 trial (NCT03533114) of low-sodium oxybate (LXB) for idiopathic hypersomnia began LXB treatment with an open-label treatment titration and optimization period (10–14 weeks), followed by a 2-week stable-dose period (SDP). Participants were randomized to placebo or continued LXB treatment during a 2-week, double-blind, randomized withdrawal period (DBRWP). Using the VAS-SI, participants rated their difficulty awakening on a 100-mm line anchored at 0 (very easy) and 100 (very difficult). The PGIc asks participants to rate their change in condition on a 7-point Likert-type scale (1, very much improved; 7 very much worse). Participants completed the VAS-SI at baseline, end of SDP, and end of DBRWP, and the PGIc at end of SDP and DBRWP. To estimate the MCID, the relationship between change in VAS-SI and PGIc scores was assessed using the Kruskal-Wallis test and a linear mixed model (LMM) with repeated measures.

Results: Participants (N=99) had a mean (SD) age of 40.7 (13.5) years and were primarily female (74%) and White (85%). Mean (SD) VAS-SI scores were 56.0 (25.0) at baseline (n=99) and 28.0 (20.0) at end of SDP (n=91); at end of DBRWP, scores were 27.5 (19.9) in those randomized to continued LXB (n=49) and 55.3 (25.0) in those randomized to placebo (n=45). Median (quartile 1, quartile 3) change in VAS-SI for each PGIc level was 52.4 (31.6, 59.6) for very much worse; 18.8 (2.4, 34.3) for much worse; 2.5 (−3.2, 14.0) for minimally worse; 0.4 (−3.0, 6.7) for no change; −12.3 (−17.4, 2.2) for minimally improved; −15.6 (−35.7, −5.1) for much improved; and −28.7 (−51.6, −17.6) for very much improved (Kruskal-Wallis test statistic, 110.2; $P<0.001$). With an LMM, the mean (SE) difference in VAS-SI scores between consecutive PGIc levels was 10.9 (0.8).

Conclusions: Using an anchor-based approach, we propose an MCID of 10 to 12 mm for the VAS-SI. Having an MCID for the VAS-SI will help clinicians identify clinically meaningful change in the management of sleep inertia, a common and debilitating symptom of idiopathic hypersomnia.

Unrefreshing naps and sleep architecture during the MSLT in idiopathic hypersomnia

S. Mombelli[1,2], A.-S. Deshaies-Rugama[1,3], H. Blais[1], Z. Sekerovic[1], C. Thompson[1], A. Desautels[1,4], J. Montplaisir[1,2], M. Nigam[1,4], J. Carrier[1,3], N. Gosselin[1,3]
[1]Center for Advanced Research in Sleep Medicine, Research Center of the Centre Intégré Universitaire de Santé et de Services Sociaux du Nord de l'Île-de-Montréal, Montréal, Canada, [2]Université de Montréal, Department of Psychiatry and Addictology, Montréal, Canada, [3]Université de Montréal, Department of Psychology, Montréal, Canada, [4]Université de Montréal, Department of Neuroscience, Montréal, Canada

Introduction: Unrefreshing naps are supportive clinical features of idiopathic hypersomnia (IH). We have previously shown that self-reported unrefreshing naps are associated with more consolidated nocturnal sleep in IH patients compared to those reporting refreshing naps. These results suggest that unrefreshing naps are not due to poor sleep quality, but could rather be explained by a weak arousal drive. Here, our aim was to characterize the nap sleep architecture of IH patients reporting unrefreshing naps and to compare them to those with refreshing naps.

Materials and methods: We selected 116 IH patients (34.4 ± 10.3 years, 66.4% women) in a retrospective clinical database (2000 to 2019). They were diagnosed based on a full night of in-laboratory polysomnography, an adapted version of the Multiple Sleep Latency Test (MSLT) with four naps (09:00, 11:00, 13:00, and 15:00), questionnaires on sleepiness and mood and a clinical interview. The refreshing aspect of naps was determined by a sleep medicine physician following a semi-structured clinical interview and during which the comprehensive medical history included the question: "In general, do you feel that your daytime naps are refreshing or unrefreshing?". Patients were diagnosed with objective IH (with objective markers of long sleep duration or MSLT ≤ 8 min) or subjective IH (no objective marker of long sleep duration or sleepiness). If the patient falls asleep during the MSLT, the nap period lasts 15 min. For each nap, sleep architecture variables were extracted, including total sleep time, sleep onset latency, REM sleep latency, sleep efficiency, wake after sleep onset, number of awakenings, duration and percentage of each sleep stage, awakening index (number of wake epochs/hour), number of transitions from one stage to any other stage and a sleep stage transition index (number of sleep stage transitions/hour). Groups (unrefreshing vs refreshing naps) were compared on each MSLT nap sleep architecture variable using ANCOVAs corrected for age for continuous variables, and χ2 tests for categorical variables.

Results: 59% (N=68) of patients reported having unrefreshing naps during the clinical interview. The unrefreshing naps group was younger than the refreshing naps group (31.5 ± 8.8 years vs 38.5 ±10.9 years, p < 0.001). 112 participants felt asleep during the first MSLT nap, 114 during the second, 112 during the third, and 99 during the fourth. While there were no group differences for the first, second, and fourth naps, at the third nap, the unrefreshing naps group had less N3 stage (0.1 ± 0.3 min vs 0.1 ± 0.5 min, p = 0.039) and N3 stage percentage (0.3 ± 1.9% vs 0.8 ± 3.0%, p = 0.018) compared to those reporting refreshing naps. However, only nine patients had reached N3 sleep stage during a nap and therefore, the group difference in N3 duration and proportion was driven by these patients.

Conclusions: Based on MSLT characteristics, IH patients with and without unrefreshing naps do not differ in terms of nap sleep architecture. Future studies should involve longer naps to investigate a more ecological nap architecture in IH patients.

Insomnia

Aberrant effective connectivity in Default Mode Network and Salience Network may reflect the hyperarousal state in chronic insomnia disorder

T. Georgiev[1], R. Paunova[2,3], S. Kandilarova[2,3], T. Zdravkova[4], K. Avramov[1], A. Draganova[1], K. Terziyski[1,4]

[1]Medical University - Plovdiv, Pathophysiology, Plovdiv, Bulgaria, [2]Medical University - Plovdiv, Department of Psychiatry and Medical Psychology, Plovdiv, Bulgaria, [3]Research Institute at Medical University of Plovdiv, Plovdiv, Bulgaria, [4]Complex for translational neuroscience at MU - Plovdiv, Plovdiv, Bulgaria

Introduction: The hyperarousal state is an important concept in the proposed pathogenesis of chronic insomnia (CI), though standard diagnostic modalities, such as polysomnography and conventional neuroimaging methods, do not allow its detection. On the contrary, functional neuroimaging techniques offer promising tools for the observation of the hyperarousal state and its integration into the diagnostic process. In the current study, we explored the effective connectivity in patients with CI and healthy controls (HC) via resting-state functional magnetic resonance imaging, attempting to visualize the hyperarousal state.

Materials and Methods: We recruited 35 CI patients (ICSD-3 criteria) and 14 age-, gender-, and education-matched HC, who underwent unattended home-based polysomnography using NOX A1 PSG systems, to rule out a concomitant sleep disorder. All subjects were scanned on a 3T MRI system, obtaining structural and functional data. Analysis was performed using SPM 12 (Statistical Parametric Mapping). Dynamic causal modelling was applied to determine the direction and effect (suppressive or excitatory) of connections to and from various nodes within and between the Default Mode Network (DMN), Salience Network (SN) and Executive Control Network (CEN). One-sample t-test was used to define the connections significantly different from zero within each group, and two-sample t-test was performed to determine the connections significantly different between the groups. Non-parametric analysis was used with a threshold set at $p=0,05$

Results: On a group level, there was an apparent difference between the results from the one-sample t-test of the HC and the CI with several aberrant connections, present only in patients – inhibitory from dorsal medial prefrontal cortex (DMPFC) to posterior cingulate cortex (PCC), from medial prefrontal cortex (MPFC) to left anterior insula (AIL), and connections absent in CI – suppressive from dorsal anterior cingulate cortex (dACC) to PCC. Moreover, some connections had a positive mean value in the HC, and a negative in the CI, although the direct comparison was not significant – from MPFC to dACC and from MPFC to right anterior insula (AIR). The only statistically significant result from the two-sample t-test was the difference between the connection from the DMPFC to the entire MPFC, which was negative in the HC and non-different from zero in the CI group.

Conclusions: Our findings suggest that compared to HC, patients with CI present with an inability to suppress the DMN during resting state, which is in concordance with other research demonstrating the hyperarousal state in CI. Based on the reported data, a hypothesis might be drawn that the SN in CI fails to moderate the transition from resting state to active cognitive engagement. These results could provide objective measurements for the dysregulation and overactivation of neural circuits in the central nervous system of patients with CI.

Acceptance and Commitment Therapy versus Cognitive Behavioral Therapy for insomnia: a randomized controlled trial

R. El Rafihi-Ferreira[1], R. Hasan[2], A. Toscanini[2], I. Marques Porto Linares[1], D. Suzuki Borges[2], I. Brasil[2], M. Carmo[1], F. Lotufo Neto[1], C. Morin[3]
[1]University of São Paulo, São Paulo, Brazil, [2]Hospital das Clínicas HCFMUSP, Instituto de Psiquiatria (IPq), São Paulo, Brazil, [3]Laval University, Quebec, Canada

Introduction: There is a large body of evidence on the efficacy of cognitive behavioral therapy for insomnia (CBT-I). Although many patients have beneficial experiences with CBT-I, some do not respond to this modality of intervention and many who show improvement do not maintain their gains over the long-term. Furthermore, adherence to the sleep restriction technique is difficult for many individuals. Acceptance and Commitment Therapy (ACT) has a growing empirical base in the treatment of insomnia complaints among adults. Randomized comparisons of acceptance-based treatments with traditional CBT for insomnia disorder are lacking. This study evaluated the effectiveness of ACT-based protocol for insomnia in adults compared to CBT for insomnia.
Materials and Methods: Participants were 227 adults (173 women; M age=40.7 years, SD=10.05) with insomnia. They were randomized to 6 weekly, group sessions consisting of ACT-I (n=76), CBT-I (n=76), or Wait list (WL) (n=75). The therapies took place via the online zoom platform. Assessments at pre-treatment, post-treatment, and 6-month follow-up measured insomnia, sleep patterns, depression, anxiety, beliefs about sleep, acceptance of sleep, and psychological flexibility outcomes. Adherence and satisfaction with treatment were also investigated. All reported analyses were done on the intention-to-treat population.
Results: Both treatment modalities significantly reduced insomnia severity with large effect sizes (d=1.4 and 1.7) in the post-treatment phase. These results were maintained in the follow-up period with large effect sizes (d=1.5 and 1.7). Generalized mixed models was used to examine between-group differences on outcomes measures. CBT was superior to ACT in reducing ISI at post-treatment and follow-up, with a small effect size (d=0.2). ACT was superior to WL at post-treatment and follow-up with moderate effect size (d=0.6). The treatment response and remission ratio were higher with CBT at posttreatment (37%vs53% and 19%vs32%) and similar at 6-month follow-up (48%vs52% and 27%vs35%) for both therapies, as ACT made further gains in response and remission. ACT had a significantly higher proportion than WL in response and remission in both periods (post-treatment and follow-up). After treatment, CBT was superior to ACT on sleep onset latency, wake after sleep onset, and sleep efficiency, but these measures were similar between groups at 6-month follow-up. On the other hand, ACT was superior to WL in sleep efficiency and sleep satisfaction in both periods (post-treatment and follow-up). Both therapies produced improvements of daytime functioning at both post treatment and follow up, with few differential changes across groups.
Conclusions: Both CBT and ACT are effective, with superiority of CBT and a delayed improvement for ACT. ACT proved to be an effective therapy, especially in the long term, even in the absence of behavioral techniques of stimulus control and sleep restriction, being a viable option for those who have difficulties in adhering to behavioral techniques.

Aerobic exercise training and zolpidem have similar efficacy for reducing insomnia severity

G.S. Passos[1], S.D. Youngstedt[2], A.R.C. Rozales[1], D.E. de Assis[1], B.P. de Assis[1], S. Han[2], M.G. Santana[1]
[1]Universidade Federal de Jataí, Health Sciences Institute, Jataí, Brazil, [2]Arizona State University, Edson College of Nursing and Health Innovation, Phoenix, United States

Introduction: Some evidence suggests that exercise training elicits improvements in sleep in individuals with chronic insomnia. Exercise would be a healthy alternative to sleep pills. However, there have been no experimental comparisons of the effects of exercise training and daily sleeping pill use. This study examined whether 6-week moderate intensity aerobic exercise training is non-inferior to zolpidem on insomnia severity.

Materials and Methods: Fifteen patients with chronic insomnia completed the study (ZOLPIDEM, n=8; EXERCISE, n=7). The ZOLPIDEM treatment involved taking a 10 mg dose of zolpidem before bedtime, every night, for 6 weeks. The EXERCISE treatment involved 6-week of exercise 3 times a week, for 50 min, at 50% of heart rate reserve. Insomnia severity was evaluated by Insomnia Severity Index (ISI). The non-inferiority margin was defined a priori as 2.0 points on the ISI at week 6.

Results: No significant treatment by time interaction was observed. ANOVA time effects indicated that zolpidem and exercise treatments decreased the severity of insomnia (16.25 ± 3.41 to 8.88 ± 5.33 *vs* 16.86 ± 3.44 to 11.14 ± 4.60, $p < 0.05$, respectively).

Conclusions: Six weeks of moderate-intensity aerobic exercise training and zolpidem had similar efficacy for reducing insomnia severity of patients with chronic insomnia. Despite of nonsignificant difference between treatments on improvements, the noninferiority analysis showed inconclusive.

A multicenter, open-label study to evaluate the efficacy and safety of lemborexant alternative therapy in subjects with insomnia (Somnus study)

M. Ozone[1], S. Hirota[2], Y. Ariyoshi[3], K. Hayashida[4], A. Ikegami[5], M. Habukawa[1], H. Ohshima[1], D. Harada[6], H. Hiejima[1], N. Kotoril[7], K. Murotani[8], T. Taninaga[9], N. Uchimura[1]
[1]Kurume University School of Medicine, Fukuoka, Japan, [2]Hirota Clinic, Fukuoka, Japan, [3]Yu Ariyoshi Sleep Clinic, Fukuoka, Japan, [4]Sleep Support Clinic, Tokyo, Japan, [5]Kuwamizu Hospital, Kumamoto, Japan, [6]Sleep & Stress Clinic, Tokyo, Japan, [7]Kotorii Isahaya Hospital, Nagasaki, Japan, [8]Kurume University, Fukuoaka, Japan, [9]Eisai Co, Ltd, Tokyo, Japan

Introduction: Due to concerns regarding the risks of tolerance, dependence, falls and withdrawal syndrome with the use of benzodiazepine-receptor agonists (BZRA) for the treatment of insomnia, effective alternative therapies are needed to improve outcomes. Lemborexant (LEM), a competitive dual orexin-receptor antagonist approved in several countries, has shown superior therapeutic efficacy to zolpidem extended-release 6.25 mg in a phase 3 clinical trial; therefore, LEM may be a potential alternative candidate.

Materials and Methods: A prospective, nonrandomized, open-label, multicenter study in 90 patients with chronic insomnia who were dissatisfied with current treatment was designed to investigate whether direct transition to LEM improved patient satisfaction. Four cohorts were included in the study: (1) nonbenzodiazepine sedative-hypnotic (Z-drug) monotherapy, (2) orexin receptor antagonist (suvorexant [SUV]) monotherapy, (3) SUV plus BZRA combination therapy, and (4) melatonin receptor agonist plus BZRA combination therapy. The primary outcomes were continuation of treatment after 2 weeks (end of titration phase) and 14 weeks (titration phase and maintenance phase), as well as responses on the Patient Global Impression – Insomnia version (PGI-I) and Insomnia Severity Index (ISI) scales. This study was approved by the Certified Clinical Research Review Board, and informed consent was obtained.

Results: In all, 95.6% (n=86/90) of subjects were successfully transitioned to LEM after 2 weeks, and LEM continuation rates were 97.8% (n=88/90) and 82.2% (n=74/90) at the completion of the titration and maintenance phases, respectively. At 14 weeks, dose reduction and interruption of BZRA occurred in 12.5% (4/32 patients) of the combined cohort. In the entire cohort, PGI-I scores showed a greater percentage of positive responses than negative responses. ISI total scores also improved over time after the transition to treatment with LEM. The overall incidence of adverse events was 47.8% (43/90 patients), and none were serious.

Conclusions: These findings suggest that direct transition to LEM is a valid treatment option for insomnia in patients who are dissatisfied with their current treatment.

An AI-based approach for detecting COVID-19 long-haul patients through sleep polysomnography analysis: the pandore-IA project

H. Lerogeron[1], A. Aloulou[2], F. Crosbie[2], M. Benballa[1], P. Bouchequet[2], F. Sauvet[2], M. Berger[2], J. Taieb[2], A. Rouen[2], R. Picot-Clemente[1], D. Léger[2]
[1]Saagie, Rouen, France, [2]Université Paris Cité, VIFASOM (ERC 7330 Vigilance Fatigue Sommeil et Santé Publique), Paris, France

Introduction: Patients with long COVID-19 continue to show symptoms of the disease at least 4 weeks after infection. Acute daytime fatigue and sleep disturbances are the most common symptoms reported by these patients. The aim of this study was to explore the sleep of insomniac patients with long COVID-19, and to identify, using an artificial intelligence (AI) approach, the presence of specific electroencephalography (EEG) patterns, compared with insomniac patients without long COVID-19.

Materials and Methods: 31 patients with long COVID-19 and chronic insomnia took part in the study and underwent a polysomnography sleep analysis. 62 insomniac subjects without COVID-19 affection were used as controls, matched for sex, age, and body mass index. Insomnia was confirmed by a sleep specialist, in accordance with the ICSD-3 definition and DSM-5 classification. No other sleep disorders were detected, and none of the subjects were night-shift workers.

The main analysis compared EEG sleep signal between long COVID-19 patients and controls to understand how long COVID-19 impacts sleep using an AI-based approach. For each patient, 9 EEG channels were selected and data were cut into 30-second epochs sampled at 100Hz. The windows were shuffled and a classifier was trained to classify a random window as coming from a patient infected with long COVID-19 or not. We hypothesized that long COVID-19 markers are detectable by the sleep classification algorithm. Consequently, features were created based on contributions from the state of the art in sleep classification. Interpretable classifiers (RandomForest, CatBoost, Stochastic Gradient Descent) were then trained on the entire dataset, keeping one patient as a test. This operation was repeated for each patient. Modern deep learning approaches developed initially for sleep staging algorithms were also tested. Moreover, these analyses were compared across sleep stages to assess whether long COVID-19 had a greater impact on a particular sleep stage.

Results: Slow waves sleep (SWS) was the main sleep stage impacted by long COVID-19, with an average accuracy on all patients tested with RandomForest of 0.64, while lower score were obtained for other sleep stages (wake: 0.52; N1: 0.55; N2: 0.49 and REM: 0.58). The inter-individual variability between patients created a considerable gap between the results obtained on training set patients (mean accuracy of 0.91) and test patients (the aforementioned 0.64). For 11/25 (44%) patients infected with long COVID-19, the model predicted that over 70% of their signals showed long COVID-19 hallmarks. For the remaining 14/25 patients (66%), at least 80% of their signals were classified as unmarked by long COVID-19. For the controls, 37/50 (74%) subjects were correctly classified. The most important features were O1-M2 channel time domain statistics and patient age.

Conclusions: Using an AI-based approach, this study suggested that SWS was more impacted than other sleep stages by long COVID-19. Patient age and O1-M2 time domain channel were identified as the most important features for the classification task. Further analysis will be carried out to explore the clinical symptomatology of patients with long-haul COVID-19, correctly predicted by the model, compared to those who were not.

An online sleep intervention for adolescents who are gaming

V. Imani[1], A. Pakpour[2]
[1]Acibadem University Medical Faculty, Sleep Disorders Unit, Neurology Department, Istanbul, Turkey, [2]Qazvin University of Medical Sciences, Social Determinants of Health Research Center, Research Institute for Prevention of Non-Communicable Diseases, Qazvin, Iran, Islamic Republic of

Introduction: Internet Gaming Disorder (IGD) has been identified a prevalent condition among adolescents. Moreover, treatment evidence on IGD has been documented via in-person programs designed using the transtheoretical model (TTM) or cognitive behavioral therapy (CBT) frameworks. However, little is known whether such theory-based treatments can be implemented using a mobile app-based intervention. The present study aimed to examine in Iranian adolescents the app-based intervention adopting the TTM and CBT frameworks.

Materials and methods: Iranian adolescents were recruited using one-stage random sampling and then randomly assigned to an Active Control group (n=103) or an Intervention group (n=103). The Active Control group received the app-based intervention for insomnia; the Intervention group received the app-based intervention for IGD. Interventions for both groups lasted eight weeks, each week about 30 minutes. Participants' IGD severity was assessed using the Internet Gaming Disorder Scale–Short-Form (IGDS9-SF). Moreover, secondary outcomes included psychological distress, insomnia, decisional balance, and self-efficacy.

Results: The Intervention group had significantly better outcomes than the Active Control group, leading to decreased IGD severity, lower psychological distress, greater decisional balance, and increased self-efficacy at both one month and three months after the end of treatment. Although no significant differences were found between the two groups in their insomnia severity levels at both one month and three months after the end of treatment, sleep across both groups improved.

Conclusions: The present study demonstrated the treatment effects of TTM and CBT via virtual delivery (i.e., using an app-based intervention) on IGD symptom reductions and health improvements among Iranian adolescents.

A novel analytic framework to identify the neural signatures of sleep state misperception from polysomnographic recordings

R. Herzog[1], T. Andrillon[1], S. Drummond[2], D. Léger[3]
[1]Sorbonne Université, Institut du Cerveau - Paris Brain Institute - ICM, Inserm, CNRS, Paris, France, [2]Monash University, Turner Institute for Brain and Mental Health, Monash School of Psychological Sciences, Clayton, Australia, [3]Université Paris Cité et APHP Hôtel Dieu, Centre du Sommeil et de la Vigilance, Paris, France

Introduction: Sleep difficulties are an issue of utmost importance for public health given their far-reaching consequences and high-prevalence. However, the diagnosis and treatment of sleep disturbances can be complex, notably because of a lack of robust biomarkers for sleep quality. This difficulty is partly due to the frequent disconnection between what individuals report regarding their sleep quality and what classical sleep exams reveal. This discrepancy is also known as sleep state misperception (SSM) and is frequent in insomnia. Here, we propose
i) to improve the analysis of polysomnographic (PSG) recordings by applying recent advances in computational neuroscience and machine learning, and
ii) to characterize the neural signatures of SSM that differentiate it from insomnia without SSM and normal sleep.

Materials and methods: Hundreds of full-night PSG were obtained from the Hotel Dieu Hospital (Paris) and Monash University (Melbourne), including Good Sleepers (GS), insomnia without SSM (INS) and SSM. Traditional and non-traditional features of sleep were extracted. The first included macroscopic (e.g. power spectrum, ~30s epochs) and microscopic (e.g. spindles, slow waves, ~1 s epochs) features. The second included a set of more than 7000 features included in the highly comparative time series analysis (hctsa) toolbox obtained for 1s epochs. To avoid redundancy between these features and improve interpretability, a feature selection algorithm was used. Then, macroscopic, microscopic and selected non-traditional features were used separately to evaluate their potential to classify GS, SSM and INS using machine learning algorithms.

Results: Spectral features of the EEG and sleep microstructure distinguished well individuals with SSM from good sleepers, showing that SSM patients have deteriorated sleep despite a pseudo-normal hypnogram. In fact, SSM patients become undistinguishable from insomnia patients without SSM (INS) for a supervised classification algorithm trained to distinguish GS, SSM and INS individuals. This starkly contrasts with the results from a similar classification operated on the classical "visual" features (based on the hypnogram), which are typically used in sleep medicine to assess a PSG recording. Analyses of PSG data with hctsa were able to retrieve sleep structure in good sleepers in a data-driven way, and also to provide a better classification performance than classical features derived from the hypnogram.

Conclusions: This work shows that analyzing PSG recordings in finer detail is enough to find robust markers of insomnia, independently of the presence of SSM. Importantly, although using all computed features did not lead to above chance performance when classifying SSM vs INS, we identified a small set of PSG features that distinguish the SSM and INS group (e.g., more, faster sleep spindles). This new approach shows that using non-traditional features of brain activity provides a robust characterization of sleep and new neural signatures of SSM.

A polysomnographic study of weighted-blankets in patients with psychophysiological insomnia

G. Benbir Senel[1], D. Karadeniz[1]
[1]Istanbul University-Cerrahpasa, Cerrahpasa Faculty of Medicine, Department of Neurology, Sleep and Disorders Unit, İstanbul, Turkey

Introduction: Options in pharmacological therapies in chronic insomnia are scarce and bear risks for side-effects and addiction. Non-pharmacological integrative therapies are increasingly being demanded by the patients. We designed a prospective polysomnographic (PSG) study in patients with chronic insomnia to investigate the effects of weighted-blankets on sleep parameters and heart rate variability.

Materials and methods: Patients with primary psychophysiological insomnia used weighted-blankets (equal to about 10% of the patients' body weight) at home for 10 consecutive nights. All had clinical evaluation and full-night video-PSG before and after the use of weighted-blankets. Turkish Version of Basic Scale on Insomnia Complaints and Quality of Sleep (BaSIQS) and Pittsburgh sleep quality index (PSQI) were filled in.

Results: Of twenty-six patients (18 males, 69.2%; mean age 48.7 ± 9.4 years), 16 patients (69.2%) stated a benefit from weighted-blanket. Total scores of BaSIQS ($p=0.005$) and PSQI ($p=0.003$) decreased significantly. Sleep latency was shortened ($p=0.040$) and the percentage of N3 sleep was increased ($p=0.034$) at the second PSG in compared to the first PSG. It was observed that the obstructive apnea-hypopnea index was increased ($p=0.038$). In HRV analysis, mean average RR duration, mean LF band and LF/HF ratio showed a trend to decrease at second PSG, but the difference didn't reach to the statistically significant level.

Conclusions: Weighted-blankets are becoming a promising option for the occupational practical therapy for chronic insomnia. Our study demonstrates the efficacy of weighted-blankets in chronic psychophysiological insomnia, especially on shortening the sleep latency and quality. Heart rate variability was tested for the first time in the literature, but results are not conclusive and should be tested in larger population. Last, but not least, weighted-blankets should cautiously be used in patients with obstructive sleep apnea.

A scoping review of validation studies for commercially available CBTi smartphone applications

M. Mak[1], A. Rahmani[2], C. Carney[3]
[1]University of Toronto, Toronto, Canada, [2]University of British Columbia, Vancouver, Canada, [3]Toronto Metropolitan University, Toronto, Canada

Purpose: Cognitive Behavioural Therapy for Insomnia (CBT-I) is the first-line treatment for insomnia disorder. Efficacy is equivalent to sedative-hypnotics but therapy carries few adverse effects. There is a substantial demand for this therapy but little supply, especially in a public-funded format. Smartphone applications are a means to deliver CBT-I (dCBT-I) widely. We seek to identify digital CBT-I smartphone applications that are supported by validated studies.
Methods: A search with terms "sleep, insomnia and CBT-I" was done on the Google Play and Apple Store. We then searched for validation studies for those applications on Google Scholar. We included studies conducted in the past 10 years. Our second search consisted of reviewing PubMed and Google Scholar for validation studies for CBT-I applications. Our search terms consisted of "CBT-I and smartphone, CBT-I and application and CBT-I and digital".
Results: The majority of smartphone applications claiming to treat insomnia do not follow CBT-I principles, focusing mostly on meditation, relaxing sounds and relaxation techniques.
Out of the 12 dCBT-I applications which are commercially available on Google Play and Apple Store, 5 have validation studies published in peer reviewed journals: Sleepio, CBT-I coach, Sleeprate, Sleep Ninja, and Somryst.
Conclusions/implications: Most smartphone applications misrepresent claims of using CBT-I principles to guide treatment. Only 5 smartphone applications deliver dCBT-I with validation studies. There remains potential to study the effectiveness of dCBT-I with larger sample sizes in a controlled format.

Assessment of circadian rhythm markers and clock genes expression in patients with Chronic Insomnia

C. Carvalhas-Almeida[1,2,3], B. Santos[1,2,3], L. Gaspar[1,2,4], M. Ferreira[5], J. Serra[5], J. Moita[5], C. Cavadas[1,3], A. Alvaro[1,2,4]
[1]CNC - Center for Neuroscience and Cell Biology, University of Coimbra, Coimbra, Portugal, [2]CIBB - Centre for Innovation in Biomedicine and Biotechnology, University of Coimbra, Coimbra, Portugal, [3]Faculty of Pharmacy, University of Coimbra, Coimbra, Portugal, [4]IIIUC - Institute for Interdisciplinary Research, University of Coimbra, Coimbra, Portugal, [5]Sleep Medicine Centre, Coimbra Hospital and University Centre (CHUC), Coimbra, Portugal

Introduction: Chronic Insomnia (CI) is the most prevalent sleep disorder and the second most prevalent mental disorder worldwide, affecting about 10 to 15 % of the global population. However, the diagnosis and treatment of patients with CI is challenging due to several factors that depend on each patient's idiosyncrasy. The circadian clock system regulates daily rhythms of physiology and behavior. Recent studies suggest that CI might disrupt the biological clock, potentially causing alterations in clock gene expression. Although clock gene expression alterations have been associated with sleep disorders, the effect of CI on clock disruption has not been fully explored. The aim of the present study is to evaluate changes in clock gene expression and circadian markers in patients with CI.
Materials and Methods: In this study we evaluated body temperature as a circadian rhythm marker and the expression of nine clock genes (Per1-3; Cry1-2; Bmal1; Clock; Rev-erb), at four time points (8 am; 11 am; 3.30 pm and 9.30 pm), in peripheral blood mononuclear cells (PBMCs) of 15 patients with CI and 12 control subjects with healthy sleep, of similar age, body mass index (BMI) and sex. CI was diagnosed at the sleep unit of Coimbra Hospital and University Centre (CHUC) by polysomnography, actigraphy for 2 weeks, and a detailed clinical evaluation to avoid the overlap with other sleep disorders. Clock gene expression was assessed by qRT-PCR. This study was approved by the ethical committees of FMUC and CHUC, Coimbra, Portugal.
Results: The obtained results show significant differences in Bmal, Per1, Per2, and Rev-erb α expression in PBMCs of patients with CI, compared to control subjects ($p < 0.05$). We also observed a distinct oscillatory profile in body temperature in patients with CI throughout the day. CI patients showed particularly lower body temperatures at 8 and 11 am, relative to controls ($p < 0.01$). Furthermore, we observed significant linear associations between the expression of some clock genes (Per1, Per2, Clock) and sleep-related parameters (sleep efficiency percentage, Insomnia Severity Index, and Sleep Latency) in the study participants (spearman correlations, $p < 0.05$).
Conclusions: Our findings suggest that CI impacts the expression of several clock genes in PBMCs and affects body temperature throughout the day. In the future, we expect to explore the use of clock gene expression in PBMCs as a CI biomarker for complementary diagnosis of patients with CI, thus improving CI diagnosis and treatment.

Associated variables with success and adherence to behavioral treatments for insomnia

I. Linares[1], R. Ferreira[1]
[1]Universidade de São Paulo, São Paulo, Brazil

Introduction: Non-pharmacological therapies for insomnia, such as Cognitive-Behavioral Therapy (CBT-I) and Acceptance and Commitment Therapy (ACT-I) have proven effective results in the literature. However, there are patients who do not respond to behavioral treatment. In this way, the objective of the present study is to investigate the variables that are related to success and failure, as well as adherence and non-adherence to behavioral treatment for insomnia. It is also intended to compare whether there are differences in variables related to success and failure, adherence and non-adherence to treatment between the CBT-I and ACT-I groups.

Materials and Methods: Data and results from a randomized clinical trial comprising 227 adults aged 18 to 59 years with a diagnosis of chronic insomnia will be analyzed. The data for the present study were collected from a randomized controlled clinical trial (ClinicalTrials.gov Identifier: NCT04866914), evolving baseline and post-treatment time measurements that allow prediction analysis. Patients were randomly assigned to the ACT-I, CBT-I, and waiting list (WL) groups. The intervention for both groups (ACT-I and CBT-I) was carried out in six weekly group sessions. Sociodemographic measures, measures of depression and anxiety (HADS), psychological inflexibility (AAQ-II), dysfunctional beliefs about sleep (DBAS), acceptance of sleep problems (SPAQ) and personality traits (NEO-FFI -R) of the groups will be detected using the unpaired Student's t test (continuous variable) or chi-square test (categorical variable) or Mann-Whitney test (ordinal variable). Logistic regression model will be performed to estimate treatment improvement according to baseline variables. Results will be presented with odds ratio estimates. Subsequently, data will be analyzed to compare whether there are differences in the variables associated with success, failure, adherence and non-adherence between the therapeutic modalities.

Results: Understanding the variables that predict the effectiveness of a given therapy (ACT-I or CBT-I) for patients with chronic insomnia, can result in greater treatment efficacy (reduction of insomnia symptoms and improvement in sleep patterns, or i.e. sleep onset latency, sleep efficiency, total sleep time, time awake after waking). In addition, we seek to evaluate variables that increase or decrease adherence to the treatment in question (session frequency, drop out, adherence questionnaire, completion of the sleep diary, completion of tasks and guidance between sessions).

Conclusions: By understanding the variables associated with success and adherence, the present study will be able to contribute to the direction of the type of non-pharmacological therapy most indicated for each patient diagnosed with chronic insomnia (ACT-I or TCC-I), as well as to the decrease evasion, cost reduction and lower waiting time for access to treatment.

Association between insomnia and depression and risk of all-cause mortality: a population-based prospective cohort study

Y. Lee[1], S. Lee[2], S. Kim[3,4], C. Shin[2,3,5], S. Suh[1]
[1]Sungshin University, Department of Psychology, Seoul, Korea, Republic of, [2]Institute of Human Genomic Study, College of Medicine, Korea University, Ansan Hospital, Ansan, Gyeonggi, Korea, Republic of, [3]Korea University Ansan Hospital, Biomedical Research Center, Ansan, Gyeonggi, Korea, Republic of, [4]University of Pennsylvania, Division of Sleep Medicine, Department of Medicine, Philadelphia, PA, United States, [5]Korea University, College of Medicine, Seoul, Korea, Republic of

Introduction: The purpose of this study was to investigate the association of insomnia and depression, both independently and combined, on long-term mortality. This study was conducted based on 20 years follow-up data from a population-based cohort study in Korea, namely the Korean Genome and Epidemiology Study (KoGES).

Materials and methods: Participants (n=3,357; mean age 48.7 ± 7.6; females 45.2%) completed self-report questionnaires including demographic information (age, sex, marital status, education, monthly family income), lifestyle (smoking, alcohol use, exercise), medical history (cancer, cardiovascular disease, hyperlipidemia, diabetes), insomnia symptoms (difficulty initiating sleep, difficulty maintaining sleep, early morning awakening) and depressive symptoms using Beck Depression Inventory-I (BDI-I). All data was collected biannually from 2001 to 2020. Mortality data were collected from the Statistics Korea (KOSTAT) and combined with the original dataset. Participants who reported more than one of the three symptoms of insomnia at least three times a week, more than three months (or at both baseline and 1st follow-up) were classified into the Insomnia group. Participants with a score of 24 or more on the BDI-I were classified into the Depression group. Cox proportional hazards model using Python ("*Lifelines*" package) was conducted to predict mortality using the following four groups classified at baseline: no insomnia or depression (Healthy), Insomnia-only, Depression-only, and Both-Insomnia-and-Depression group.

Results: After controlling for covariates (demographic factors, lifestyle, medical history), the differences of hazard ratio (HR) for all-cause mortality were significant among groups. Specifically, the HR for all-cause mortality of the Insomnia-only group was 1.7 times higher than the Healthy group (HR, 1.74; 95% CI, 1.19-2.55; p=.005). The HR for the Both-Insomnia-and-Depression group for all-cause mortality was 3.8 times higher than the Healthy group (HR, 3.77; 95% CI, 1.60-8.88; p=.002). There was no difference in HR for the Depression-only group and Healthy group for all-cause mortality.

Conclusions: The Insomnia only group and the combined Insomnia and Depression group had a significantly elevated likelihood of mortality compared to the Healthy group in a 20-year follow-up study. Notably, insomnia, a risk factor for several mental and physical illnesses, was found to be associated with higher mortality in this study. This study provides additional evidence for the association between insomnia and all-cause mortality.

Association between insomnia symptoms and cancer among U.S. Hispanic adults: analysis of 2013-2018 National Health Interview Survey Data

J. Roncoroni[1], N. Alibrahim[2], S. Whitaker[1], L.J. Drucaroff[3]
[1]University of Denver, Counseling Psychology, Denver, United States, [2]University of Denver, Research Methods and Statistics, Denver, United States, [3]Universidad de Lanús, Instituto de Salud Colectiva, Remedios de Escalada, Argentina

Introduction: This study aimed to examine the association between sleep medication use and insomnia symptoms (i.e., difficulty falling asleep, difficulty staying asleep, not feeling rested upon awakening) with cancer among Hispanic adults in the United States.

Materials and Methods: Data were extracted from the National Health Interview Survey (NHIS) for the years 2013-2018. Data were collected in English and Spanish. Logistic regressions were conducted to determine the relationship between medication use and each insomnia symptom (categorized into not, mild, moderate, severe) with cancer, adjusting for sociodemographic variables, BMI, and health behaviors.

Results: The sample included 74,757 Hispanic participants. The results showed a significant association between difficulty falling asleep and cancer, with higher odds of cancer among participants with severe (OR=2.202, 95% CI: 1.692-2.866) and moderate (OR=1.323, 95% CI: .896-1.952) difficulty falling asleep. Similarly, we found significant associations between sleep maintenance difficulties (severe: OR=1.770, 95% CI: 1.383-2.266) and sleep medications (severe: OR=1.763, 95% CI: 1.279-2.430) with cancer. Not feeling rested was also associated with higher odds of cancer (severe: OR= 1.759, 95% CI: 1.375-2.250).

Conclusions: This study offers evidence of a significant association between insomnia symptoms, sleep medications, and cancer among Hispanic adults. These findings highlight the importance of addressing sleep problems as a potential risk factor for cancer among this population. Further research is needed to elucidate the underlying mechanisms and to develop targeted interventions to improve sleep quality and potentially reduce the risk of cancer in Hispanic adults.

Acknowledgements: None.

Association of insomnia symptoms with neurocognitive impairment in COVID-19 survivors

P. Li[1], D.J. Yu[1], S. Chen[1], S.W.-H. Chau[1], J.W.Y. Chan[1], Y.-K. Wing[1], R.N.-Y. Chan[1]
[1]The Chinese University of Hong Kong, Psychiatry, Hong Kong, Hong Kong, SAR of China

Introduction: Long COVID, as characterized by the continuation or development of new symptoms 3 months after the initial SARS-CoV-2 infection. Among the many long covid symptoms reported, cognitive difficulties are one of the most common long lasting problems. Moreover, insomnia is also commonly reported after recovery from COVID. Yet, few studies have specifically examined the association of insomnia with the persistent cognitive difficulties after COVID-19 recovery. Our study aimed to evaluate the relationship between insomnia and both subjective and objective neurocognitive impairment in adult COVID-19 survivors among Hong Kong Chinese

Materials and Methods: A cross-sectional study was conducted among 269 COVID-19 survivors (mean age: 51.2 ± 14.1y; 62.5% female) recruited from the community in Hong Kong. All the participants had experienced a COVID-19 infection more than three months prior to recruitment. Persistent concentration difficulty was assessed by a questionnaire survey regarding the presence of ongoing lingering symptoms lasting 3 months or longer. In addition, all subjects would also undergo the 3-minute psychomotor vigilance task (PVT) to evaluate their sustained attention and response speed. Insomnia was defined by Insomnia Severity Index (ISI) with a cut-off score of ≥ 10. Logistic regression models were used to examine the relationship between insomnia and self-reported concentration difficulties. We also performed linear regression and modified poisson regression models to evaluate the association between PVT metrics, including reciprocal reaction times, lapses (>0.355s) and false starts (<0.1s), and insomnia. All regression analyses were adjusted for potential confounders including demographics, elapsed time since COVID-19 infection, COVID-19 severity, vaccination doses, substance use history, comorbidity of hypertension/ heart disease/ diabetes, stress level, anxiety and depressive mood.

Results: One hundred (33.8%) COVID survivors reported insomnia symptoms. Participants with insomnia were more likely to have subjective concentration difficulty (adjusted Odds Ratio (aOR), 4.08; 95% CI, 1.16 to 15.44, p=0.03), higher PVT lapses rate (aIRR, 1.37; 95% CI, 1.02 to 1.84, p=0.03) and lower response speed than those without insomnia (Beta: -0.20; 95% CI, -0.36 to -0.02, p=0.03). There was no significant difference in PVT false start rates between those with and without insomnia (p=0.83).

Conclusions: Our study reveals a significant association between insomnia and both subjective and objectively measured concentration difficulties among COVID-19 survivors, independent of mood state and comorbidities. These findings highlight the importance need to assess and address sleep and insomnia problems in the management of post COVID condition. Further longitudinal research is warranted to further explore the temporal association of insomnia with cognitive difficulties and the underlying mechanisms linking sleep disturbances to neurocognitive functioning in COVID-19 survivors.

A systematic review about the associations between insomnia and psychological inflexibility and flexibility of Acceptance and Commitment Therapy

L. Paulos-Guarnieri[1], I. Linares[1], R. El Rafihi-Ferreira[2,1]
[1]Universidade de São Paulo, Instituto de Psiquiatria do Hospital das Clínicas da Faculdade de Medicina, São Paulo, Brazil, [2]Universidade de São Paulo, Instituto de Psicologia, São Paulo, Brazil

Introduction: Acceptance and Commitment Therapy (ACT) is a contextual behavioral therapy that aims to promote psychological flexibility and undermine the psychological inflexibility. Psychological flexibility is composed of the processes of acceptance, defusion, contact with present moment, self-as-context, values and committed action. Meanwhile, psychological inflexibility is composed of the processes of experiential avoidance, fusion, conceptualized past and feared future, attachment to conceptualized self, lack of values clarity and inaction, impulsivity or avoidance. ACT is effective for treating a range of disorders (e.g., anxiety, depression, chronic pain, obsessive compulsive disorder, substance abuse) including insomnia. Although the systematization of treatments using ACT for insomnia or sleep problems has already been done, the area still lacks a systematization of studies on the association between psychological flexibility or inflexibility and insomnia. This study aimed to identify the relationships between psychological inflexibility and flexibility with insomnia or sleep parameters, and also identify which ACT processes may be more related to insomnia.
Materials and methods: A systematic review were conducted following the PRISMA Statement. The selection process followed the steps of identification, scanning and eligibility. The searched databases were Scopus, PubMed and PsicINFO. Keywords involving psychological inflexibility and flexibility and insomnia were used. Studies that evaluated any association of psychological inflexibility or flexibility with insomnia and/or sleep parameters were included. The study evaluated the design and format of the studies, the instruments used to measure psychological flexibility/inflexibility and factors related to sleep and the occurrence and type of association found in the studies.
Results: At all, 86 studies were identified, 55 studies were scanned and 13 were included. All included studies demonstrated some type of relationship between psychological inflexibility or flexibility and insomnia or sleep parameters. In total, 10 studies were cross-sectional and 3 were longitudinal; 10 studies performed correlations, 6 studies performed predictions, 3 studies performed comparisons and 3 studies performed mediations analysis. A variety of subjetive instruments were used to measure both psychological flexibility and inflexibility and to measure insomnia or sleep parameters. The most ACT related instrument used was AAQ-II and AAQ, in 4 studies each. The most sleep related instrument used was ISI, in 6 studies. The most associated processes were value-based actions, in 13 associations, acceptance, in 12 associations and cognitive fusion in 7 associations.
Conclusions: The data found suggest that both psychological flexibility and inflexibility has a role in insomnia. While psychological inflexibility may be a predisposing and perpetuating factor for insomnia, being a risk factor, psychological flexibility can be considered a protective factor for insomnia. In addition, data suggest that acceptance, defusion, and values-based actions may be more closely related to sleep difficulties. Using objective instruments for sleep and multidimensional questionnaires for inflexibility and psychological flexibility, in addition to using other study designs and statistical analysis, can contribute to better understanding the role of processes in insomnia and allow more individualized treatment formulations and designs to be developed.

Autonomic cardiac modulation in patients with co-morbid insomnia and obstructive sleep apnea using heart rate variability analysis during wakefulness prior to sleep

H. Qin[1,2], J.W. Kantelhardt[3], F. Vaquerizo-Villar[4], N. Wessel[5], J.F. Kraemer[5], X. Zhang[6], T. Penzel[1]
[1]Charité-Universitätsmedizin Berlin, Interdisciplinary Center of Sleep Medicine, Berlin, Germany, [2]The First Affiliated Hospital of Guangzhou Medical University, State Key Laboratory of Respiratory Disease, Department of Otolaryngology, Head & Neck Surgery, Guangzhou, China, [3]Martin-Luther-Universität Halle-Wittenberg, Institute of Physics, Halle, Germany, [4]Universidad de Valladolid, Biomedical Engineering Group, Valladolid, Spain, [5]Humboldt-Universität zu Berlin, Department of Physics, Berlin, Germany, [6]The First Affiliated Hospital of Guangzhou Medical University, Department of Otolaryngology, Head & Neck Surgery, The Key Laboratory of Advanced Interdisciplinary Studies Center, Guangzhou, China

Introduction: Autonomic abnormalities are independently associated with an increased risk of mortality in insomnia and in obstructive sleep apnea (OSA). Co-morbid insomnia and obstructive sleep apnea (COMISA) is related to a higher risk of all-cause mortality compared to subjects without insomnia or OSA. However, little is known about potential additive effect of COMISA on autonomic modulation assessed by heart rate variability (HRV). This study aimed to evaluate COMISA-impacted HRV measurements and the relative contribution of sympathetic and parasympathetic modulation to autonomic impairment in COMISA during wakefulness.

Materials and Methods: 5225 participants from the Sleep Heart Health Study were included. The participants underwent unattended polysomnography and completed sleep questionnaires on insomnia and daytime impairment from which the diagnosis of COMISA was determined. The diagnosis of COMISA required the criteria for both insomnia (difficulties initiating sleep, maintaining sleep, and/or early morning awakenings on 16-30 times/month and daytime impairment) and sleep apnea (an apnea-hypopnea index [AHI]≥15 events/h) to be met. HRV measures were computed from a 5-min ECG segment extracted during wakefulness prior to sleep using time-domain and frequency-domain methods, detrended fluctuation analysis, entropy, symbolic dynamics, acceleration capacity (AC) and deceleration capacity (DC). Analysis of covariance controlling for relevant covariates (age, body-mass index, gender, race, smoking status, AHI and prevalent cardiovascular disease) was used to compare differences in HRV characteristics among control, insomnia, OSA, and COMISA groups.

Results: Of the 5225 participants, 2697 (51.6%) were controls without insomnia or OSA, 170 (3.3%) had insomnia alone, 2221 (42.5%) had OSA alone, and 137 (2.6%) had COMISA. Patients with COMISA are associated with reduced HRV, showing autonomic imbalance, decreased parasympathetic function and less complexity of cardiac rhythms in the wake condition. After adjusting for covariates, the COMISA group has a lower standard deviation of 1-min average of normal-to-normal interbeat intervals (SDANN1) compared to the controls ($P<0.001$) and OSA patients ($P<0.05$). COMISA patients exhibit greater autonomic imbalance with a higher ratio of low to high frequency (LF/HF) compared to controls ($P<0.001$) and OSA patients ($P<0.05$). There is a decreased root mean square of successive differences between normal interbeats (RMSSD) in both COMISA and OSA patients compared to controls ($P<0.05$). A reduction in Shannon entropy is also found in COMISA patients compared with controls ($P<0.05$).

Conclusions: COMISA is associated with dysregulation of the autonomic nervous system, demonstrating reduced cardiovascular variability, impaired parasympathetic control and discordant autonomic imbalance. This may explain the increased risk of cardiovascular diseases and mortality in COMISA. HRV during wakefulness can provide information on underlying pathogenic mechanisms of alterations in the autonomic cardiac modulation in COMISA.

Behavioral Rhythm and Sleep Therapy (BeRST) – A pilot of CBT-I with chronotherapy in older adults

A. Neikrug[1], I. Chen[1], A. Stehli[1], K. Vinces[1], R. Malhas[1], N. Meza[1], B. Mander[1], M. Mapstone[1], R. Benca[1]
[1]University of California Irvine, Irvine, United States

Introduction: Insomnia and circadian rhythm disturbances are common in older adults and associated with cognitive impairment and Alzheimer's disease (AD). However, these issues are rarely targeted together in treatment, and data on combined approaches are limited. We present preliminary findings from a 12-session cognitive behavioral therapy for insomnia (CBT-I) with or without chronotherapy (bright light therapy and daily behavioral activity scheduling) in older adults with insomnia. This pilot study explores the feasibility and acceptability of integrating interventions for insomnia and circadian rhythm disturbances, aiming to improve understanding and provide insights for future treatment strategies.

Materials and Methods: Twelve older adults (M_{age}=70.1±7.6, range: 62-82; 10 women) with insomnia disorder (Insomnia Severity Index, ISI≥8) were randomly assigned to either a Sleep Optimization Group (SOG; CBT-I with chronotherapy) or a Comparison Group (COG; CBT-I with non-therapeutic dim light). Assessment measures included sleep diary, actigraphy for sleep continuity and circadian activity rhythms, questionnaires, and blood draw for AD-risk biomarkers (β-amyloid [$A\beta_{40}$, $A\beta_{42}$], phosphorylated tau [$p\text{-}tau_{181}$], and neurofilament light chain [NfL]) at baseline, mid-treatment, post-treatment, and at 6-month follow-up. Focus groups were conducted at post-treatment. Cohen's d effect size was used to evaluate changes over time and group differences (Strong:>= 0.80, moderate:0.50-0.79, weak: 0.2-0.49).

Results: Both groups demonstrated improvements in ISI scores at post-treatment (SOG: d=-1.24, COG: d=-2.14), and these gains were maintained at the 6-month follow-up (SOG: d=-1.4, COG: d=-2.4). Participants in the SOG group reported increased sleep duration at the 6-month mark (444 vs. 411 minutes), as supported by actigraphy measures (422 vs. 375 minutes). Notably, both groups showed an increase in bright light exposure post-treatment, as confirmed through focus groups and actigraphic lux meter monitoring. Morning circadian activity rhythms were advanced by 1.1 hours at post-treatment compared to baseline. The preliminary findings consistently indicated increases in AD biomarkers over time, with lower increases observed in the SOG compared to COG: $A\beta_{40}$ (d=-0.3), $A\beta_{42}$ (d=-0.4), $p\text{-}tau_{181}$ (d=-0.23), and NfL (d=-0.45). Strong negative correlations were observed between sleep duration and NfL levels at the 6-month follow-up assessment (d=-0.844).

Conclusions: The preliminary results of this pilot demonstrated promising acceptability and feasibility of a combined treatment approach targeting insomnia and circadian rhythm disturbances in older adults. Both intervention groups showed significant improvements in insomnia symptoms at post-treatment, with sustained gains observed at the 6-month follow-up. Notably, participants in the SOG showed increased sleep duration subjectively and objectively, suggesting the potential benefits of integrating bright light therapy and behavioral activity scheduling. Morning circadian activity rhythms were advanced, and results indicated potential effects on AD biomarkers, with lower levels observed in the SOG. Moreover, a strong correlation between increased sleep duration and decreased levels of NfL, a biomarker associated with neurodegeneration, was observed at the 6-month follow-up. These preliminary findings provide valuable insights into the potential efficacy of the combined treatment approach and warrant further investigation in larger, controlled studies.

Better sleep in psychiatric care - ADHD: a randomized controlled study of cognitive behavioral treatment for insomnia adapted for patients with ADHD

S. Jernelöv[1], M. Cassel[1], K. Blom[1], V. Kaldo[2,1]
[1]Karolinska Institutet, Clinical Neuroscience, Stockholm, Sweden, [2]Linneaus University, Psychology, Växjö, Sweden

Introduction: Patients with ADHD often experience significant sleep problems. A common problem is sleep onset insomnia, often combined with delayed sleep phase disorder. We have previously demonstrated feasibility in a clinical setting, of an adapted version of cognitive behavioral therapy for insomnia (CBT-I) which is considered treatment of choice for insomnia. In the present study we aimed to evaluate effects of this CBT-I group intervention adapted for adult patients with insomnia and ADHD.

Materials and Methods: 58 patients at the Department of ADHD, Northern Stockholm Psychiatry (Stockholm, Sweden) with a diagnosis of ADHD, self-reported insomnia and Insomnia Severity Index (ISI) score above 10, were randomized to an adapted version of CBT-I (including sleep time scheduling or sleep compression, stimulus control, mindful relaxation and cognitive interventions, and specific attention to light exposure and sleep hygiene) as a ten-session group intervention, or wait-list. Additional co-morbidities and medication use were allowed. Primary outcome was insomnia severity (ISI) at pre- and post-treatment.

Results: Participants had had sleep problems for over 17 years when entering the study. Most patients reported a diagnosis of attention deficit or combined attention deficit and hyperactivity, and one or more comorbid psychiatric conditions. Preliminary analyses show statistically significant improvements in insomnia severity in the treatment group ($p<$ .0001; ISI pre=18, post=10), but not in the control group ($p=$ .1; ISI pre=17, post=16). At post, the difference between the groups was statistically significant with a large effect ($p=$ .0004; g=0.9).

Conclusions: CBT-i adapted for the patient group reduced insomnia severity in patients with ADHD with a long history of sleep problems and other comorbid conditions. Further analyses are needed to investigate effects on sleep and ADHD-symptoms, and whether treatment effects are sustained after treatment is finished. The current study is an important piece of the puzzle to create an evidence base for the use of non-pharmacological alternatives to treat sleep problems in ADHD, with the potential to greatly improve care and quality of life.

Birth control and sleep disturbances

E. Jube[1], A. Blaser[2], K. Pugmire[1], J. Bateman[3], A. Wright[3], J. Jones[2], D.B. Kay[3]
[1]Brigham Young University, Neuroscience, Provo, United States, [2]Brigham Young University, Provo, United States, [3]Brigham Young Univeristy, Provo, United States

Introduction: The use of birth control in women has been associated with sleep disturbances, which encompass difficulties in both initiating and maintaining sleep quality. Hormonal birth control can impact various systems regulated by the endocrine system, including sleep and mental health. This study aims to investigate the effects of birth control on sleep.

Materials: A total of 160 participants were recruited for two separate studies via word-of-mouth, poster advertisements, and social media posts. Both studies collected data on sleep using the Patient-Reported Outcomes Measurement Information System Sleep Disturbance (PROMIS-SD), the Insomnia Severity Index (ISI), and the Patient-Reported Outcomes Measurement Information System Sleep-Related Impairment (PROMIS-SRI). Use of birth control was determined through the Medical Health Questionnaire. Data was collected through online surveys using qualtrics and in-person intake assessments–which gathered marital status. STATA was used to run a regression analysis on the data.

Methods: From the original data, our analyses included 85 women ages 18-57, 23 of which were using birth control. Regression models were applied to the collected data to determine the effects of birth control usage on Sleep Disturbances (PROMIS-SD), Insomnia Severity (ISI), and Sleep-Related Impairments (PROMIS-SRI) controlling for Age and marital status. A regression analysis was conducted to explore the relationship between sleep and birth control.

Results: Following a regression analysis in STATA, our findings indicate no significant relationship between birth control usage and sleep outcomes. In the ISI regression, birth control yielded a p-value of 0.543, with marital status (p-value of 0.346) and age (p-value of 0.379) as covariates. In the PROMIS-SRI regression, birth control had a p-value of 0.564, while marital status and age served as covariates with p-values of 0.370 and 0.722, respectively. For the PROMIS-SD regression with marital status and age as covariates, we obtained the following p-values: birth control (0.965), marital status (0.743), and age (0.391).

Conclusions: Our study revealed no significant correlation between the use of birth control and sleep quality. However, this outcome does not exclude the possibility of such a connection. A limitation of our study is that it did not explore the impacts of each type of hormonal birth control. An additional limitation is the relatively small sample size, which likely influenced the absence of observed associations between birth control use and sleep. Past research suggests a potential relationship. Future studies could replicate this investigation with a larger sample size to ascertain the nature of this relationship, while also delving into the contrasting effects of hormonal and non-hormonal birth control methods.

Cannabinol (CBN; 30 and 300 mg) effects on sleep and next-day function in insomnia disorder ('CUPID' study): protocol for a randomised, double-blind, placebo-controlled, crossover, three-arm, pilot trial

I. Lavender[1,2,3], D. McCartney[1,2,3], N.S. Marshall[1,4], A. Suraev[1,2,5], C. Irwin[6], A.L. D'Rozario[1,3,4], C. Gordon[1,7], B. Saini[1], R.R. Grunstein[1,4,8], B.J. Yee[1,4,8], I. McGregor[2,3], C.M. Hoyos[1,4]
[1]Woolcock Institute of Medical Research, Centre for Sleep and Chronobiology, Sydney, Australia, [2]University of Sydney, Lambert Initiative for Cannabinoid Therapeutics, Brain and Mind Centre, Sydney, Australia, [3]University of Sydney, Faculty of Science, School of Psychology, Sydney, Australia, [4]Macquarie University, Faculty of Medicine, Health and Human Sciences, Sydney, Australia, [5]University of Sydney, Faculty of Medicine and Health, School of Medical Sciences, Sydney, Australia, [6]Griffith University, School of Health Sciences and Social Work, Menzies Health Institute Queensland, Sydney, Australia, [7]University of Sydney, Susan Wakil School of Nursing and Midwifery, Sydney, Australia, [8]Royal Prince Alfred Hospital, CPC-RPA Clinic, Sydney, Australia

Introduction: Insomnia is a pervasive and debilitating sleep disorder with few practical and effective pharmacotherapies. Growing evidence suggests a role of the endogenous cannabinoid system in regulating circadian sleep-wake cycles, highlighting a potential avenue for novel therapeutics. Cannabis sativa includes over 140 constituent chemical compounds, 'cannabinoids', which are increasingly used for sleep despite low-quality evidence supporting this use. Cannabinol (CBN), a novel cannabinoid formed through oxidation of delta-9-tetrahydrocannbinol (THC), has gained prominence as 'the sleepy cannabinoid', with manufacturers marketing CBN products as sleep-inducing. Despite anecdotal reports of efficacy, the isolated effects of CBN on sleep have never been systematically studied in humans. Historical studies suggest CBN is non-intoxicating, potentially rendering it a pragmatic and safer alternative to THC as a sleep aid, providing a rationale for clinical investigation. The primary study aim is to investigate the effects of CBN (30 and 300 mg) versus placebo on sleep in insomnia disorder.

Materials and methods: This randomised, double-blind, placebo-controlled, single-dose, three-arm, crossover, pilot study investigates the acute effects of CBN on sleep and next-day function in twenty individuals aged 25-65 years old with clinician-diagnosed insomnia disorder (as per the International Classification of Sleep Disorders-3 [ICSD-3] and Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [DSM-5]) and Insomnia Severity Index [ISI] Score ≥15. Participants undergo extensive screening, including overnight polysomnography (PSG) to rule out other sleep disorders that commonly co-occur with insomnia. Eligible participants receive a single fixed oral liquid dose of 30 mg CBN ('ECS310' 1.5%), 300 mg CBN ('ECS310' 15%), and matched placebo, in random order on three treatment nights each separated by a two-week washout period. During treatment nights, participants undergo overnight sleep assessment using in-laboratory PSG and next-day neurobehavioral function tests. The primary outcome of the study is wake after sleep onset (WASO) minutes measured using PSG, compared to placebo. Secondary outcomes include changes to traditional sleep staging, sleep onset latency, and absolute spectral power during non-rapid eye movement (NREM) sleep. Tertiary outcomes include changes to sleep spindles during NREM sleep, arousal indices, absolute spectral power during rapid eye movement (REM) sleep, and subjective sleep quality. Safety-related and exploratory outcomes include changes to next-day driving performance, alertness and reaction time, overnight memory consolidation, subjective drug effects, mood, postural balance, subjective and objective sleepiness, and plasma, urinary, and salivary cannabinoid concentrations.

Conclusions: This is the first clinical study to investigate the effects of CBN isolate on sleep and employs gold-standard objective measures, validated subjective measures, and rigorous design methodology. The study will provide novel preliminary data on CBN safety and efficacy in insomnia disorder, which may inform larger clinical trials. ClinicalTrials.gov Identifier: NCT05344170. Recruitment commenced August 2022 and will likely conclude in August 2023. The first participant was randomised on the 13th of October 2022.

Clinically guided digital Cognitive Behavioural Therapy for insomnia (CBTi) in patients with COMISA: a case-control pilot study with focus on mental health and cardiometabolic risk factors

M. Meira e Cruz[1,2,3], A.R. Brito[2], I. Rocha[4], C. Salles[3], M. Kryger[5], D. Gozal[6], A. Sweetman[7]
[1]Centro Cardiovascular da Universidade de Lisboa, Lisbon School of Medicine, Sleep Unit, Lisbon, Portugal, [2]Centro Europeu do Sono, Lisbon, Portugal, [3]International Center for Clinical Sleep Medicine and Research, Bahiana School of Medicine and Public Health, Salvador, Brazil, [4]Centro Cardiovascular da Universidade de Lisboa, Lisbon School of Medicine, Cardiovascular Autonomic Function Lab, Lisbon, Portugal, [5]Yale University, New Haven, CT, United States, [6]Joan C. Edwards School of Medicine, Marshall University, Huntington, United States, [7]Adelaide Institute for Sleep Health, Flinders University, Adelaide, Australia

Introduction: Insomnia and obstructive sleep apnea are the two most prevalent sleep disorders and frequently co-occur. This study aimed to assess the effect of a clinically guided digital cognitive behavioral therapy for insomnia (CBTi) on sleep, mental health and behavioral cardiometabolic risk factors in patients with COMISA.

Materials and methods: A non-randomized case-control study was used to investigate the effect of a 6-week clinically guided digital CBTi program versus sleep education control in patients with COMISA. Consecutive sleep clinic patients were screened to identify those with an Insomnia Severity index (ISI) score>8, a STOP-Bang≥3, and sleep apnea according to a Circul derived 3%ODI >5 events/hr. Symptoms of insomnia (ISI), sleepiness (ESS), depression (PHQ-9) and anxiety (GAD-7), and patterns of alcohol consumption, smoking, and physical activity were assessed at baseline and post-treatment.

Results: Patients with COMISA were enrolled to CBTi (N=7; 5 males; age= 55,6±10,2; BMI=25,2±2,8) or control (N=7; 5 males; age=56,3±7,7; BMI=24,5±1,5). There were no between-group differences in anthropometric/clinical measures at baseline. CBTi was associated with significant improvement in the ISI (19 to 8; p=0,017), ESS (11 to 6; p=0,018), GAD-7 (8 to 5; p=0,038), and sleep/wake parameters. There were no significant changes in these parameters in the control group. The CBTi group reported improvement in cardiometabolic risk factors, including alcohol consumption (by 11%), smoking (by 3%) and physical activity (by 23%).

Conclusions: In this pilot study, digital CBTi improved insomnia, anxiety, and cardiometabolic risk factors in patients with COMISA. Fully-powered RCTs are needed to confirm the results of this pilot study.

Comparing the efficacy of face-to-face and eHealth-delivered cognitive behavioral therapy for insomnia (CBTI) in head-to-head randomized controlled trials: a systematic review and meta-analysis of equivalence

R. Zachariae[1], S. Knutzen[2], D. Christensen[2], P. Cairns[2], M. Damholdt[2], A. Amidi[2]
[1]Aarhus University Hospital, Aarhus, Denmark, [2]Aarhus University, Aarhus, Denmark

Introduction: Cognitive-behavioral therapy for insomnia (CBTI) is the recommended first-line treatment for insomnia. There are, however, several challenges in meeting population needs, e.g., limited availability of trained therapists, high costs, and geographical limitations. In response, alternative methods of delivering CBTI, such as telephone, video, or digital programs, have been developed and shown effective. Nevertheless, little is known about how well these eHealth approaches compare to the traditional face-to-face delivery of CBTI. To address this gap, we conducted a systematic review and meta-analysis to compare the efficacy of face-to-face CBTI with eHealth CBTI.

Materials and methods: Four electronic databases were searched for randomized controlled trials (RCTs) directly comparing face-to-face delivered CBTI (FtF-CBTI) with different types of eHealth-delivered CBTI (eCBTI). The outcomes of insomnia severity, sleep quality, and sleep diary-based outcomes (sleep onset latency (SOL), wake after sleep onset (WASO), total sleep time (TST), and sleep efficiency (SE)) were compared with equivalence meta-analysis, testing whether the pooled differences were statistically significantly equivalent within the suggested minimal important differences (MIDs) for the investigated sleep outcomes.

Results: Thirteen independent RCTs with a total of 812 participants were included in the review. Analyzed separately, both FtF-CBTI and eCBTI appeared highly efficacious in improving insomnia, sleep quality, and sleep diary-based outcomes from pre to post-intervention and from pre-intervention to follow-up (FU): (FtF-CBTI: Hedges' $g = 0.31$ (post TST) to 2.10 (post insomnia severity); eCBTI: $g = 0.23$ (post TST) to 1.52 (FU insomnia severity)). While the effects found for FtF-CBTI were generally larger than those found for eCBTI, the difference only reached statistical significance for insomnia severity ($g=0.38$; $p=0.012$) and for SE (mean difference = 1.85%; $p=0.039$) at post-intervention. When testing the equivalence of the two delivery types at post-intervention, they emerged as statistically significantly equivalent for 9 out of 12 comparisons, including standardized mean differences (Hedges's g) for SE, SOL, WASO, and TST, and mean differences in insomnia severity, sleep quality, SE (%), SOL (min), and WASO (min). A similar pattern was found for results at FU. Although the level of evidence was moderate, supplementary Bayesian analyses favored the hypothesis of zero difference for all outcomes, with the exception of insomnia severity. Generally, more participants dropped out in the eCBTI (post: 15.6%; FU: 34.5%) conditions than during FtF-CBTI (post: 9.1%; FU: 28.3%). Meta-regression revealed that larger differences in dropout between the two conditions were associated with significantly larger differences in favor of FtF-CBTI for self-reported sleep quality outcomes (insomnia severity and sleep quality combined) at both post intervention (slope=0.02; $p=0.027$) and FU (slope=0.02; $p=0.011$). The influence of therapist contact (contact vs. fully automated) did not reach statistical significance.

Conclusions: While the number of studies remains limited and the eHealth-delivered CBTI formats were highly heterogeneous, spanning from telephone-delivered to fully automated web-based CBTI, face-to-face delivered CBTI and eHealth-delivered CBTI emerged as equivalent in efficacy for the majority of sleep outcomes investigated. The results confirm that eHealth-delivered CBTI formats are relevant efficacious alternatives to face-to-face delivered CBTI.

Comparison of objective and subjective sleep evaluations based on the presence or absence of insomnia among Japanese city employees

C. Omichi[1,2], H. Kadotani[1], Y. Sumi[1], A. Ubara[1,3], K. Nishikawa[1,4], A. Matsuda[1], U. Tsovoosed[1], Y. Ozeki[1]

[1]Shiga University of Medical Science, Department of Psychiatry, Otsu, Japan, [2]Osaka Medical and Pharmaceutical University, Department of Hygiene and Public Health, Takatsuki, Japan, [3]PRA Health Science K.K., Minato-ku, Japan, [4]Japan CBT Center, Hikone, Japan

Introduction: Discrepancies between subjective and objective assessments of sleep duration and onset latency have been reported among insomnia patients. However, such discrepancies have not been well studied in the general population or working populations with sleep EEG measurements. The aim of this study was to compare subjective and objective assessments of sleep at home in a working population.

Materials and Methods: Between 2017 and 2019, a questionnaire survey including the Athens Insomnia Scale (AIS) and home 1-Ch electroencephalograph (EEG) measurements were conducted among municipal employees in Koka, Shiga Prefecture, Japan (NinJaSleep study). Sleep duration and sleep onset latency (SL) on weekdays answered in the questionnaire were used as the subjective evaluation. Sleep duration and SL determined with 1-Ch EEG were used as the objective evaluation. AIS≥6 was defined as having insomnia. The study protocol was approved by the Ethics Committee of the Shiga University of Medical Science.

Results: 646 employees (44.7 ± 11.5 years, AIS: 5.4 ± 3.6 points) participated in the study. In the with-insomnia group (AIS≥6, n=274), no significant difference was found between subjective and objective sleep duration (347.1±75.8 min vs. 355.1±78.9 min, p=0.153), and subjective SL was longer than objective SL (24.5±20.2 min vs. 19.5±18.8 min, p=0.002). In the without-insomnia group (AIS<6, n=372), no significant differences were found between subjective and objective evaluations in both sleep duration (372.3±64.6 min vs. 369.9±78.6 min, p=0.597) and SL (18.9±15.8 min vs. 16.9±12.3 min, p=0.259).

Conclusions: In the with-insomnia group, subjective SL was perceived longer than the objective SL. No differences were found between subjective and objective sleep duration both in with and without insomnia groups, which may come from the study performed in a working population.

Comparison of the treatment effectiveness between lemborexant and zolpidem tartrate extended release for insomnia disorder subtypes

Y. Inoue[1,2], M. Nishida[3], N. Kubota[3], M. Koebis[3], T. Taninaga[3], K. Muramoto[3], K. Ishikawa[3], M. Moline[4]
[1]Tokyo Medical University, Tokyo, Japan, [2]Japan Somnology Center, Institute of Neuropsychiatry, Tokyo, Japan, [3]Eisai Co, Ltd, Tokyo, Japan, [4]Eisai Inc., Nutley, United States

Introduction: Patients with insomnia can be classified into 2 phenotypes determined by polysomnography (PSG); insomnia with short sleep duration (I-SSD; < 6 hours) and insomnia with objectively longer, more normal sleep duration (I-NSD; ≥ 6 hours). This study examined differences in response to treatment with the competitive dual orexin receptor antagonist lemborexant (LEM) or zolpidem tartrate extended release (ZOL), compared with placebo (PBO) in subjects with I-SSD or I-NSD.

Materials and Methods: Study E2006-G000-304 (Study 304; NCT02783729) was a 1-month, randomized, double-blind, PBO- and active-comparator (ZOL)-controlled study of LEM 5 mg and LEM 10 mg. Subjects age ≥55 years who met criteria for insomnia disorder per *DSM-5* and with verified sleep maintenance problems were enrolled. In this analysis, changes in subjective (self-reported) variables based on sleep diaries and objective variables based on PSG were assessed after 1-month administration of study drugs. Data from participants with I-SSD and I-NSD were compared.

Results: From the Full Analysis Set (n=1006), 710 subjects were categorized into the I-SSD subgroup and 295 into the I-NSD subgroup. In the I-SSD subgroup, both LEM doses led to significant improvements in sleep-onset latency (SOL), total sleep time (TST), and wake after sleep onset (WASO) compared with PBO. ZOL also provided significant benefit for TST and WASO, but not SOL, with neither PSG or subjective measures compared with PBO. In the I-NSD subgroup, LEM and ZOL provided significant benefit for TST and WASO compared with PBO as measured by PSG, but not as measured subjectively. Both doses of LEM provided significant benefit for SOL compared with PBO with subjective measures, but not as measured by PSG.

Conclusions: LEM consistently showed subjective and objective benefits compared with PBO in subjects with insomnia who had I-SSD. ZOL also showed benefits compared with PBO, but with less consistency, particularly for sleep onset measures. Neither drug provided consistent benefits on sleep-onset and sleep maintenance variables for subjects with I-NSD.

Cri du Chat Syndrome (5p-) and cognitive-behavioral therapy for insomnia: a case report

P. Kageyama[1], F. Stelzer[1], A. Eckeli[1]
[1]University of São Paulo, Faculty of Medicine of Ribeirão Preto, Neuroscience and Behavioral Science, Division of Neurology, Ribeirão Preto, Brazil

Introduction: Sleep problems in children with Cri du Chat Syndrome (CDC) are relatively common, occurring in 30 to 50% of cases. Insomnia and sleep-disordered breathing are among the main sleep issues in this population. A 4-year-old white female patient with CDC and childhood behavioral insomnia was referred to go to cognitive behavioral therapy for insomnia (CBT-I). The parents' complaint was that the child woke up 2 to 5 times a night, every night of the week, for at least three months. At these awakenings she got out of bed and went to her parents' room. The child was in good general health at that time and she did not have respiratory symptoms nor Willis-Ekbom Disease symptoms associated with the sleep problem.

Methods: The CBT-I protocol was applied providing sleep education to the patient's parents. Parental education sessions were conducted once a week, totalizing 5 weeks of treatment. Weekly sleep diaries were used for follow-up. At the first session a survey of sleeping habits was applied and an assessment of the room's patient was conducted to evaluate possible distractions and environmental stimuli. Through these tools, we recommend the following strategies to the patient's parents: establishing a pre-sleep routine for the child; increasing the child's daytime nap time; turning off lights in the child's room at night; taking the child back to her room when she wakes up and waiting for her to fall asleep in her own bed; allowing the child to fall asleep earlier at night in her own bed.

Results: Analyzing the weekly sleep diaries after treatment, we observed that the frequency of the patient's nocturnal awakenings decreased from 1.6 (average of night awakenings at the first week of sleep diary) to 0.3 (average of the last week of sleep diary). Sleep onset latency was reduced by 32% (between the first and fifth weeks of treatment) and a reduction in early morning awakening was also reported by the patient's parents. These results could be explained by the adoption of sleep hygiene guidelines and behavioral approaches proposed to the patient's parents through the CBT-I protocol described previously. Results persisted for 10 months after treatment.

Conclusion: CBT-I proved to be effective for the treatment of childhood behavioral insomnia of a 4-year-old child with CDC, although we do not have many reports in the literature of its validity in this specific population.

Curriculum-based education in insomnia significantly improves primary care physician knowledge, competence and confidence

SC. Rohani-Montez[1], T. Finnegan[2], K. Carpenter[1], D. Garcia-Borreguerro[3], G. Hajak[4,5], P. Zee[6], K. Doghramji[7], R. Muza[8], R. Benca[9]
[1]Medscape Education Global, London, United Kingdom, [2]Medscape Education, New York, United States, [3]European University of Madrid, Sleep Research Institute, Madrid, Spain, [4]University of Regensburg, Regensburg, Germany, [5]Psychosomatic Medicine and Psychotherapy Social Foundation, Bamberg, Germany, [6]Northwestern University Feinberg School of Medicine, Chicago, IL, United States, [7]Thomas Jefferson University, Philadelphia, PA, United States, [8]Guys' & St Thomas' Hospitals, London, United Kingdom, [9]Wake Forest School of Medicine, Winston-Salem, NC, United States

Introduction: Primary care physicians (PCPs) are commonly involved in the management of insomnia but have a limited understanding of the latest evidence-based approaches. We sought to evaluate the impact of a series of educational activities provided over a 1.5-year course about sleep mechanisms, diagnostic approaches and evidence-based treatment strategies.

Materials and methods: A curriculum of 11 educational activities including lectures, expert discussions, patient stories, and animation on sleep mechanism pathways was launched in 2021-2022. For each activity, the effects of the education were assessed using a 3-question, repeated pairs, pre-assessment/post-assessment study design. One question assessed confidence. Differences from pre- to post-assessment were evaluated. Data were subsequently combined and analysed by theme to provide a summative overview of the effect of the education across the combined activities. Differences from pre- to post-assessment were evaluated using the McNemar's test. P values <.05 are statistically significant.

Results: Data related to 6 learning themes were collected between May 2021 and April 2023, with ns ranging from 548 to 3,614 completing both pre- and post-activity questions. Findings showed

- Statistically significant improvements in knowledge and competence for PCPs across all 6 learning themes: the physiology of sleep, insomnia disease burden, insomnia diagnosis, selecting appropriate therapies, emerging therapeutic targets (all P <.001) and assessing daytime functioning (P <.01)
    1. The relative improvements in % of correct responses for each learning theme ranged from 8%–40%
- Pre-education, overall only 9% of PCPs felt confident (4 or 5 on a scale from 1-5) in understanding, diagnosing, and managing insomnia, and this rose to 22% post-education (P <.001)

Conclusions: These results highlight the benefits of a curriculum of education in helping PCPs understand the pathophysiology behind insomnia, their role in diagnosis and management, and how to select evidence-based approaches in their practice. However, the results suggest that PCPs would benefit from further education to reinforce these concepts and to support them in translating knowledge of novel treatment strategies into clinical practice in order to optimize patient outcomes.

Daridorexant treatment effectiveness for chronic insomnia: A real-world retrospective study

M. Fernandes[1], F. Placidi[1,2], F. Izzi[2], A. Castelli[2], A. Pagano[2], N.B. Mercuri[1,2], C. Liguori[1,2]
[1]University of Rome "Tor Vergata", Department of Systems Medicine, Rome, Italy, [2]Policlinic "Tor Vergata", Sleep Medicine Centre, Neurology Unit, Rome, Italy

Introduction: Insomnia is a prevalent sleep disorder that significantly affects individuals' well-being and daily functioning. It is thus crucial to treat it to improve patients' quality of life and overall health. Daridorexant is a recently approved insomnia treatment which works by blocking orexin receptors. This study aimed to evaluate real-world data on daridorexant treatment in adult patients with chronic insomnia through the means of subjective outcomes.

Materials and Methods: Retrospective observational study. Consecutive patients starting on-label daridorexant per clinician's choice at the Sleep Medicine Centre, Neurology Unit, University Hospital Tor Vergata (Rome), were enrolled and evaluated at baseline and at 30 days follow-up (FU). This study evaluated patients' characteristics, insomnia duration, previous insomnia treatments, comorbidities, and clinicians' and patients' subjective reported changes in insomnia with the 7-point Likert scale (1=very much improved; 4=no change; 7=very much worse) Clinical and Patient Global Impression-Improvement scores (CGI-Is and PGI-Is). Moreover, changes in insomnia symptoms were evaluated with the Insomnia Severity Index (ISI) scale in a subgroup of patients.

Results: 69 patients [33 (47.8%) female, age 51.32±16.42 (19–83) years] were enrolled. 50 (72.5%) had sleep maintenance insomnia, 11 (15.9%) had sleep onset insomnia, 8 (11.6%) had both. On average, insomnia lasted 59.97±69.45 (3–360) months. 19 (27.5%) patients had no comorbidities, 34 (49.3%) had at least one, and 16 (23.2%) had at least two. The most common comorbidities were depression (n=21, 30.4%), anxiety (n=17, 24.6%), and epilepsy (n=6, 8.7%). Nine (13.0%) patients reported no previous insomnia medication, 15 (21.7%) reported one, 19 (27.5%) reported two, 7 (10.1%) reported three, and 19 (27.5%) reported more than four. All patients started treatment with a 50mg dosage; 12 (17.4%) dropped out at FU (n=5 due to inefficacy and n=7 due to personal reasons). CGI-Is and PGI-Is are available for the entire cohort. At FU, mean PGI-Is were 3.00±1.25; namely, only 5 (7.2%) patients rated their insomnia as worsened, while it remained unchanged for 24 (34.8%), and improved for 40 (58.0%). Mean CGI-Is were 2.80±1.18; namely, clinicians never rated insomnia as worsened, while they rated it as unchanged for 29 (42.0%) patients and improved for 40 (58.0%). No differences according to the number of comorbidities were found (p=0.451 and p=0.583 for CGI-Is and PGI-Is, respectively). No differences in the PGI-Is and CGI-Is across sexes, number of previous medications, and most common comorbidities were found. No association among PGI-Is, CGI-Is and insomnia duration were observed. Finally, ISI scores (n=24) significantly decreased from 18.25±3.21 to 12.08±6.12 (Z=8.000; p<0.001) at FU. In linear regression models, age, insomnia duration and number of previous medications for insomnia did not predict CGI-and PGI-I.U.

Conclusions: Low CGI-I and PGI-I scores, as well as significant reductions in the ISI scores, suggest daridorexant is effective in treating adult patients with chronic insomnia in a real-world setting. Patients' sex, number of previous medications, and insomnia duration seem to not affect treatment. Larger cohorts are warranted to clarify daridorexant treatment potential in clinical practice.

Determinants of maternal cognitions about infant sleep during pregnancy

S. Suh[1], L. Tikotzky[2], B. Bei[3], J. Song[1], N. Solomon[4], N. Simpson[4], R. Manber[4]
[1]Sungshin University, Department of Psychology, Seoul, Korea, Republic of, [2]Ben Gurion University of the Negev, Department of Psychology, Negev, Israel, [3]Turner Institute for Brain and Mental Health, School of Psychological Sciences, Monash University, Melbourne, Australia, [4]Stanford University School of Medicine, Department of Psychiatry and Behavioral Sciences, Palo Alto, United States

Introduction: Parents have cognitive-emotional schemas of infant sleep that may influence behaviors toward infant sleep in the postpartum. Currently, little is known about how these internal representations towards one's child's sleep are formed.

Materials and Methods: This study used a Random Forest machine learning approach to identify determinants of maternal cognitions about infant sleep during pregnancy, measured with the Infant Sleep Vignettes Interpretation Scale (ISVIS), which consists of three subscales: Distress, Limit-Setting, and Temperament. We used baseline data provided by 82 pregnant women, gestation age between 18 and 32 weeks, who participated in a randomized controlled trial of insomnia treatment. We examined the ISVIS relative to 29 variables including demographic factors, mental health, sleep questionnaires, actigraphy, and sleep diaries. The ISVIS was measured approximately 5-6 weeks after baseline assessment.

Results: The dataset explained 18.04% of the variance for the ISVIS-Distress scale, with top predictors being actigraphy-based sleep onset latency (SOL; 19.1% of model variance, positive association), parental education (14.6%, negative association), and Edinburgh Postnatal Depression Scale scores (12.6%, positive association). The dataset explained 6.56% of the variance for the ISVIS-Temperament scale, with top predictors being parental education (16.7% of the model variance, negative association), actigraphy-based total wake time (15.2%, positive association), and the Ford Insomnia Response to Stress Test scores (14.2%, positive association). The ISVIS-Limit Setting subscale model was not statistically significant.

Conclusions: The mother's own sleep and mental health during pregnancy appear to be related to her cognitions about infant sleep, specifically the propensity to interpret infant crying at night as signaling distress or reflecting temperamental tendency. Such interpretations are likely to impact her responses when the infant cries, which, in turn, may impact the infant's subsequent sleep behaviors.

Digital sleep therapeutics intervention to improve cognitive health (SleepTIGHT) for mild cognitive impairment: a randomized controlled pilot study

Y. Leng[1], S. Milton[1], A.-M. De Bolt[2], A. Prather[1], K. Yaffe[3], A. Krystal[1]
[1]University of California, San Francisco, Department of Psychiatry and Behavioral Sciences, San Francisco, United States, [2]California School of Professional Psychology, Alliant International University, Emeryville, United States, [3]University of California, San Francisco and San Francisco VA Medical Center, Departments of Psychiatry and Behavioral Sciences, Neurology, and Epidemiology, San Francisco, United States

Introduction: Poor sleep quality and insomnia are associated with cognitive impairment in older adults. However, it remains controversial whether it is feasible to slow down cognitive decline through sleep interventions, such as Cognitive Behavioral Therapy for Insomnia (CBT-I), among individuals at high risk for dementia. The goal of this ongoing pilot study was to evaluate the feasibility of implementing a digital CBT-I program in patients with insomnia and mild cognitive impairment (MCI) or mild dementia.

Materials and methods: We are enrolling adults aged 65 and older with evidence of MCI or mild dementia and subthreshold or clinical insomnia. Participants are randomized into a digital CBT-I treatment (Somryst®) or an attention-matched control program. Eligibility criteria include Insomnia Severity Index (ISI) scores of 8 or higher and derived Clinical Dementia Rating (CDR) scores of 0.5 or 0.1, as assessed using the Quick Dementia Rating System (QDRS). We evaluate sleep quality and cognitive function at baseline and post-intervention, using a 7-day sleep diary, the Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), STOP-BANG for Obstructive Sleep Apnea (OSA) risk, and a comprehensive neuropsychological battery for remote cognitive assessment in older adults. We employ quantitative and qualitative methods to assess feasibility and acceptability. Data collection is conducted via phone or video interviews.

Results: To date, 13 participants (9 women, average age 74.8±5.3 years) have been enrolled and randomized into CBT-I treatment (n=8) or control program (n=5). Eight (61.5%) participants showed evidence of MCI, and five (38.5%) showed mild dementia. Six (46.1%) participants had subthreshold insomnia, and seven (53.9%) had clinical insomnia (four moderate and three severe). Almost all (12/13) participants had poor sleep as defined by a PSQI of at least 5, and seven (53.9%) participants showed at least an intermediate risk of OSA. Participants generally expressed concerns about sleep problems and their cognitive impact and were cooperative throughout the screening and data collection process.

Conclusions: Insomnia symptoms are common in patients with MCI or mild dementia. Preliminary results suggest that older adults with both insomnia and MCI or mild dementia can be successfully enrolled in a fully remote sleep treatment program, indicating the potential for digital CBT-I treatment in this population. Further research is needed to evaluate the effectiveness of digital CBT-I treatment in improving sleep quality and cognitive health in older adults at high risk for dementia.

Early experience with the new DORA daridorexant in patients with insomnia disorder: results of a real world study with a 3 months follow up period

L. Palagini[1], G. Alfi[2], R. Gurrieri[2], V. Caruso[1], M. Trivella[2], E. Annuzzi[1], M. Gambini[1], G. Grenno[2], M. Miniati[1], A. Gemignani[2]
[1]University of Pisa, Department of Experimental and Clinic Medicine, Section of Psychiatry, University of Pisa, Pisa, Italy, [2]University of Pisa, Department of Surgical, Medical, Molecular, and Critical Area Pathology, University of Pisa, Pisa, Italy

Introduction: Insomnia disorder is the most frequent sleep disorder which may affect mental health increasing suicidal risk. Targeting insomnia is crucial in the clinical practice. A new Dual Orexin Receptor Agonist (DORA) daridorexant has recently approved in Europe for insomnia treatment. Accordingly, the aim of the study was to evaluate its effects on sleep, mood and emotions in patients with insomnia disorder.

Materials and Methods: Consecutive patients with insomnia disorder according with the DSM-5-TR criteria (diagnosis with Sleep Condition Indicator SCI<16) attending the Psychiatric Unit of the University Hospital of Pisa in Italy were with daridorexant 50 mg from January 2023 to May 2023. Baseline (T0), 1 months (T1) and 3 months (T2) evaluations were performed. Demographics, and clinical data for all patients included: insomnia severity (Insomnia Severity Index-ISI), mood, anxiety symptoms and suicidal risk (Beck Depression Inventory II-BDI-II, Young Mania Rating scale-YMRS, Self Reported anxiety Scale- SAS, Suicidal Ideation Scale-SSI), dysfunctional emotion and cognition (Difficulties in Emotion Regulation Scale- DERS, dysfunctional beliefs about sleep- DBAS). Psychiatric comorbid conditions were evaluated according with DSM-5-TR criteria (SCID-5) and concomitant pharmacological therapy was taken into account.

Results: The final sample included 39 patients with insomnia disorder treated with daridorexant. Mean age was 54 $\pm$ 13.6 years, 51,2% were females, 74.3% were diagnosed with comorbid mood disorders (Bipolar n°7 and Unipolar depression n°22), 51% showed a comorbid anxiety disorder, and 38% presented a sedative hypnotic use misuse. Patients were CBT- Insomnia treatment resistant (n°5, 12%) or insomnia pharmacological treatment resistant and assumed combination of different hypnotics (53% sedative-hypnotics, 30% melatonin 2 mg PR , 5.1% neuroleptics) or naive insomnia patients (12.8%); 61.5% was assuming SSRI antidepressants for anxiety or mood disorders and 28.2 mood stabilizers. At T0 total scores were ISI: 17.7 $\pm$ 1.5, YMRS: 2.56$\pm$ 1.5, BDI-II: 13.7$\pm$ 2.6, SAS: 29.2$\pm$ 6.6,SSI: 3.3$\pm$ 1.07, DBAS: 124.2$\pm$ 25.0, DERS: 94.0$\pm$ 16.1. At T1 insomnia, mood and anxiety symptoms, suicidal ideation, emotion dysregulation and dysfunctional cognition about sleep were significantly improved with total scores significantly reduced (ISI p=0.033, YMRS p=0.027, BDI-II p=0.010, SSI p=0.002, DBAS p<0.001, DERS p<0.001). In particular, at T1 the DERS subscale measuring impulsivity was significantly reduced vs T0 (14$\pm$ 3.0 vs 13.1$\pm$ 2.2, p=0.017). At T3 after 3 months vs T0, scores were: ISI: 6.7 $\pm$ 2.4 (p<0.01), YMRS: 1.5$\pm$ 0.69 (p=0.031), BDI-II: 5.3$\pm$ 2.6 (p<0.001), SAS: 21.2$\pm$ 2.9 (p=0.002),SSI: 0.54$\pm$ 0.54 (p<0.001), DBAS: 81.2$\pm$ 15.7 (p<.0.001), DERS: 59.0$\pm$ 30.1 (p<0.001). Subscales of DERS measuring impulsivity, lack of emotional awareness, limited access to emotion regulation strategies and lack of emotional clarity particularly improved (p<0.001).

Conclusions: Early experience with daridorexant in this pilot study showed that by targeting insomnia it may be possible to improve non only insomnia symptoms but also mood, anxiety and suicidal risk in patients with insomnia disorder. It is emerging that it may contribute to regulate emotions and to reduce dysfunctional beliefs about sleep which may fuel hyerarousal in insomnia. Further studies are needed to confirm these early experience.

Early identification of patients most vulnerable to acute insomnia after trauma

A. Reffi[1], D. Kalmbach[1], G. Seymour[1], M. Solway[2], D. Moore[2], G. Mahr[2], C. Drake[1]
[1]Henry Ford Health, Sleep Medicine, Detroit, United States, [2]Henry Ford Health, Psychiatry, Detroit, United States

Introduction: Acute sleep disturbances are a common, modifiable consequence of trauma that, if left untreated, increase risk of PTSD by nearly two-fold. This suggests acute sleep disturbances after trauma are an important contributor to the etiology of PTSD that could be targeted early to prevent the disorder. Yet, effective strategies to prevent PTSD cannot currently be implemented because we cannot identify who is most at risk of acute sleep disturbances after trauma, thus obstructing the ability to identify high-risk groups in need of early intervention. This study will test sleep reactivity – a trait predisposition to experience sleep disturbances after stress – as a predictor of posttraumatic sleep disturbances within one month following trauma exposure.

Materials and Methods: We recruited patients ($N = 88$, $M_{age} = 39.53 \pm 14.31$) admitted to Henry Ford Hospital's intensive care unit in Detroit, Michigan for traumatic injury (e.g., gunshot wound). While in the hospital, patients reported their pre-trauma sleep reactivity (Ford Insomnia Response to Stress Test; FIRST) and insomnia symptoms from the past two weeks (Insomnia Severity Index; ISI). Patients then completed the ISI again one month later ($n = 48$). We tested high sleep reactivity (FIRST ≥ 21) as a prospective predictor of clinically significant posttraumatic sleep disturbances (ISI ≥ 10).

Results: Patients were mostly black men (67%), and nearly half reported an annual income ≤ $20,000 (47.7%). Motor vehicle collisions were the most common trauma that precipitated patients' hospital admission (42%), followed by assaults with a weapon (30.7%). While adjusting for age and pre-trauma sleep disturbance, high sleep reactivity predicted increased odds of sleep disturbances one month after trauma ($b = 2.08$, $SE = .98$, $p = .033$, OR = 8.01, CI = 1.19 – 54.15).

Conclusions: Individuals with high sleep reactivity are at increased susceptibility of clinically significant sleep disturbances after trauma. The 9-item FIRST is a brief and clinically useful indicator that offers providers the ability to predict the onset of acute sleep disturbances after trauma, which are novel targets for early intervention. This might enable the early identification of potentially vulnerable individuals who might develop PTSD, toward whom sleep-focused preventive efforts can be targeted.

Acknowledgements: We are grateful to Henry Ford Hospital's Dept. of Surgery, Division of Acute Care Surgery for supporting our research, and of course, we thank the patients who enrolled in our study during such a stressful time.

Education needs in insomnia: a clinician survey

C. Rohani-Montez[1], P. Zee[2]
[1]Medscape Education Global, London, United Kingdom, [2]Northwestern University Feinberg School of Medicine, Center for Circadian and Sleep Medicine and Division of Sleep Medicine, Chicago, United States

Introduction: Primary care physicians are commonly involved in the management of insomnia but may have a limited understanding of the best evidence-based approaches. We sought to understand how these physicians currently manage insomnia and what kind of education is most needed.
Materials and Methods: A 16-question online survey to assess clinician knowledge, current practice, confidence, barriers, and educational needs in insomnia was emailed to Medscape member physicians. It launched on March 9, 2022, and closed on March 26, 2022.
Results: A total of 102 family or general practice, internal medicine, and geriatrics physicians in the US and EU5 participated in the survey. The most important goal of insomnia treatment was daytime functioning, for 48% or EU5 and 38% of US physicians. Although most physicians said they recommend sleep hygiene measures and assess insomnia-associated comorbidities for a newly diagnosed insomnia patient, they said most patients (93%) ask for insomnia pharmacotherapies. Differences were evident between US and EU5 physicians in treatment patterns. Most US physicians said they prefer to prescribe melatonin/melatonin receptor agonists (RAs) or CBTI, whereas most EU5 physicians prefer benzodiazepines or CBTI. However, in routine practice, physicians said they prescribe CBTI less frequently than they would like, with most US physicians prescribing melatonin/melatonin RAs or antidepressants, and most EU5 physicians prescribing benzodiazepines or antidepressants. With DORAs being an emerging option in Europe, 48% of EU5 physicians said they didn't know in which situations this class should be recommended. US physicians favoured DORAs in the settings of those who experience side effects with current insomnia treatments and those who have insufficient efficacy for night-time symptoms. Only a third suggested DORAs should be selected for those who have daytime impairment. Physicians were more satisfied with pharmacotherapies than CBTI in addressing sleep-onset and/or sleep-maintenance insomnia, but the reverse was true regarding improving next day functioning. There was poor satisfaction with availability of CBTI and adherence to CBTI, and only ~16% were confident in implementing it. Only 35% were very/mostly confident in choosing the most appropriate pharmacotherapy for insomnia and ~36% were confident in addressing sleep problems when the patient is presenting with another complaint. The top barriers in managing insomnia included limitations of indicated therapies due to addiction potential (71% EU5 and 44% of US physicians), and side effect profiles of benzodiazepines or BZRAs (60% EU5 and 40% of US physicians). Top topics for further education included clinical data on new insomnia therapies, and new mechanisms being targeted to improve sleep quality.
Conclusions: This educational research study identifies gaps in managing insomnia and supports the need to develop education for physicians on how to tailor insomnia management to provide optimal night-time and daytime outcomes.

Effectiveness of a multi-component digital intervention program in Type 2 Diabetes Mellitus (Type 2 DM) patients with sleep apnea

P. Thiyagarajah[1], A. Shah[1], S. Piyush Pattnayak[1], T. Ahadome[1], K. Khanna[1]
[1]Wellthy Therapeutics Pvt Ltd, Clinical Research, Mumbai, India

Introduction: Type 2 DM and obstructive sleep apnea are common medical conditions with significant clinical, epidemiological and public health implications. There is a bidirectional relationship between Type 2 DM and sleep apnea, not everyone with one condition will develop the other. However, managing both conditions through a comprehensive and personalized approach is essential for overall health and well-being. Several studies have demonstrated a bidirectional relationship betweenType 2 DM and OSA. Type 2 DM increases the risk of developing OSA, and OSA, in turn, worsens glycemic control and metabolic dysfunction in individuals with diabetes. Digital health interventions provide great promise for improving care delivery, particularly in developing nations where mobile technology is widely used. Need arises to prove the efficacy of digital interventions on medication adherence. This study aims to evaluate the effectiveness of a Multi-Component Digital Intervention Program for Type 2 DM Patients with Sleep Apnea

Materials and Methods: An interventional program with multi component strategy was delivered by health care personnels of Wellthy Therapeutics over a period of 24 weeks. 75 patients who were diagnosed for Type 2 DM with sleep apnea were recruited for this study. The program had app based interventions including lifestyle counseling, disease awareness and importance of sleep test, medication adherence and self management training of symptoms at home. Interventions were initiated by certified health coaches via chats and calls. Statistical analysis was done using SPSS version 21. Univariate analysis and Paired T test were done.

Results: Out of 75 patients 78.66 % were male and 21.33 % were female, 44% were under high risk, 42% had disturbed sleep, 53.33% had snoring during their night sleep, 17.3% had acid reflux on waking up. BMI greater than 30 was present in 43% of patients. At baseline 30% pts experienced disturbed sleep, 30% had light sleep and 40% had deep sleep. At endline 60 % had deep sleep and 40% had light sleep as a result of intervention. There was statistically significant improvement in FBS following the digital patient support program from 134.57 to 127.29 (p < 0.006), an improvement of 7.28mg/dl and PPBS from 197.66 to 161.58 an improvement of 36.08mg/dl respectively.

Conclusions: The bidirectional relationship between Type 2 DM and sleep apnoea highlights the importance of understanding and addressing these conditions together. Early detection, proper diagnosis, and a comprehensive treatment approach can significantly improve outcomes and enhance the quality of life for those affected by Type 2 DM and sleep apnoea. The study demonstrates the potential of digital health interventions to provide a multifaceted approach to care delivery.

The observed improvements in sleep quality and glycemic control highlight the potential benefits of holistic, personalized approaches to healthcare, delivered through convenient and accessible digital platforms. As the burden of these conditions continues to rise, digital interventions hold promise in enhancing the well-being and health outcomes of individuals dealing with Type 2 DMand sleep apnea. Further research and larger-scale studies are warranted to validate and expand upon these findings, paving the way for more effective and accessible healthcare solutions.

Effectiveness of Cognitive-Behavioral Therapy for Insomnia and homeostatic function of K-complexes

M. Sforza[1,2], G. Carollo[2], F. Casoni[2], M. Zucconi[2], C.M. Morin[3], T.T. Dang Vu[4,5], F.B. Pomares[4,5], A.A. Perrault[4,5], J. Bušková[6,7], K. Janku[6,7], A. Vgontzas[8], J. Fernandez-Mendoza[8], V. Castronovo[2], L. Ferini-Strambi[1,2], A. Galbiati[1,2]
[1]Vita-Salute San Raffaele University, Milan, Italy, [2]IRCCS San Raffaele Scientific Institute, Department of Clinical Neurosciences, Neurology-Sleep Disorders Center, Milan, Italy, [3]Université Laval, School of Psychology and Centre de Recherche CERVO, Québec, Canada, [4]Concordia University, Center for Studies in Behavioral Neurobiology, Montreal, Canada, [5]Concordia University, PERFORM Center, Montreal, Canada, [6]National Institute of Mental Health, Klecany, Czech Republic, [7]Charles University, Third Faculty of Medicine, Prague, Czech Republic, [8]Pennsylvania State University, Sleep Research & Treatment Center, Department of Psychiatry, Hershey, United States

Introduction: Insomnia Disorder (ID) is the most prevalent sleep disorder worldwide. Despite the current guidelines relying on subjective assessment for its diagnosis, an objective evaluation of nocturnal sleep could be relevant for the identification of different subtypes, as well as for the evaluation of differential treatment response. Macrostructural standard indices of sleep recorded by polysomnography (PSG) do not seem to change significantly following Cognitive-Behavioral Therapy for Insomnia (CBT-I). However, quantitative and micro-structural EEG indices, such as high and slow EEG frequencies, delta power, and sleep spindles analysis might be more revealing in evaluating treatment response. In this context, an overlooked graphoelement that could be associated with CBT-I effectiveness is K-complex (KC). To date, there are no studies on the association between KC and CBT-I efficacy outcomes.

The aim of this study is to evaluate the role of KC in predicting the effectiveness of CBT-I in chronic insomnia patients.

Materials and Methods: A total of 101 patients (age=49.3±12.69, 69.3% of females, Insomnia Severity Index ISI at the baseline=16.87±3.46; Objective TST at the baseline=334.11±74.18) meeting criteria for Insomnia Disorder were enrolled retrospectively in a multi-center study, and underwent a 6-8 weeks CBT-I, one PSG evaluation pre- and one post-treatment, as well as ISI. The main outcomes were KC density (KCd) (number of KC/minutes of N2) and the KCd slope, calculated in each patient as the slope of the linear equation of the KC density evaluated at the baseline in each NREM stage 2 epoch along the whole night. In order to investigate CBT-I effectiveness we divided the sample into responders, which were classified by an ISI total score decrease ≥ 8 after treatment (ISI bl=17.60±2.99), and non-responders which had a ISI total score < 8 (ISI bl=15.69±3.74) after treatment. Two subjects were excluded as outliers based on KCd slope.

Results: A non-parametric one-way ANOVA, splitting the sample into responders (n=57) and non-responders (n=42) as a fixed factor showed statistically significant differences between groups ($p<0.05$). Specifically, the responders showed an impaired KCd slope index at the baseline ($-2.95 \times 10^{-5} \pm 3.35 \times 10^{-5}$), in comparison to non-responders ($-5.56 \times 10^{-5} \pm 5.24 \times 10^{-5}$). On the other hand, KCd showed no differences between groups (responder: 1.50±0.80, non-responder: 1.94±1.23; p=0.13).

Conclusions: These findings suggest that responders to CBT-I show reduced sleep homeostatic pressure objectively calculated by K-complex density distributed over the night, in comparison to non-responders patients. These findings could suggest that the effect of the behavioral components of CBT-I, namely Sleep Restriction and Stimulus Control, might be of greater importance in patients with impaired homeostatic sleep pressure at baseline.

Effectiveness of cognitive-behavioral therapy for insomnia in quantitative EEG analysis of non-REM sleep

M. Sforza[1,2], G. Carollo[2], F. Casoni[2], M. Zucconi[2], C.M. Morin[3], T.T. Dang Vu[4,5], F.B. Pomares[4,5], A.A. Perrault[4,5], J. Bušková[6,7], K. Janku[6,7], A. Vgontzas[8], J. Fernandez-Mendoza[8], V. Castronovo[2], L. Ferini-Strambi[1,2], A. Galbiati[1,2]

[1]Vita-Salute San Raffaele University, Milan, Italy, [2]IRCCS San Raffaele Scientific Institute, Department of Clinical Neurosciences, Neurology-Sleep Disorders Center, Milan, Italy, [3]Université Laval, School of Psychology and Centre de Recherche CERVO, Québec, Canada, [4]Concordia University, Center for Studies in Behavioral Neurobiology, Montreal, Canada, [5]Concordia University, PERFORM Center, Montreal, Canada, [6]National Institute of Mental Health, Klecany, Czech Republic, [7]Charles University, Third Faculty of Medicine, Prague, Czech Republic, [8]Pennsylvania State University, Sleep Research & Treatment Center, Department of Psychiatry, Hershey, United States

Introduction: Insomnia Disorder (ID) is the most prevalent sleep disorder worldwide. Despite current guidelines relying on subjective assessment to diagnose insomnia disorder, objective evaluation of nocturnal sleep could be potentially relevant for identifying different subtypes, as well as to evaluate treatment effectiveness outcomes. Indeed, the effectiveness of Cognitive-Behavioral Therapy for Insomnia (CBT-I), the first-line treatment for chronic insomnia, is often assessed through subjective variables. Macrostructural standard indices of sleep recorded by polysomnography (PSG) do not seem to change significantly following CBT-I. However, quantitative and micro-structural EEG indices might be more revealing in highlighting treatment objective response, such as low and high frequencies power.
The aim of this study was to evaluate the effectiveness of CBT-I in chronic ID patients using quantitative EEG indices of non-REM sleep as primary outcomes. Moreover, subjective and objective macrostructural sleep outcomes were also evaluated.
Materials and methods: A total of 101 chronic insomnia patients (age=49.3±12.69, 69.3% of females, Insomnia Severity Index (ISI) at the baseline=16.87±3.46; Objective TST at the baseline=334.11±74.18) were retrospectively enrolled in a multi-center study. Each patient underwent a 6-8 weeks CBT-I protocol, one PSG evaluation pre- and one post-treatment, as well as subjective indices assessed by sleep diaries and ISI. The main outcomes were Beta (16-30 Hz) band relative power, and Delta (1-4 Hz) bands relative power in Non-Rapid Eye Movement sleep with no artifacts.
Results: All subjective indices at post-treatment displayed an amelioration (sleep efficiency SE, sleep onset latency SOL, number of awakenings NoA, wake after sleep onset WASO, time in bed TIB, and ISI; p<0.001), except for total sleep time (TST; p=0.068). Moreover, macro-structural objective indices showed improvements after treatment (SE, SOL, WASO, TIB; p<0.05). Quantitative EEG analysis of non-REM sleep reported a statistically significant decrease of Beta band relative power (Beta; p<0.05), and a statistically significant increase of Delta band relative power (Delta; p<0.05) after treatment.
Conclusions: These findings could suggest that the effectiveness of CBT-I can also be observed in objective indices. In particular, quantitative EEG analysis showed a reduction of high frequency and an increase in low frequency after treatment, that are in line with previous literature regarding brain activity of participants with insomnia disorder during sleep. These results are consistent with the current view of ID being associated with hyperarousal during both sleep and wakefulness, and could inform about ID pathophysiology and CBT-I mechanisms of action.

Effectiveness of e-based cognitive behavioral therapy for insomnia on enhancing depression and insomnia outcome in Chinese youth with both diagnoses

S.-J. Chen[1], J.-Y. Que[2,3], N.Y. Chan[1], S.X. Li[4,5], J.-H. Zhang[1,6,7], Y. Zhong[2], Y.L. Ho[1], C.C. Tsang[1], L. Shi[2], L. Lu[2], Y.K. Wing[1]
[1]Li Chiu Kong Family Sleep Assessment Unit, Department of Psychiatry, Faculty of Medicine, The Chinese University of Hong Kong, Hong Kong, Hong Kong, SAR of China, [2]Peking University Sixth Hospital, Peking University Institute of Mental Health, NHC Key Laboratory of Mental Health (Peking University), National Clinical Research Center for Mental Disorders (Peking University Sixth Hospital), Peking University, Beijing, China, [3]Xiamen City Xianyue Hospital, Xiamen, China, [4]Department of Psychology, The University of Hong Kong, Hong Kong, Hong Kong, SAR of China, [5]The State Key Laboratory of Brain and Cognitive Sciences, The University of Hong Kong, Hong Kong, Hong Kong, SAR of China, [6]Center for Sleep and Circadian Medicine, The Affiliated Brain Hospital of Guangzhou Medical University, Guangzhou, China, [7]Key Laboratory of Neurogenetics and Channelopathies of Guangdong Province and the Ministry of Education of China, Guangzhou Medical University, Guangzhou, China

Introduction: Sleep disturbance is a prevalent health problem among youth and frequently comorbid with mental disorders, particularly depression. If left untreated, sleep disturbance may lead to poorer response towards depression treatment and increase its recurrence rate. Although previous studies reported beneficial effects of cognitive behavior therapy for insomnia (CBT-I) on both insomnia and depressive symptoms among depressed patients with comorbid insomnia, the existing data were mostly based on adults. Thus, we aimed to evaluate the efficacy of e-based CBT-I (e-CBT-I), a more scalable solution than traditional face-to-face CBT-I, on improving insomnia and depression outcome in youth with both diagnoses.

Materials and methods: Chinese youth (aged 15-25) with comorbid insomnia disorder and major depressive disorder as ascertained by clinical interview were recruited and randomly assigned (1:1) to 6-week e-CBT-I or e-based health education (e-HE as control). The assessments were conducted at baseline, post-intervention, 1- and 6-month follow-up. Two additional assessments were given during the intervention to evaluate sleep and mood parameters of participants at week 3 and 5. The digital intervention program was developed by our research team, and was modified and issued by BestCare & SuMian BioTech Co. The primary outcomes included insomnia and depressive symptoms measured by Insomnia Severity Index (ISI) and Patient Health Questionnaire (PHQ-9), respectively. Treatment effects were examined by linear mixed-effects model and generalized estimating equations analysis. This trial was registered with the Chinese Clinical Trial Registry (ChiCTR2100045660).

Results: A total of 120 participants were randomly allocated to either e-CBT-I (n = 59) or e-HE group (n = 61). The preliminary results were based on the initial sample of 113 participants who completed 6-month follow-up (e-CBT-I: n = 56; e-HE: n = 57; 43.4% girls; mean age ± SD: 21.9 ± 2.0 years). The intervention group reported less severe insomnia symptoms at both week 5 (between-group difference in the mean change [SE], 2.7 [0.9]; P = .008) and 6-month follow-up (2.7 [1.1]; P = .02) than the controls, though the overall interaction effect was only marginally significant (P = 0.08). In addition, the intervention group had a reduced risk of having persistent insomnia over the 6-month period (OR: 0.44, 95% CI: 0.21 − 0.90, P = 0.03) than the controls. In terms of depression outcome, youth in e-CBT-I group showed a significant decrease of depressive symptoms (PHQ-9 score, 16.6 vs 8.3; P < .001) from baseline to 6-month follow-up, but the between-group differences were not significant. The intervention group also had decreased fatigue at post-intervention and reduced dysfunctional sleep beliefs throughout the 6-month follow-up compared with the control group.

Conclusions: The preliminary results of current study demonstrate that e-CBT-I is effective in improving insomnia and sleep-related outcomes among youth with comorbid insomnia and depressive disorder, and indicate the need for adding treatment components typically targeting mood problems to optimize the treatment effects.

Effective reduction of long term benzodiazepine and other drugs usage for insomnia through cognitive behavioral therapy, muscle stretching session, tDCS, binaural beats, and aromatherapy: a case series

P. Prawiroharjo[1,2], E.A.A. Santawi[2], Y.T. Martono[2]
[1]Department of Neurology, Faculty of Medicine Universitas Indonesia, Jakarta, Indonesia, [2]Mandaya Royal Hospital Puri, Cognitive and Sleep Center, Tangerang, Indonesia

Introduction: Insomnia is a pervasive sleep disorder that can significantly impair quality of life. Long term benzodiazepine use can lead to addiction and is a risk factor of dementia and falls. Although pharmacological treatments remain prevalent, the potential for drug dependence and withdrawal complications necessitates the exploration of alternative therapies. This report presents a case series in using a multimodal method consisting of Cognitive Behavioral Therapy, muscle stretching session, Transcranial Direct Current Stimulation (tDCS), binaural beats therapy, and aromatherapy in reducing the use of sleep drugs and improving sleep quality.

Materials and methods: We report a case series consisting of four patients diagnosed with insomnia and a history of benzodiazepine and other anti-insomnia drug use longer than a year. All patients underwent multimodal method combining Cognitive Behavioral Therapy, muscle stretching session, tDCS session on the bilateral Dorsolateral Prefrontal Cortex (DLPFC) for a duration of 30 minutes before sleep, binaural beats using delta frequency, and aromatherapy, assisted by the medical team during hospital stay. This approach was implemented within four to nine days.

Results: Across all four cases, a decrease in the consumption of sleep drugs was observed within the first few days, accelerating faster than the usual tapering processes. Patient A was using 2 mg of Alprazolam for 15 years every night and had stopped using it after nine days of therapy. Patient B was using 3 to 4 mg of Estazolam for 15 years every night and was able to stop using it after three days of therapy. Patient C was using 2 mg of Clonazepam, 2 mg of Lorazepam, 0.5 mg of Opizolam, and three other non-benzodiazepine anti-insomnia drugs for three years and was able to decrease the amount of benzodiazepine being used after three days of therapy to just 1 mg of Clonazepam. Patient D was using 1 mg of Clonazepam and an SSRI for three months and was able to stop using Clonazepam after just 1 night of therapy. Importantly, the decrease was achieved without the patients experiencing significant withdrawal effects, suggesting that this method could potentially mitigate the drawbacks of benzodiazepine addiction. Moreover, in all cases, a decrease in Pittsburgh Sleep Quality Index (PSQI) of up to 10 points was observed on follow up, suggesting that this method can effectively improve the quality of sleep.

Conclusions: The multimodal approach, combining Cognitive Behavioral Therapy, muscle stretching session, tDCS, binaural beats delta, and aromatherapy, could potentially be a promising alternative for managing benzodiazepine addiction and at the same time improves the quality of sleep. Further research is needed to validate our findings in a larger population.

Effect of cognitive behavioral therapy for patients with acute or subthreshold insomnia: a systematic review and meta-analysis

D. Barroso[1], L. Hespanhol[2], P.H. Romeiro[3], C. Silva[4], N. Félix[2], M.L. Barros[5], I. Costa[6], A. Teixeira Filho[7]

[1]State University of Santa Cruz, Medicine, Ilhéus, Brazil, [2]Federal University of Campina Grande, Medicine, Campina Grande, Brazil, [3]Tiradentes University Center, Medicine, Maceió, Brazil, [4]Federal University of Rio Grande do Norte, Medicine, Natal, Brazil, [5]Federal University of Acre, Medicine, Rio Branco, Brazil, [6]Federal University of Triângulo Mineiro, Medicine, Uberaba, Brazil, [7]University of Miami, Department of Psychiatry and Behavioral Sciences, Miami, United States

Introduction: Cognitive behavioral therapy for insomnia (CBT-I) is a first-line, non-pharmacological intervention for patients suffering from insomnia in different settings. However, its effectiveness in acute and subthreshold insomnia remains unclear. Thus, we aimed to assess the efficacy of CBT-I in patients suffering from acute or subthreshold insomnia through a systematic review and meta-analysis.

Materials and methods: We systematically searched PubMed, Embase, and Cochrane Library in April 2023 for randomized controlled trials (RCTs) comparing patients with acute insomnia who were assigned to CBT-I versus those who were not. We employed the weighted inverse variance method to pool the effect sizes of continuous outcomes. Statistical analyses were performed using R software version 4.1.2, and between-study heterogeneity was assessed with I^2 statistics.

Results: We included five RCTs comprising 529 patients with acute or subthreshold insomnia, of whom 262 (49,5%) were randomized to CBT-I. Studies' follow-up ranged from starting right after the treatment to a period of 12 months. CBT-I significantly reduced the Insomnia Severity Intensity (ISI) score in the overall analysis (mean difference -4.07; 95% CI -6.43, -1.72; p<0.001). Nonetheless, there was no significant difference between groups in terms of total sleep time (mean difference 13.46; 95% CI -3.20, 30.13; p=0.113) and sleep efficiency (mean difference 5.06; 95% CI −0.55, 10.67; p=0.077).

Conclusions: In this meta-analysis of RCTs, CBT-I significantly improved the severity of symptoms associated with insomnia, despite no significant change in the total sleep time and sleep efficiency.

Effect of daridorexant on sleep micro-architecture in adult patients with insomnia disorder – An analysis of two pooled Phase 3 studies

T. Di Marco[1,2], I. Djonlagic[3], Y. Dauvilliers[4], N. Tjiptarto[5], A. Arslan[5], A. Datta[6], G. Hajak[7], J. Hubbard[1], D. Kleinschmidt[5], A. Krystal[8], D. Little[5], A. Olivieri[1], L. Parrino[9], J. Pathmanathan[5], K. Sadeghi[5], B. Westover[5], G. Zammit[10], J. Donoghue[5], T. Scammell[3]
[1]Idorsia Pharmaceuticals Ltd, Allschwil, Switzerland, [2]University of Basel, Department of Clinical Research, Basel, Switzerland, [3]Beth Israel Deaconess Medical Center, Department of Neurology, Boston, United States, [4]Centre Hospitalier Universitaire de Montpellier, INSERM INM Montpellier, Montpellier, France, [5]Beacon Biosignals, Inc., Boston, United States, [6]University Children's Hospital Basel, Basel, Switzerland, [7]Social Foundation Bamberg, Department of Psychiatry, Psychosomatic Medicine and Psychotherapy, Bamberg, Germany, [8]University of California, San Francisco, United States, [9]University of Parma, Department of Medicine and Surgery, Parma, Italy, [10]Clinilabs Drug Development Corporation, New York, United States

Introduction: Insomnia disorder, which is associated with hyperarousal state, impairs sleep micro-architecture (spectral components of the electroencephalogram [EEG] and sleep spindles) and sleep continuity. The orexin system may play a role in this hyperarousal state. This research explores the hypothesis that aspects of sleep micro-architecture pertaining to the hyperarousal state in insomnia may be improved by treatment with the dual orexin receptor antagonist daridorexant.

Materials: Data from patients randomized to placebo (n=615), daridorexant 25 mg (n=618) and daridorexant 50 mg (n=308) were extracted from two 3-month trials (trial 1: NCT03545191; trial 2: NCT03575104) designed to assess the efficacy and safety of daridorexant in insomnia patients (according to DSM-5 criteria) at three dose levels (10 mg [trial 2], 25 mg [both trials], 50 mg [trial 1]). The 10 mg (ineffective dose) data were not used. Baseline and 3-month data were calculated from two consecutive polysomnography nights. Sleep-stage transition probabilities were assessed using a first-order Markov model. Micro-architecture was evaluated using spectral analysis of the EEG. Spectral power density was estimated using multi-taper spectral density estimation. The following EEG spectral bands were analyzed: delta (1–4 Hz), theta (4–8 Hz), alpha (8–12 Hz), and beta (12–30 Hz). Relative power was computed for each band relative to the sum of all four band powers. The relative and band power ratios were calculated for each annotated 30s epoch and aggregated by sleep-wake stage (N1, N2, N3, rapid eye movement [REM], Awake). Spindle density (11–15 Hz) was calculated in N2 sleep using the open-source Luna package. A linear mixed-effects regression model was used to determine whether changes in spectra or spindle incidence or morphology at month 3 were statistically different between daridorexant and placebo or baseline. A hurdle model was used to evaluate the effect on sleep-stage transitions to account for zero count transitions.

Results: Daridorexant 50 mg significantly ($p<0.05$) decreased transitions from sleep to Awake (6.9%) and significantly increased transitions from Awake to N1 (4.5%), Awake to N2 (1.1%), Awake to REM (0.8%), and N1 to N2 (2%), from baseline to month 3 relative to placebo. At month 3, compared to placebo, daridorexant 50 mg significantly ($p<0.001$) reduced relative alpha (-1.7 %) and increased relative delta power (+2.9%) in Awake and decreased relative beta in both Awake and N1 (-1.1% and -0.4%, respectively). A dose-dependent effect was observed, with quantitatively larger effects with daridorexant 50 mg than 25 mg. Relative spectral power in N2, N3 and REM at month 3 did not differ between daridorexant and placebo. No significant treatment effect was observed on sleep spindles.

Conclusions: Treatment with daridorexant for 3 months specifically reduced transitions from sleep to Awake, promoted transitions from Awake and N1 to N2, and reduced relative power in spectral bands associated with vigilance and wakefulness (alpha and beta). These findings are consistent with a decrease of the hyperarousal state associated with insomnia and support the effect of daridorexant on the pathophysiological features of insomnia.

Effect of menopausal transition on sleep deterioration in women during aging process: a 4-year follow-up study from a longitudinal cohort

H.J. Kim[1,2], H. Cho[3,2], S. Kim[2], S.K. Lee[2], C. Shin[2,4,5]
[1]Korea University Ansan Hospital, Department of Neurology, Ansan-si, Korea, Republic of, [2]Korea University, Institute of Human Genomic Study, College of Medicine, Seoul, Korea, Republic of, [3]Korea University, BK 21 Four R&E Center for Learning Health Systems, Seoul, Korea, Republic of, [4]Korea University Ansan Hospital, Biomedical Research Center, Ansan-si, Korea, Republic of, [5]Korea University, College of Medicine, Seoul, Korea, Republic of

Introduction: Perceived sleep problems become more prevalent in women compared to men, especially during the aging process, and it is known that menopause is one of the major inflection points in middle-aged women. However, limited data exist to understand the respective impact of menopause and the aging process itself that deteriorates various sleep characteristics in women.
Materials and Methods: In this study, we examined a 4-year longitudinal data of 1,211 women participants collected as part of the Korean Genome and Epidemiology Study (KoGES). The subjects were grouped into three menopausal stages: pre-menopausal, peri-menopausal, and post-menopausal. The sleep characteristics assessments were based on the Pittsburgh Sleep Quality Index (PSQI). Besides the conventional component estimation of the PSQI, we further evaluated the individual sleep characteristics (e.g., time in bed, mid-time sleep) as continuous variables. Regression analyses were conducted to examine the impact of the menopausal stage on the deterioration of sleep over time, considering age, education level, household income, marital status, drinking status, and body mass index.
Results: Among 1,211 women included, 553 (46%; 56.89 ± 6.83 years old) were post-menopausal, 242 (20%; 47.61 ± 2.89 years old) were peri-menopausal, and 416 (34%; 44.58±2.12 years old) were pre-menopausal group. Compared to baseline, both peri- and post-menopausal groups showed higher PSQI, longer sleep latency and time in bed, and less habitual sleep efficiency after 4-year follow-up (all $p < .02$). In addition, the post-menopausal group also exhibited earlier mid-sleep time ($p < .041$) after 4 years. Compared to the pre-menopausal group, the peri-menopausal group exhibited a significant increase in sleep latency (β [SE] = 4.370 [1.603]; $p = 0.007$), and the post-menopausal group exhibited an increase in PSQI (β [SE] = 0.627 [0.279]; $p = 0.025$) and advancement in mid-sleep time (β [SE] = -0.178 [0.076]; $p = 0.02$).
Conclusions: The present study suggests that various deteriorating sleep characteristics during the aging process among middle-aged women are differently affected by menopausal status.

Effects of at-home transcutaneous electrical trigeminal nerve stimulation on sleep quality in patients with insomnia

J. Kim[1,2], S. Kim[1], W.-J. Lee[3], J.R. Kim[3], S.i. Nam[3], C.-H. Yun[3]
[1]Ybrain Inc, Seongnam, Korea, Republic of, [2]Institute for Basic Science (IBS), Center for Neuroscience Imaging Research, Suwon, Korea, Republic of, [3]Seoul National University Bundang Hospital, Department of Neurology, Bundang Clinical Neuroscience Institute, Seongnam, Korea, Republic of

Introduction: Insomnia patients often exhibit an overactive sympathetic branch of the autonomic nervous system, with hyperarousal models reported as key in the pathophysiology of insomnia. Transcutaneous Trigeminal Nerve Stimulation (TENS) may stabilize this overactive sympathetic nerve and improve insomnia symptoms. This study aimed to investigate the effects and safety of at-home TENS usage for individuals diagnosed with insomnia.

Materials and Methods: A 4-week, single-center, randomized sham-controlled study was conducted. Twenty-nine individuals (18 females; mean age 49.9±11.0 years), aged between 19 to 65 years and diagnosed with insomnia, were included in the study and randomized into an experimental group (n=14) and a control group (n=15). Each participant administered TENS for 20 minutes daily, using a YPS-401B device (Ybrain Inc., South Korea) before bedtime every night for the duration of the study. The experimental group employed an actual device that applied TENS, including pulse (10kHz), and burst waveform (10Hz) to the trigeminal nerve on the forehead. In contrast, the control group attached an identical-looking device to the same location but received sham stimulation. The effectiveness of insomnia symptom improvement was evaluated using questionnaires, such as the Insomnia Severity Index (ISI), Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), Beck Depression Index (BDI), and Generalized Anxiety Disorder 7-item scale (GAD-7), both pre- (T0) and post- (T1) the four-week TENS intervention.

Results: There were no significant interactions between time and groups concerning sleep and mood parameters. However, in the PSQI sub-scale analysis, a notable time group interaction emerged in habitual sleep efficiency ($p < 0.05$). Subgroup analysis of patients with moderate to severe insomnia (ISI score of 15 or higher) revealed a significant interaction between time and group in the PSQI total score ($p < 0.05$). The experimental group (T0: 14.3±2.9, T1: 9.7±3.4) demonstrated a better improvement in the PSQI score compared to the control group (T0: 13.1±1.5, T1: 10.8±3.4). Furthermore, no serious adverse events were reported in either group.

Conclusions: The findings of this study suggest that at-home TENS application can have a beneficial effect on sleep quality, particularly sleep efficiency. However, TENS's effectiveness may be limited in patients with moderate to severe insomnia.

Effects of cognitive therapy for depression on insomnia in women with metastatic breast cancer

C. Mc Brearty[1,2,3,4,5], S. Dallaire-Habel[1,4], J. Savard[1,2,3,4,5]
[1]Université Laval, School of Psychology, Quebec, Canada, [2]Université Laval Cancer Research Center, Quebec, Canada, [3]CHU de Québec-Université Laval Research Center, Quebec, Canada, [4]Center for Studies and Interventions in Mental Health, Quebec, Canada, [5]Réseau Québécois de Recherche en Soins Palliatifs et de Fin de Vie, Quebec, Canada

Introduction: High rates of insomnia are found in patients with advanced cancer. Insomnia often co-occurs with depressive symptoms, and the relationship between insomnia and depression appears to be bidirectional. This suggests that treating one condition may also improve the other one. However, studies conducted in non-cancer patients have shown that insomnia often remains untreated after cognitive-behavioral therapy for depression, with a rate of residual insomnia at posttreatment as high as 51%. However, the effects of a psychological intervention targeting depression on insomnia in the context of cancer are largely unknown. This study aims to assess the effects of CT for depression on insomnia rates and severity in women with metastatic breast cancer.

Materials and Methods: Thirty-seven women with metastatic breast cancer and depressive symptoms were randomly assigned to CT for depression or a waitlist control group (WLC). CT consisted of eight weekly sessions and three booster sessions administered at 3-week intervals following the end of CT. Insomnia was measured at pre- and posttreatment, as well as 3 and 6 months later using the Insomnia Severity Index (ISI). Participants assigned to the WLC group waited for eight weeks (duration of the CT) and were then reassessed on insomnia severity before receiving CT.

Results: The probability of obtaining a clinical insomnia score (ISI≥ 8) decreased significantly from pre- to posttreatment, $F_{(1,31.84)}=5.69$, $p<0.05$ (PRE=83%; POST=52%). The mean insomnia severity score differed significantly between groups at posttreatment, $F_{(1,32.3)}=8.02$, $p<0.01$ (intervention=8.6; control=13.2) and the ISI score decreased significantly from pre- to posttreatment, $F_{(1,30.1)}=7.33$, $p<0.05$ (PRE=12.6; POST=9.1). However, group-by-time interactions were not significant. Analyses were performed pooling both groups together after WLC patients received CT. The proportion of patients with a clinical level of insomnia, $F_{(3,67.58)} =5.58$, $p<0.01$ (PRE=78%; POST=28%; FU3=48%; FU6=22%), and the mean insomnia score significantly decreased over time, $F_{(3,43.7)}=17.08$, $p=0.001$ (PRE=12.14; POST=5.26; FU3=8.38; FU6=5.80).

Conclusions: Although insomnia improved over time, CT for depression was not associated with a greater reduction of insomnia as compared to a waiting list control condition, and a substantial proportion (22 to 48%) of women reported residual insomnia symptoms following this intervention. CT for depression was not associated with a significantly greater reduction of insomnia compared to a WLC condition. Therefore, a concomitant treatment that directly targets insomnia should be provided to women with co-occurring depression and insomnia.

Efficacy of digital cognitive behavioural therapy for insomnia: a randomised controlled trial using a new App that tracks sleep continuously using HRV

M. Schabus[1,2], E.-S. Eigl[1,2], P. Topalidis[1,2], A. Hinterberger[1,2]
[1]Paris Lodron University Salzburg, Lab for Sleep, Cognition and Consciousness Research, Salzburg, Austria, [2]Center for Cognitive Neuroscience Salzburg (CCNS), Salzburg, Austria

Introduction / Question: In the German speaking countries alone, around 25-30 million people complain of poor sleep and symptoms of insomnia. Thus, the demand as well as the offer of digital CBT-I programs is increasing, which makes the systematic investigation regarding the effectiveness of these programs necessary. Here, we report the first results of an RCT study on the efficacy of the smartphone app NUKKUAA, which combines a CBT-I sleep training program with daily and valid objective sleep measurement using an ECG chest strap.

Patients and Methods: Currently, the efficacy of a 6-week app-based sleep training program is investigated by comparing an experimental group (EG) and a control group (KG) at multiple measurement points (MP). During the 6-week app phase, the EG used the app and ECG chest strap daily to measure their sleep. The app phase is preceded by a 2-week baseline. At the beginning of the baseline (T0), at the start (T1) and end of the app phase (T2), and at the follow-up after 4 weeks (T3), various clinical questionnaires are completed by both groups. In addition, three ambulatory polysomnographies (PSG) were performed at T0-T2.

So far, 43 subjects (26 women) aged 21-75 years (M=45.93, SD=15.76) have completed the training phase. All subjects reported a PSQI ≥ 6 and/or ISI ≥ 8 at baseline.

Results: Preliminary analyses show significant sleep improvements in EG, but not KG as measured by the PSQI (8.67 to 6.10; MP*group: p=.030) and ISI (15.14 to 9.71; MP*group: p=.002) over the course of the study. Across both groups, there was improvement in dysfunctional believes (DBAS; p=.010), overall symptoms in the brief symptom inventory (BSI; p=.043), anxiety (BSI Anxiousness subscale; p=.029), and Physical Health domain (WHOQOL-BREF; p=.013).

Conclusions: The preliminary RCT results show training-specific effects in terms of improvement in sleep quality and insomnia symptomatology. Results indicate efficacy of the NUKKUAA app, which comes with the specific feature to combine CBT-I based sleep training with daily and accurate objective sleep measurements in 4 classes (wake, light and deep sleep, REM). More well-controlled and validated dCBT-I trials are needed in order to provide effective, low-threshold and 24/7 support to the ever increasing problem of insufficient sleep (quality) in our society.

Efficacy of internet-based self-help cognitive behavioural therapy for insomnia (CBT-I) in reducing insomnia symptoms among adults with sub-threshold insomnia symptoms: a randomized controlled trial

K.L. Chan[1], H.Y.N. Pau[1], F.O. Poon[1], L.H.B. Lam[1], C.B.I. Lam[2], K.S.K. Chan[3]
[1]Baptist Oi Kwan Social Service, Integrated Mental Health Services, Hong Kong, Hong Kong, SAR of China, [2]The Education University of Hong Kong, Department of Early Childhood Education, Hong Kong, Hong Kong, SAR of China, [3]The Education University of Hong Kong, Department of Psychology, Hong Kong, Hong Kong, SAR of China

Introduction: Insomnia is a common sleep disorder that affects a significant portion of the Hong Kong population. It can have negative impact on emotional well-being, daytime functioning, cognitive abilities, and physical health. It can also increase the risk of developing mental disorders including depression and anxiety. The present study aimed to conduct a randomized controlled trial to examine the efficacy of an internet-based self-help cognitive behavioral therapy for insomnia (CBT-I) in reducing insomnia severity among individuals with sub-threshold insomnia in Hong Kong.

Materials and methods: In this study, we conducted a two-arm parallel randomized controlled trial, with participants randomly assigned to either the seven-week CBT-I intervention group or the waitlist control group. The CBT-I comprised an introductory module followed by six weekly modules incorporating key components of CBT-I, including sleep hygiene education, stimulus control, sleep restriction, relaxation training, and cognitive therapy. The waitlist control group did not receive any intervention during the first seven weeks. Both groups completed research assessments at baseline (T0), immediately after intervention (T1), and four weeks afterwards (T2).

Results: Participant recruitment took place from October to December 2022, resulting in the enrollment of 358 eligible participants who completed baseline assessments. A multilevel model predicting insomnia symptoms showed that the main effect of group was non-significant, but the main effect of time was significant at T1 (B = -2.46, $p < 0.001$, 95% CI = [-3.09, -1.83]) and T2 (B = -2.84, $p < 0.001$, 95% CI = [-3.49, -2.19]). In addition, there was a significant group X time interaction effect at T1 (B = -2.96, $p < 0.001$, 95% CI = [-3.92, -2.01]) and T2 (B = -2.99, $p < 0.001$, 95% CI = [-3.97, -2.02]). Between-group comparisons revealed a significant group difference, with the intervention group showing lower insomnia severity at T1 ($t_{(756.67)}$ = -6.61, $p < 0.001$, Cohen's d = 1.09, 95% CI = [-4.01, -2.17]) and T2 ($t_{(773.70)}$ = -6.53, $p < 0.001$, Cohen's d = 1.10, 95% CI = [-4.06, -2.18]).

Conclusions: The results of this two-arm RCT suggest that online self-help CBT-I is effective for adults with subthreshold insomnia. Given its low cost, high accessibility, and minimal therapist involvement, it is recommended as a first-step intervention.

Electroacupuncture for chemotherapy-associated insomnia and related psychiatric symptoms in breast cancer patients: randomized controlled trials

Z.-J. Zhang[1]
[1]The University of Hong Kong, School of Chinese Medicine, Pokfulam, Hong Kong, SAR of China

Introduction: Chemotherapy often causes insomnia, anxiety, depression, and cognitive impairment in patients with breast cancer. Electroacupuncture may have beneficial effects in improving chemotherapy-associated insomnia and related psychiatric disorders. Here we reported results of two randomized controlled trials.

Methods and results: In the first trial, 138 breast cancer patients with chemotherapy-associated insomnia were randomly assigned to receive either 15-session active or sham acupuncture (69 each) over 18 weeks. Compared to sham control, active acupuncture produced short-term treatment and long-term follow-up better outcomes in improving sleep onset latency, total sleep time, sleep efficiency, anxiety, depression, and quality of life. Participants of the active acupuncture group had a dramatically higher cessation rate of sleeping medications than the sham control (56.5% versus 14.3%, P = 0.011). In the second trial, 93 breast cancer patients under or post chemotherapy with cognitive impairment (chemobrain) were randomly assigned to electroacupuncture trigeminal nerve stimulation plus body acupuncture (EA/TNS+BA, n = 46) and minimum acupuncture stimulation (MAS, n = 47) for 2 sessions per week over 8 weeks. EA/TNS+BA treated group had much better outcomes than MAS-treated group on cognitive performance, sleep quality, and anxiousness. The two trials consistently showed that all treatment-related adverse events were mild.

Conclusions: These results suggest that electroacupuncture had particular benefits in reducing chemotherapy-associated insomnia and related psychiatric symptoms and could serve an effective therapy for breast cancer patients.

Estimation of the gobal prevalence of chronic insomnia among adults: a literature-based analysis

A.V. Benjafield[1], F.H. Sert Kuniyoshi[2], A. Malhotra[3], L.F. Maurer[4], E.M. Wickwire[5]
[1]ResMed Science Center, Sydney, Australia, [2]ResMed Science Center, San Diego, United States, [3]University of California San Diego, La Jolla, United States, [4]mementor DE GmbH, Leipzig, Germany, [5]University of Maryland, School of Medicine, Baltimore, United States

Introduction: Insomnia, defined as difficulty initiating and/or maintaining sleep with associated daytime consequence, is among the most common sleep disorders worldwide. Insomnia is associated with a broad range of adverse medical, mental health, and economic outcomes, and is widely recognised as an independent condition warranting treatment. Despite the globally recognised burden of insomnia, no prior study has sought to determine the global prevalence of insomnia. Estimates of the number of people affected are important for effective health policy. The purpose of this literature-based analysis was to estimate the global prevalence of insomnia among adults.

Materials and methods: We applied published nation-specific estimates of the population prevalence of insomnia to current population estimates for all countries worldwide. We obtained current global populations by sex and age (20yrs+) from the United Nations World Population Prospects 2022 and utilised research search engines (PubMed and Embase) to identify relevant peer-reviewed studies on insomnia prevalence in the general population published in English language. The search was conducted without restricting the timeframe and used key terms such as insomnia, prevalence, general population. The search was done between May and June 2023. The studies were reviewed in detail, and population, methods (e.g., operational definitions of insomnia), and results were extracted. We excluded studies that did not report the prevalence of chronic insomnia among the general adult population (i.e., difficulty initiating and/or maintaining sleep, $\geq$3 nights/week, $\geq$1 month duration, with adverse daytime consequence). Then we applied the following criteria to determine which insomnia prevalence estimates to use: 1) for studies that reported insomnia prevalence stratified by both age and sex together we used these stratified results; 2) for studies that reported insomnia prevalence by age and sex separately, we used the age-based results; 3) for studies that reported insomnia prevalence by sex but not age, we used the sex-based results; 4) for studies that reported only a single prevalence estimate, we applied the estimate to the entire population for that nation. When >1 potential reference study existed for a nation, expert opinion was used to select the most methodologically rigorous study. For countries lacking a reference study, we applied the estimates from a well-conducted large study on insomnia prevalence.

Results: Of 236 nations recognised by the United Nations, 29 were found to have a suitable nation-specific prevalence estimate of insomnia among adults. Based on these published data, the estimated global prevalence of chronic insomnia is 880,088,936 adults (male=355,804,305; female=524,284,631), reflecting 16.7% of the adult population. A sensitivity analysis was performed using a very conservative operational definition of severe chronic insomnia, which resulted in a global prevalence estimate of 430,020,462 adults (8.2% of adult population).

Conclusions: To our knowledge, this is the first study to aggregate published data to estimate the global population prevalence of insomnia, with approximately 880 million adults suffering chronic insomnia worldwide, representing 16.7% of the global population. Nearly half of these individuals suffer severe chronic insomnia. The estimated prevalence rates underscore the need for comprehensive sleep health initiatives.

Acknowledgements: This study was funded by ResMed.

Evaluating the efficacy and safety of daridorexant in treating chronic insomnia diagnosed by Somnomedics® HomeSleep Test: a clinical trial proposal

L. Ramos[1], C. Rivas Echeverria[2,3,4,5,6], L. Molina[7,4], A.G. Pérez[8,2], F. Rivas Echeverria[1,9,10,2,11,12,8], A. Rui Leal[13,14,15], K. Siddiqui[16,15], Z. Peña[2], C. Marabotti[17], V. Rivas[2], C. Rivas Molina[11], A. Zacher[18,19,20,2], P. Serrano[21,2,22], N. Campos[23,2], E. Venturini[24], M.B. Gallardo Perelló[4], C. Pont febrer[4], I. Sainz[25], L. Vargas Ramírez[26], H. Prá[4], J. De Otero[4], M.J. Torres[4], A. Bauzá[4]

[1]Kauel USA, Artificial Intelligence, Houston, United States, [2]Sleepcare clinics, Leicester, United Kingdom, [3]SLEEPCARE Clinics of Sleep and Respiratory Medicine/the Health Suite, Leicester, United Kingdom, [4]SLEEPCARE Clinics of Sleep and Respiratory Medicine/Hospital Parque Llevant, Porto Cristo, Spain, [5]The Centre Surgery, Hinckley, United Kingdom, [6]The Health Suite, Sleep Clinic, Leicester, United Kingdom, [7]IBSALUT Conselleria Salut I Consum Illes Balears, Palma de Mallorca, Spain, [8]Universidad de Los Andes, Merida, Venezuela, [9]Miu City University, Miami, United States, [10]Pontificia Universidad Católica del Ecuador, Ibarra, Ecuador, [11]Universidad de Navarra, Facultad de Medicina, Pamplona, Spain, [12]Yachai Tech University, Ecuador / MIU City University Miami, USA, San Miguel de Urcuqui, Ecuador, [13]Fondation Sanitus, Porto, Portugal, [14]Med-Linkare Clinic, Porto, Portugal, [15]SLEEPCARE Clinics of Sleep and Respiratory Medicine/Heart Friends Around The World (HFATW), Kolkata, India, [16]Ruby General Hospital, Kolkata, India, [17]CNR Institute of Clinical Physiology of Pisa, Pisa, Italy, [18]British Society of Pharmacy Sleep Services, Lincoln, United Kingdom, [19]CIO European Academy Dental Sleep Medicine, Lincoln, United Kingdom, [20]Taskforce Member on an Independent Advisory Board to the All Party Parlamentary Group for Sleep, Lincoln, United Kingdom, [21]Hospital Clínico Universitario "Lozano Blesa", Zaragoza, Spain, [22]Hospital Viamed Montecanal, Zaragoza, Spain, [23]Universidad Técnica de Manabí, Portoviejo, Ecuador, [24]Cecina Civil Hospital, Department of Cardiology, Unit of Cardiac Rehabilitation, Cecina, Italy, [25]Hospital Virgen del Rocio, Centro de Rehabilitación Cardiaca Fisiocard, Sevilla, Spain, [26]Instituto Neumológico del Oriente, Bucaramanga, Colombia

Introduction: Insomnia, a widespread sleep disorder impacting millions globally, brings significant health, economic, and social burdens. Non-pharmaceutical is the first-line therapy. Although treatments such as hypnotics and antidepressants are employed (frequently misused), yet they present issues like side effects, ineffectiveness, and dependency. In this regard, a new medication, Daridorexant, a dual orexin receptor antagonist, shows promise. However, previous studies rely either on self-reported or subjective measurements, which are prone to biases; or full polysomnography, which is unaffordable, impractical and unrealistic in most clinical settings.

Consequently, a novel, objective approach is needed to assess sleep quality and treatment efficacy. Somnomedics® HomeSleep Testing (HST), a cost-effective, convenient, and less intrusive method for patients, emerges as a potentially superior alternative to the gold standard sleep measurement method, polysomnography. This proposal aims to evaluate the efficacy and safety of Daridorexant in treating insomnia diagnosed by HST and validate the latter's reliability by comparing its results with polysomnography. To the best of our knowledge, this is the first trial assessing the subject.

Materials and Methods: We propose conducting a multicentric, randomised, double-blind, placebo-controlled clinical trial among adult patients with chronic insomnia diagnosed with HST, randomly assigned to receive either Daridorexant or a placebo. Patients from France, India, Italy, Portugal, Spain, and The United Kingdom will be enrolled. The masking of group assignments from both investigators and participants will ensure bias elimination. Unmasking will be possible in case of an emergency. Exclusion criteria are secondary insomnia (Chronic Obstructive Pulmonary Disease, Obstructive Sleep Apnoea, psychiatric disorders, painful conditions like rheumatic disease or cancer, etc). Sleep patterns and architecture will be objectively measured through HST and polysomnography performed simultaneously, allowing a comparative analysis between these two diagnostic methods. The primary endpoints will be the change in baseline and three months from initiating the therapy in sleep duration, wake time after sleep onset, sleep latency, REM latency, sleep fragmentation, sleep efficiency, percentage of light, deep and REM sleep, and cortical arousals. Statistical analysis will be an integral part of our study to identify any significant differences between the test and control groups and verify the efficacy of Daridorexant. Additionally, it will be used to evaluate the correspondence and reliability of HST compared to polysomnography.

Conclusions: This study's innovative approach, utilising HST as a diagnostic tool within a robust clinical trial framework, could redefine the evaluation of insomnia management. It could replicate Daridorexant's efficacy and potentially underscore HST as a better-suited diagnostic tool for insomnia, offering a more accurate, cost-effective, and less invasive method of assessing sleep. This research could facilitate the development of more personalised therapeutic strategies by identifying specific subgroups that benefit most from Daridorexant treatment. The findings from this study are poised to

contribute significantly to sleep disorder research, potentially setting a new standard for insomnia diagnosis and treatment evaluation.

Acknowledgements: We present to this audience this proposal in order to get more support and participating groups, and centres. We acknowledge all the coauthors that have reviewed the proposal and are actively prepared to enrol patients.

Experiences of insomnia, help-seeking, and treatment preference among Chinese young adults with insomnia: a qualitative study

H.F. Sit[1], J.M.Y. Or[1], N.Y. Chan[2], F.T.W. Cheung[1], R.R. Wang[1], Y.K. Wing[2], S.X. Li[1,3]
[1]The University of Hong Kong, Sleep Research Clinic and Laboratory, Department of Psychology, Hong Kong, Hong Kong, SAR of China, [2]The Chinese University of Hong Kong, Li Chiu Kong Sleep Family Assessment Unit, Department of Psychiatry, Faculty of Medicine, Hong Kong, Hong Kong, SAR of China, [3]The University of Hong Kong, The State Key Laboratory of Brain and Cognitive Sciences, Hong Kong, Hong Kong, SAR of China

Introduction: Insomnia is a common mental health problem that affects up to 38% of the youth population. However, only around 10% of young people with insomnia seek professional care for their sleep problems. Therefore, understanding the experience of insomnia, help-seeking behaviours, and treatment preferences from the young people's perspective is essential to the development of suitable programs that can address their needs and concerns. The present study aimed to explore the clinical characteristics of a sample of Chinese youth with insomnia and to identify potential barriers to engaging in treatment.

Materials and methods: Nineteen treatment-seeking young adults (age range=18-20; mean=19.16; SD=0.96; 78.95% female) with DSM-5 insomnia disorder as ascertained by clinical interview took part in a 30-minutes one-to-one semi-structured qualitative interview conducted via videoconferencing. The interview covered the questions on one's experience of sleep disturbance, previous help-seeking behaviours, and preferences for insomnia treatment. Interviews were audio-recorded and verbatim transcribed. Data analysis for qualitative data was guided by a 6-phrase thematic approach described by Braun and Clarke (2006).

Results: Four major themes were identified for the daytime experiences associated with insomnia: physical complaints (e.g., daytime tiredness), cognitive difficulties (e.g., difficulty in concentration), psychomotor difficulties (e.g., being less active during class), and mood impairments (e.g., irritability). Only 15.79% of participants have sought professional help (e.g., medical doctor, traditional Chinese medicine practitioners) for insomnia. Three major themes were identified for the reasons of not seeking professional help: self-perceived severity of symptoms, no access to insomnia treatment, and family influence (e.g., the family believed that it is not necessary to see a doctor). Three themes were identified for the behaviours to improve sleep: self-reliance (e.g., searching information on the Internet), use of melatonin, and behavioural approaches (e.g., relaxation). Most participants (78.95%) preferred non-pharmacological treatment. Two themes were identified for the consideration of the treatment approach: safety (e.g., drug dependence and side effects) and effectiveness of treatment (e.g., short-term and long-term treatment effects). For treatment delivery modality, most participants (73.68%) preferred digital (e.g., app, telemedicine), followed by individual (42.11%), group-based (26.32%) and in-person (26.32%) interventions. Three themes were identified for the considerations of modality: convenience (e.g., time and place), guidance during treatment (e.g., whether personalised support would be provided during treatment), and treatment setting (e.g., confidentiality, and interaction with others).

Conclusions: The current study improved our understanding of how Hong Kong Chinese young adults perceived their insomnia experience and preferred ways of managing insomnia. The findings may inform clinical practice, especially how to best increase treatment seeking and accommodate the needs of young people in the future treatment design for insomnia. Promoting sleep literacy and help-seeking behaviours is needed in future implementation of targeted interventions.

Explanatory model of sleep and insomnia in the Arab world: a qualitative study

M. El Gewely[1], Y. Leanza[1], R. Reda Moustafa[2], N. Attia[1], H. Hesham[1], C. Bastien[1], C.M. Morin[1]
[1]Laval University, Social Sciences, Quebec, Canada, [2]Ain Shams University, Neurology, Cairo, Egypt

Introduction: Insomnia disorder affects 10% of the general population. It is often a chronic condition and is associated with adverse health outcomes. Current understanding of the etiology of insomnia stems from a biopsychosocial model (ie: 3P) and is focused on WEIRD cultures (i.e. westernized, educated, independent, rich and democratic). However, beliefs and attitudes about sleep vary across cultures. To design culturally sensitive interventions, local cultural models that explain how individuals from non-WEIRD cultures (ie: Arab) experience sleep and insomnia are necessary. This study aims to document explanatory models of healthy sleep and insomnia as experienced in the Arab world.

Materials and Methods: Ninety-four adults from the Arab community were recruited from a sleep clinic in Cairo (Egypt) and social media. Twenty-five adults were included (meeting insomnia criteria, minimum ISI of 10 and no previous consultation with a sleep physician). Comorbidities with psychiatric or sleep disorders were excluded. Participants also completed an insomnia treatment acceptability scale (CBTi vs pharmacotherapy). The interview grid aimed to capture insomnia experience, sleep-related beliefs, and behaviors. Questions were classified based on the four components of the explanatory model of distress theory (Kleinman & Good, 1985) : 1) Nature of distress, including the idiom as well as the body-mind experiences of distress ; 2) Causes of distress, referring to the subjective explanations of what precipitated or contributed to the perpetuation of the distress; 3) Coping/help-seeking strategies, the culturally specific sources used to regulate the distress and; 4) Barriers to help-seeking, any obstacle associated with accessing resources. The interviews were transcribed and coded by three coders. To reach interrater agreement, coding comparison were made in an iterative process.

Results: In total, 60% of the participants were recruited from the clinic, 70% were females and the average age was 38 years. Most of the participants were Egyptians (n = 20; 80%), and the remaining were from Sudan, Syria, Jordan, and Yemen. Insomnia was severe (ISI average: 20 ± 3.76). Healthy sleep was perceived as essential for performance, rest, wellness (psychic and brain) functions as well as a sign of blessing from God. "Insomnia" was represented as a reversed condition to "normal sleep". It was experienced in the brain (*demagh*) and defined as "overthinking, stress and anxiety". Causes of "insomnia" were linked to psychological (i.e.: unrested psyche), religious (ie: fear of missing the morning prayers), social (i.e.: fear of robbery while sleeping; evil eye) and/or biological factors (i.e.: biological clock). Strategies to cope with "insomnia" involved spiritual practices (i.e.: prayers), which triggered inner peace; medication use, which was associated with fear of side effects; as well as changes in sleep and food hygiene (i.e.: sleep deprivation; drinking herbals). Barriers to help seeking were unawareness of treatment options. When asked about treatment preference, 84% preferred a non-pharmacological intervention.

Conclusions: The explanatory model highlights differences in insomnia experience between WEIRD and Arab cultures. Future treatment protocols designed for Arabs should target cultural idiom (ie: racing mind) and causes of distress (ie: evil eye) as well as to reinforce local coping strategies (ie: prayers).

Exploring the link between premature ovarian insufficiency, insomnia and circadian pathways

A. Kloster[1], M.M.-O. Moysés-Oliveira[1], L. N. G. Adami[1], H. Hachul[1], M. L. Andersen[1,2], S. Tufik[1,2]
[1]Sleep Institute, Associação Fundo de Incentivo à Pesquisa, São Paulo, Brazil, [2]Universidade Federal de São Paulo, Departamento de Psicobiologia, São Paulo, Brazil

Introduction: Sleep disturbances are frequent complaints within menopausal women. An overlap in the genetic architecture of insomnia and premature ovarian insufficiency (POI) have been demonstrated and oxidative stress has been suggested as a putative molecular mechanism underlying this convergence. Yet the specific circadian biological pathways which link those two clinical manifestations are still a knowledge void to the field and the extent to which those circadian pathways affect neural circuits remains poorly understood.
Aims: We established a functional interaction network between genes related to POI and insomnia, and identified the most relevant cell types in which those biological connections take place. We then contrasted POI-associated genes with a compendium of gene expression markers for neural circadian control, defining pathways that underlie the connection between ovarian insufficiency and the physiological clock.
Methods: Previously reported lists of genes associated with POI and insomnia were contrasted with a gene list, which reflect the circadian gene expression regulation in the brain. The latter gene list was retrieved from recent single-cell RNA-seq studies which identified gene expression markers for the suprachiasmatic nuclei (SCN) and genes with circadian expression in neural cell types. Intersection gene lists were used as input on a protein-protein interaction (PPI) analysis via String database (https://string- db.org/) with a minimal interaction score of 0.7, allowing a maximum of 5 additional interactors in the network. Benjamini–Hochberg test, adjusting for multiple comparisons, was used to identify Gene Ontology (GO) and Kyoto Encyclopedia of Genes and Genomes (KEGG) enriched pathways, with a significance threshold of adjusted *p-value*<0.05.
Results: The PPI generated between the 27 genes that compose the intersection between POI and insomnia gene lists formed 3 networks with a total of 16 nodes, with 5 of these nodes being additional interactors. The vast majority of those nodes (14 out of 16) are highly expressed in the central nervous system, prompting us to investigate the relation between POI genes and the circadian control in the brain. When contrasting the POI gene list with the list of genes related to circadian gene expression regulation in neural cell types, the intersection of 11 genes formed a PPI with 9 nodes, 5 of which are additional interactors. Enriched pathways among the intersect between POI and neural circadian genes include cortisol synthesis and secretion (*p-value*=1.08E-07, OR=261.37), circadian entrainment (*p-value*=2.42E-07, OR=171.16), ovarian steroidogenesis (*p-value*=1.04E-09, OR=541.98), GnRH signaling pathway (*p-value*=2.32E-07, OR=178.89), and oocyte meiosis (*p-value*=2.40E-08, OR=200.27).
Conclusions: Our findings suggest that disruption of biological pathways related to hormonal regulation and signalization are common in the joint presence of both phenotypes. One of the major physiological mechanisms supporting the crosstalk between the ovary and the brain is the hypothalamic–pituitary–gonadal axis. The intersect gene lists and the enriched pathways retrieved from our analysis might reflect how the circadian control of neural circuits affect the steroidogenesis and the female reproductive system.
Keywords: Sleep, premature ovarian insufficiency (POI), insomnia, steroidogenesis, reproductive hormone.

Feasibility and efficacy of an online cognitive behavioral therapy program for insomnia and anxiety in older adults

J. Adoutoro[1], F. Pomares[1,2,3], C. Desrosiers[1], L. Barbaux[1,2,3], M. Reyt[1,2,3], K. Gong[1,3,4], K. Dion[5,6], M. Lanthier[5,6], R. Robillard[5,6], S. Grenier[1,7], J. Savard[8], T.T. Dang-Vu[1,2,3]
[1]Centre de Recherche de l'Institut Universitaire de Gériatrie de Montréal, CIUSSS Centre-Sud-de-l'Ile-de-Montréal, Montreal, Canada, [2]Concordia University, Department of Health Kinesiology and Applied Physiology, Montreal, Canada, [3]Center for Studies in Behavioral Neurobiology, Concordia University, Montreal, Canada, [4]Concordia University, Département de Psychology, Montreal, Canada, [5]University of Ottawa, School of Psychology, Ottawa, Canada, [6]University of Ottawa Institute of Mental Health Research at the Royal, Sleep Research unit, Ottawa, Canada, [7]Université de Montréal, Département de Psychologie, Montreal, Canada, [8]School of Psychology, Université Laval and CHU de Québec-Université Laval Research Center, Québec, Canada

Introduction: Older adults are vulnerable to insomnia complaints that are often comorbid with anxiety. Although cognitive-behavioural therapy (CBT) is the first-line treatment for insomnia, it is still not widely available given the lack of trained professionals and the costs associated with the treatment. In order to its increase accessibility in older adults suffering from insomnia and associated anxiety symptoms, we developed an online CBT program for insomnia and anxiety (eCBT+) within a web-based platform for health promotion in older adults (e-SPACE). This randomized controlled trial aimed to 1) assess the usability and acceptability of the platform for the eCBT+ intervention and 2) evaluate its efficacy in older adults with insomnia (https://doi.org/10.1186/ISRCTN15338211).

Materials and Methods: Ninety-two participants aged ≥ 65 years with insomnia (Insomnia Severity Index (ISI) score≥ 8), having access to the Internet and a computer, tablet or smartphone, were randomized to either an immediate intervention with the eCBT+ program for 7 weeks (n=47, 35 women) or a wait-list (WL) control group (n=45, 34 women). Exclusion criteria were hospitalization within 3 months, severe visual and/or hearing loss, suicidal thoughts, neurocognitive disorder, or major bipolar disorder. Both groups completed sleep diaries for 2 weeks to assess sleep efficiency (SE), as well as the ISI and the Geriatric Anxiety Inventory (GAI), before and after the 7-week intervention or wait period. After receiving the eCBT+ program (immediately for eCBT+ group and after 7 weeks for WL group), participants completed an adaptation of the System Usability Scale (SUS) to assess the platform's ease of use (a score >50.9% is considered good) and the extension of Technology Acceptance Model (TAM-2) questionnaire to identify the main factors influencing acceptability of the online program. ANCOVAs were conducted on SE, ISI, and GAI scores to evaluate the effect of the eCBT+ program. Age and sex were added as covariates.

Results: The platform was deemed user-friendly (SUS score = 66.7%). The TAM-2 showed that perceived ease of use, perceived usefulness, and result demonstrability were the main factors contributing to its acceptability and contributed to 19%, 18%, and 18%, respectively, of its score. A significant group*time interaction revealed lower ISI $(F$= 33.4, df= 1, p< 0.001) and lower GAI scores $(F$= 22.6, df= 1, p< 0.001) post-intervention in the eCBT+ group compared to the WL group. A greater increase of SE was also observed in the eCBT+ group compared to the WL group after the intervention $(F$= 11.2, df= 1, p< 0.01).

Conclusions: Overall, our results highlight the usability and acceptability of our eCBT+ program within the e-SPACE platform in older adults. We further demonstrate the efficacy of the eCBT+ program for reducing insomnia severity and anxiety symptoms. Our online eCBT+ program thus appears to be a promising tool that can provide accessible insomnia treatment to older adults with insomnia.

Frequency of insomnia in patients with pulmonary hypertension

M.F. Dourado[1], M.C. Neves[1], C.M. Guimarães[2], A.R. Silva[2], S.B. Leal[1], R. Galtieri[3], C. Salles[4]
[1]Federal University of Bahia, University Hospital Professor Edgard Santos, Salvador, Brazil, [2]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [3]Federal University of Bahia, Post Graduate Program in Interactive Processes of Organs and Systems, Salvador, Brazil, [4]Bahiana School of Medicine and Public Health, Federal University of Bahia, Jorge Amado University Center, International Center of Clinical Sleep Medicine and Research, University Hospital Professor Edgar Santos, Salvador, Brazil

Introduction: Insomnia is strongly related to various pathologies, interfering in cellular and immune response and impacting on mental, respiratory, and cardiovascular health. Studies have shown that patients with complaints of insomnia are at increased risk for non-fatal and fatal cardiovascular events. However, the literature on insomnia in patients with pulmonary hypertension (PH) is scarce. PH is a clinical and hemodynamic syndrome, defined as a mean pulmonary artery pressure greater than 20 mmHg, measured by right heart catheterization. The treatment of PH involves the use of specific medications that act on vascular tone, as well as the approach of other clinical conditions that may interfere with disease control, including sleep.
Objective: To evaluate the occurrence of insomnia in patients with pulmonary hypertension.
Methods: This is a cross-sectional study, in which 40 patients followed in a Pulmonary Hypertension outpatient clinic in Salvador, Bahia, Brazil, with an established diagnosis of PH through invasive measurement of mPAP by right-chamber catheterization (mPAP >20mmHg) participated. Questionnaires were applied regarding demographic data and an Insomnia Severity Index questionnaire.
Results: The total sample comprised 40 patients with PH, aged 55 (44 – 69,5) years. Self-declared blacks were 82.5% of the patients (n = 33); females corresponded to 70% of the individuals (n = 28). The mean BMI of the population was 29.7 ± 8.9 Kg/m^2. Mean abdominal circumference was 100.7 ± 18.5 cm; mean systolic blood pressure was 124.2 ± 18.7 mmHg, while mean diastolic blood pressure was 80.5 ± 11.8 mmHg. Regarding the Insomnia Severity Index (ISI): patients have difficulty getting to sleep = 60% (n = 24); difficulty maintaining sleep = 65% (n = 26); difficulty waking up very early = 32.5% (n = 13); considered themselves dissatisfied with their current sleep pattern = 42.5% (n = 17); considered that their sleep problem interferes with their daytime activities = 57.5% (n = 23); think that others perceive their sleep problem as interfering with their quality of life = 45% (n = 18); are worried or stressed about their sleep problem = 40% (n = 16). The median ISI score was 7.5 (3.0 - 13.5) points. Regarding the ISI classification, 47.5% (n = 19) of the patients were classified as having clinical insomnia.
Conclusion: This study shows that the frequency of insomnia in patients with PH is higher than in the general population, as well as a significant negative impact on daily activities.

Group-based cognitive behavioural therapy and bright light therapy in youths with insomnia and evening chronotype: interim analysis of a randomised controlled trial

F.T.W. Cheung[1], N.Y. Chan[2], J.W.Y. Chan[2], J. Zhang[2,3], A.M. Li[4], C.A. Espie[5], M. Gradisar[6,7], Y.-K. Wing[2], S.X. Li[1,8]
[1]The University of Hong Kong, Sleep Research Clinic & Laboratory, Department of Psychology, Hong Kong, Hong Kong, SAR of China, [2]The Chinese University of Hong Kong, Li Chiu Kong Family Sleep Assessment Unit, Department of Psychiatry, Faculty of Medicine, Hong Kong, Hong Kong, SAR of China, [3]The Affiliated Brain Hospital of Guangzhou Medicine University, Center for Sleep and Circadian Medicine, Guangzhou, Guangdong, China, [4]The Chinese University of Hong Kong, Department of Paediatrics, Faculty of Medicine, Hong Kong, Hong Kong, SAR of China, [5]Nuffield Department of Clinical Neurosciences and Sleep & Circadian Neuroscience Institute, University of Oxford, Oxford, United Kingdom, [6]WINK Sleep Pty Ltd, Adelaide, Australia, [7]Sleep Cycle AB, Gothenburg, Sweden, [8]The University of Hong Kong, The State Key Laboratory of Brain and Cognitive Sciences, Hong Kong, Hong Kong, SAR of China

Introduction: Insomnia and eveningness are prevalent and often comorbid in youths. Whilst cognitive behavioural therapy for insomnia (CBT-I) is a promising intervention in adults, its effectiveness in addressing comorbid insomnia and circadian issues in youths remained unclear. In addition, it remained unclear whether addition of bright light therapy (BLT) (being effective in shifting circadian phase) and CBT-I will further improve sleep and circadian outcomes in youths. This study examined the efficacy of CBT-I and CBT-I plus BLT in improving insomnia symptoms, mood symptoms, daytime functioning (e.g., sleepiness, fatigue, cognitive functioning) and circadian measures compared to a waitlist control group.

Materials and Methods: This is an assessor-blind, parallel-group, randomised controlled trial. 114 participants (age: 19.8 ± 3.3, 53.5% female) with comorbid insomnia with significant impairments/distress and eveningness were recruited. Participants were randomised into one of the three groups: CBT-I with active BLT (CBTI+BLT), CBT-I with placebo BLT (CBTI-BLT), and waitlist control. The intervention comprised six-week group-based CBT-I with BLT starting from the second week. Assessments were completed at baseline and post-treatment, and the two intervention groups completed a follow-up assessment at 1-month post-treatment. The primary outcomes included changes in insomnia symptoms as measured by the insomnia severity index (ISI), circadian preference as measured by the morningness-eveningness questionnaire (MEQ), and the midpoint of sleep derived from the Munich chronotype questionnaire (MCTQ). Secondary outcomes included sleep parameters measured by sleep diary and actigraphy, and measures of mood symptoms and daytime functioning. Analyses of outcome measures were conducted using multilevel modelling (MLM) following the intention-to-treat principle.

Results: An MLM comparison between the three groups showed a significant treatment*time interaction effect on insomnia severity ($F(2, 99.63) = 8.36$, $p = .001$), where both intervention groups had significant improvements in insomnia severity as measured by ISI compared to WL. The treatment*time interaction effect was significant for the midpoint of sleep ($F(2, 100.11) = 4.47$, $p = .01$) but insignificant for MEQ scores ($F(2, 98.59) = 1.60$, $p = .21$). Post-hoc analyses showed only the CBTI+BLT group showed significant advancement of the circadian phase as measured by MCTQ ($p = .004$, $d = 0.69$). Regarding secondary outcomes, significant treatment*time interactions between the three groups were found in self-report sleep quality, clinician-rated mood measures, and measures on daytime functioning. MLM results showed similar improvement of treatment effects between CBTI+BLT and CBTI-BLT on the primary and secondary outcomes at post-treatment and 1-month follow-up.

Conclusions: The current study showed that CBT-I effectively improves insomnia severity, depressive symptoms, and daytime functioning in youths with insomnia and eveningness. CBT-I with adjunct BLT additionally advanced the circadian rhythm. Future research could include objective measures of sleep and circadian parameters, such as polysomnography and utilising circadian biomarkers. Lastly, the potential moderating effects of circadian rhythm on treatment outcomes of CBT-I should be examined.

Influence of daridorexant on the health-related quality of life in patients with chronic insomnia

Y. Winter[1], D. Apel[1], S. Groppa[2]
[1]Mainz Comprehensive Epilepsy and Sleep Medicine Center, Department of Neurology, Johannes Gutenberg-University, Mainz, Germany, [2]University of Mainz, Department of Neurology, Mainz, Germany

Introduction: Daridorexant is the new dual orexin-receptor anatgonist approved in Europe for the treatment of chronic insomnia. It demonstrated its clinical efficacy and safety in randomized controlled studies. However, the real-world experience and the data on health-related quality of life are still not available. We performed an prospective observational study to investigate the influence of daridorexant on the health-related quality of life (HrQol) in patients with chronic insomnia.
Materials and methods: We recruited patients with chronic insomnia diagnosed according to DSM V criteria. All patients participated in the Mainz Sleep Registry (MAINZ-SLEEPREG). The clinical and HrQoL evaluation was performed prior to beginn the therapy with daridorexant (baseline) and after three months. HrQol was evaluated by EuroQol5D (EQ5D Index and EQVAS: visual analogue scale).
Results: 32 patients aged 53.2 ± 10.7 years (59.4% females) participated in our study. All patients received the standard dosis of daridorexant of 50mg/night. The baseline values of the EQ5D Index and EQVAS were reduced by approximately 21% in comparison to general German population. At the follow-up after three month the EQ5D Index value (0.72 ± 0.19) improved on daridorexant by 18% in comparison to baseline (0.61 ± 0.22, $p < 0.05$). Similar increase of HrQol was observed on EQVAS (62.4 ± 18.7 at baseline versus 74.2 ± 20.5, $p > 0.05$).
Conclusions: We provide the evidence from a real-world study that daridorexant significantly improves HrQol in patients with chronic insomnia. Our study encourage farther post-marketing studies to investigate the role of daridorexant in the treatment of chronic insomnia in the real-life setting.

Insomnia and personality traits: a cross-sectional study

B. Conway[1], M. Carmo[1], A.C. Toscanini[1], R. Hasan[1], R.E. Rafihi-Ferreira[1]
[1]Institute of Psychiatry, Faculty of Medicine, University of São Paulo, Psychiatry, São Paulo, Brazil

Introduction: Insomnia is the most prevalent sleep disorder among adults, with damage to physical health, mental health and quality of life. Personality traits can be considered predisposing and potential perpetuating factors of chronic insomnia. Studies based on the five-factor model of personality show that insomniacs demonstrate higher levels of neuroticism and lower levels of conscientiousness, however the existing literature on the matter is still inconclusive about which personality traits show a higher level of correlation with chronic insomnia. Identifying and analyzing the most pervasive attributes in insomniacs may help in choosing and planning the most adequate treatment to each individual patient.

Aim: Identifying personality traits associated with the presence of chronic insomnia.

Materials and Methods: Participated 608 adults, ages 18-59 years (M=38.7, SD=10.6), 81,1% women and 18,9% without a college degree, divided into two groups: with insomnia (N=371, 78,2% women, M=40,1; SD=11,3) and without insomnia (N=237, 85,7% women, M=36,6 years; SD=9). Insomniacs met DSM-V diagnostic criteria for chronic insomnia and controls are healthy adults with no complaints of insomnia. Individuals with other sleep disorders were excluded. All participants completed the online version of NEO Five-Factor Inventory Revised (NEO-FFI-R) with the assistance of a psychologist. A multivariate analysis was conducted using a binary logistic regression model to assess the personality factors associated with insomnia classification. The multivariate model included age, sex, academic background (college degree/ no college degree), anxiety score, depression score, and the big five personality traits (Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness) as predictors of insomnia classification (insomnia/ no insomnia).

Results: The groups differed on average in all personality traits ($p < 0.05$). Compared to controls, more insomniacs scored high on neuroticism and low on openness, agreeableness, and conscientiousness ($p < 0,05$). The binary logistic regression model was statistically significant [χ^2 (8) = 168, $p < .001$] and explained approximately 42.4% of the variance (McFadden's R^2). We found that, holding all other predictor variables constant, the odds for insomnia classification increased by: 131% for males; 200% for people without a university degree; 6% for each additional year of age; and 3% for each reduced point on the Openness scale. Data should be interpreted with caution due to the small number of male participants and of those who do not have a higher education.

Conclusions: Our results contradict previous studies that indicated an association between insomnia and high neuroticism scores and low conscientiousness scores. However, our findings point to a new association not suggested in previous studies, by demonstrating an association between insomnia and low Openness score. These findings indicate that personality traits such as openness may be an important factor in preventing and treatment for insomnia. For further conclusions, additional investigations are needed to identify which aspects of the openness trait are more or less associated with insomnia.

Keywords: Insomnia; Neuroticism; Openness; Personality traits.

Insomnia and stress during the COVID-19 pandemic in psychology students from Cúcuta, Colombia

O. Medina-Ortiz[1,2,3], C. Cárdenas[4], V. Arenas-Villamizar[1], M. Riaño-Garzón[1], V. Bermudez-Pirela[1]
[1]Simon Bolivar University, Psychology, Cúcuta, Colombia, [2]Santander University, Medicine, Cúcuta, Colombia, [3]Venezuelan Academic of Sleep Medicine, San Cristóbal, Venezuela, [4]Venezuelan Academic of Sleep Medicine, Caracas, Venezuela

Introduction: In the year 2020, the coronavirus infection generated fear in the general population. In addition to this, the health authorities ordered a confinement at home, which produced a feeling of loneliness and changes in mood, in addition to changing sleep habits, resulting in insomnia and a greater feeling of stress. University students did not escape this situation. The aim of this study was to determine the prevalence of insomnia and the relationship with perceived stress, in a group of psychology students from 5 Colombian Universities, during confinement due to the covid-19 pandemic.

Materials and methods: Observational, descriptive, cross-sectional study. All psychology students from the 1st to 10th semester of 5 Universities in Cúcuta (Simón Bolívar University, Pamplona University, Uniminuto, Santander University and National Open and Distance University) were invited to participate. The Athens Scale for insomnia (cut-off point = 4) and the Levenstein scale of perceived stress (cut-off point 0.60) were applied, as well as a questionnaire that collected demographic data.

Results: The sample was made up of 1632 students (80.3% female), average age 23.81 years (SD: 4.82; min: 18 / max: 54). 65.9% presented score for insomnia (mean: 6.18 SD: 4.66; min: 0 / max: 24) and 18.5% a high perception of stress (mean: 0.41 SD: 0.11; min: 0 / max: 0.92). Both students with high perception of stress and with low perception of stress presented a higher prevalence of insomnia than the general population (67.9% and 65.5% respectively) (P=NS). It was possible to determine that the younger the age, the higher the score for insomnia (P=0.023) and the higher the perception of stress (P=NS), however, the higher the perceived stress, the score for insomnia was lower (P=NS).

Conclusions: The findings of this study reveal that during the confinement due to the covid-19 pandemic, university students presented a high prevalence of insomnia, probably due to changes in hygiene and sleep patterns, and a greater perception of stress. Training in sleep habits and hygiene, to try to ensure that academic performance at home follows the same schedules as in person, could help to improve this situation.

Insomnia complaints and blood pressure control in patients with hypertension in a tertiary university center

A.V.V. Martins[1], J.G.A.L. Junior[1], L.A. Bortolotto[1], G. Lorenzi-Filho[2], L.F. Drager[1]
[1]Heart Institute, University of Sao Paulo, Cardiology, Sao Paulo, Brazil, [2]Heart Institute, University of Sao Paulo, Pneumology, Sao Paulo, Brazil

Introduction: Insomnia is defined by the difficulty in initiating and/or maintaining sleep and/or waking up earlier than desired regardless of adequate possibility of sleeping.Previous studies suggested that this sleep disorder may be related to hypertension , but it is not clear the association of insomnia with uncontrolled HTN and the frequency of apparent treatment resistant hypertension(aTRH) . In order to address these issues, we assessed the prevalence of insomnia among patients with hypertension and examined its relation to values and blood pressure (BP) control.

Materials and Methods: This was a cross sectional study in a single center with 475 consecutive adult patients who had established diagnosis of HTN recruited from a Tertiary University Center in Brazil between 2021 and 2023.The evaluation was carried out through interviews and validated questionnaires for the evaluation of insomnia . Moreover, we evaluated the comorbidities ,number of antihypertensive drugs in use, anthropometric data collection and the standardized measurement of BP (obtained by the average of 3 measurements using a validated digital device). The SPSS statistical program was used for statistical evaluation of the data

Results: Four hundred and seventy five consecutive patients were evaluated (60% female, mean age was 62.1 ± 11.86 years , 52 % obese, 47.2% with diabetes). The average number of anti hypertensive drugs was 4.3. Among evaluated patients, only 33.7 % had office BP control (BP< 140x90mmHg). Insomnia was present in 50.3 % of patients and considering patients with insomnia,12.13% with sleep onset insomnia, 19.24% with maintenance insomnia, 2.1% with early morning awakening and 66.52% with mixed insomnia.

The group with insomnia had more female patients (69.9% vs 50.00%, p < 0.001) and obese patients (56.5% vs. 47.5%, p=0.049). There was no statistically significant difference rates of aTRH and office blood pressure control between patients with and without insomnia.

Conclusions: Our preliminary data suggest that insomnia is common in patients with HTN but is not associated with increased rates of uncontrolled HTN and aTRH. Further research is needed to understand the impact of the improvement of insomnia on outcomes in patients with HTN.

Insomnia during pregnancy and risk of childhood mortality in Offspring, Florida, 2006-2019

A. Kendle[1], J. Salemi[2], A. Elmore[2], J. Louis[1]
[1]University of South Florida Morsani College of Medicine, Obstetrics & Gynecology, Tampa, United States, [2]University of South Florida, College of Public Health, Tampa, United States

Introduction: Diagnosis of insomnia during pregnancy has increased over time, and its burden disparately affects women from historically marginalized communities. A diagnosis of maternal insomnia during pregnancy is associated with increased risk of maternal morbidity, however, less is known about long term outcomes of the offspring from these births. We hypothesized that a maternal diagnosis of insomnia is associated with an increased risk of all-cause mortality in offspring. Furthermore, we hypothesized that the risk of offspring mortality among pregnancies affected by insomnia may differ by maternal race/ethnicity.

Materials and methods: We conducted a population-based retrospective cohort study of singleton births using a statewide maternal and infant longitudinally linked database consisting of vital records and hospital discharge data. Diagnosis codes documented during the delivery hospitalization or an inpatient or emergency department encounter in the year prior to delivery were used to identify insomnia (the primary exposure), obstetric comorbidities, severe maternal morbidity, and other key behavioral and clinical conditions. Birth certificates for singleton live births from 2006-2019 were linked to death certificates through December 31, 2021. The primary outcome was all-cause offspring mortality within the first 5 years after birth. Kaplan-Meier curves and log-rank tests were used to describe differences in survival by maternal insomnia status among the total sample and by maternal race/ethnicity. Cox proportional hazards regression was used to estimate hazard ratios (HR) and 95% confidence intervals (CI) reflecting the association between maternal insomnia and childhood survival after adjusting for maternal age and pre-pregnancy body mass index (BMI).

Results: Of the 2,586,868 singleton live births during the 14-year study period, 1,942 or 7.5 per 10,000 had a coded diagnosis of maternal insomnia. Women with insomnia experienced an increased comorbidity burden, and their children had worse birth outcomes. Five-year infant mortality rates were 5.7 per 1,000 births for those without insomnia and 14.9 per 1,000 births for those with insomnia. After adjusting for maternal age and pre-pregnancy BMI, maternal diagnosis of insomnia conferred a 2.3-fold increased risk of childhood mortality (HR: 2.34; CI:1.63, 3.36). Whereas a diagnosis of insomnia was not associated with an increased risk of offspring mortality among non-Hispanic White (HR: 1.35; CI: 0.74, 2.70) or Hispanic (HR: 1.84; CI: 0.59, 5.70) women, insomnia was associated with a 3.7-fold increase in offspring mortality among non-Hispanic Black (HR: 3.68; CI: 2.29, 5.92) women. Moreover, while all births among non-Hispanic Black women experienced twice the risk of 5-year mortality compared to non-Hispanic White counterparts (HR: 1.98; CI: 1.91, 2.05), the 5-year mortality risk among offspring of non-Hispanic Black women with a diagnosis of insomnia was more than five times higher than offspring of non-Hispanic White women (HR: 5.38; CI: 2.32,12.46) with a diagnosis of insomnia.

Conclusions: A maternal diagnosis of insomnia at delivery is associated with an increased risk of all-cause 5-year offspring mortality. Offspring of Black women with insomnia had the highest probability of mortality compared to other racial groups, which highlights the need for studies elucidating the mechanisms through which sleep health inequity contributes to adverse outcomes.

Insomnia is associated with low FEV1 and FEV1/FVC: RHINESSA study

R. Shigdel[1], E. Lindberg[2], S. Banjara[3], C. Senaratna[4], O. Emilsson[2], V. Schlunssen[5], S. Peddada[6], E. Helga Thorarinsdottir[7], A. Malinovschi[8], R. Bertelsen[1], T. Gislason[9], B. Benediktsdottir[10]
[1]University of Bergen, Clinical Science, Bergen, Norway, [2]University of Uppsala, Department of Medical Sciences, Uppsala, Sweden, [3]University of Bergen, Department of Dentestry, Bergen, Norway, [4]University of Melbourne, School of Population and Global Health, Melbourne, Australia, [5]Aarhus University, Department of Public Health, section for environment, Occupation and Health, Aarhus, Denmark, [6]Biostatistics and Computational Biology Branch, National Institute of Environment Health Science (NIEHS), NIH, Raleigh, United States, [7]Primary Health Care of the Capital Area, Reykjavik, Iceland, [8]Uppsala University, Department of Medical Sciences, Uppsala, Sweden, [9]University of Iceand, Faculty of Medicine, Reykjavik, Iceland, [10]University of Iceland, Faculty of Medicine, Reykjavik, Iceland

Introduction: Chronic obstructive pulmonary disease and asthma are known risk factors for sleep disorders. There is little known about the association of lung function (FEV1 and FVC and its ratio) with insomnia. In this study, we aimed to investigate the association of lung function with insomnia symptoms in adult population.

Materials and methods: We included 971 participants, from ten study centers of the community-based Respiratory Health in Northern Europe, Spain, and Australia (RHINESSA) study. Questions from the Basic Nordic Questionnaire were used to assess insomnia symptoms. Insomnia was defined as having difficulty initiating sleep, maintaining sleep or early morning awakening at least 3 times per week preceding months. FEV1 and FVC were measured and the lower limits of normal (LLN) determined using Global Lung Function Initiative (GLI) equation. The association between lung function insomnia and daytime sleepiness were assessed using logistic regression.

Results: The participants were aged 18-53 years and 51% were female. The prevalence of insomnia was 30%. Those with insomnia were of higher age, more often females, and smokers. The daytime sleepiness was more prevalent among those with insomnia as compared to those without insomnia. Each liter decrease in FEV1 was associated with 75%(95% CI, 56%-99%) higher odds of reporting insomnia adjusted for age, gender, education, smoking and BMI. Those with FEV1/FVC below the lower limit of normal had 2.0 (1.1-3.6) two times higher odds of reporting insomnia as compared to those with eval or above lower limit of normal FEV1/FVC. No association was observed between FVC, FEV1/FVC, LLNFEV1 and LLFVC with insomnia.

Conclusions: Decreased lung function was associated with higher odds of reporting insomnia in the general population. Further longitudinal studies are needed to establish if there is a casual relationship between impaired lung function and development of insomnia.

Acknowledgements: I would like to thank all the participants, principal investigators, data manager and entire team of RHINESSA research group.

Integration of cognitive-behavioral therapy for insomnia in routine cancer care: preliminary results of an implementation study

J. Savard[1,2,3], C. Filion[2,3], A. Caplette-Gingras[2,4], C.M. Morin[1,5], L. Bélanger[6], M.-P. Gagnon[7], M.-È. Lamontagne[8]
[1]Université Laval, Psychology, Quebec, Canada, [2]CHU de Québec-Université Laval Research Center, Quebec, Canada, [3]Université Laval Cancer Research Center, Quebec, Canada, [4]Centre des Maladies du Sein, CHU de Québec-Université Laval, Quebec, Canada, [5]CERVO Brain Research Centre, Quebec, Canada, [6]CHU de Québec-Université Laval, Quebec, Canada, [7]Université Laval, Faculté des Sciences Infirmières, Quebec, Canada, [8]Université Laval, Département de Réadaptation, Quebec, Canada

Introduction: Between 30 to 60% of cancer patients display insomnia symptoms. While cognitive-behavioral therapy for insomnia (CBT-I) is the recommended first-line treatment for cancer-related insomnia, it remains underutilized due to its limited accessibility.
To date, we are unaware of any study that has investigated the implementation of CBT-I in routine clinical care. Our prior work showed that a stepped care approach, combining a web-based CBT-I and 1-3 booster therapy sessions, was not significantly inferior in producing sleep improvements than a standard 6-session CBT-I. The main goals of the IMPACT (Insomnia in Patients with Cancer – Personalized Treatment) program are to assess the feasibility and efficacy of implementing this stepped care CBT-I in four cancer centers in Quebec City, Canada.
Materials and methods: The ongoing study uses a stepped wedge cluster non-randomized design implementing the stepped care CBT-I at various time intervals across cancer centers. All first-line cancer providers (e.g., nurses, oncologists, radio-oncology technologists, pharmacists) are met every 3-4 months to present/remind them of the rationale of the project and procedures to refer patients to the IMPACT program. Patients having a score ³ 4 on the sleep item of the Edmonton System Assessment System-Revised (ESAS-R-sleep) receive a leaflet explaining the stepped care CBT-I and how to access the web-based program (first step). Patients with residual insomnia symptoms after completing this first step are offered 1-3 booster sessions with a clinical psychologist (second step). Uptake and retention rates are the main variables.
Results: Until now, approximately 50% of patients having a score ³ 4 on the ESAS-R-sleep item were referred to the IMPACT program. The most common reasons for not referring were: 1) the presence of comorbid anxiety or depression symptoms (they were referred instead to the psychosocial oncology team) and; 2) patients declining help. Registration rates were greater when a brief follow-up phone call was conducted to explain the IMPACT program in more detail (vs. giving only the leaflet). Across cancer centers, between 8.5% and 32.5% of referred patients registered with the web-based CBT-I, between 84.4% and 90.9% of them initiated it and between 27.3% and 44% completed it. The most common reasons for not completing the web-based CBT-I were: 1) sleep difficulties improved or remitted (32.8%); and 2) the program did not meet patients' needs (23.4%). Only 9.1%-22.9% of completers had residual insomnia across cancer centers and were offered booster sessions. On average, sleep diary data collected during treatment (N=83) indicated a reduction of sleep-onset latency of 20 min and of wake after sleep onset of 45 min. Sleep efficiency increased from 70 to 85%.
Conclusions: Although uptake and retention rates could be improved, these preliminary data suggest that a stepped care CBT-I can be implemented in routine cancer care and is effective.

Internet-delivered cognitive behavioral therapy for adolescents with insomnia: feasibility and preliminary efficacy

M. Lekander[1,2], S. Jernelöv[2,3], E. Serlachius[3,4], S. Vigerland[3], R. Wicksell[2], E. Henje[5], L. Åslund[3]
[1]Stockholm University, Stress Research Institute, Stockholm, Sweden, [2]Karolinska Institutet, Department of Clinical Neuroscience, Stockholm, Sweden, [3]Karolinska Institute, Centre for Psychiatry Research, Stockholm, Sweden, [4]Lund University, Child and Adolescent Psychiatry, Lund, Sweden, [5]Umeå University, Department of Clinical Science, Umeå, Sweden

Introduction: Insomnia is common in adolescents and related to psychiatric and functional comorbidities. Still, treatment guidelines are missing. This study evaluated feasibility and preliminary efficacy of a six-week internet-delivered cognitive-behavioral therapy for insomnia (ICBT-I) in adolescents.

Materials and methods: In this uncontrolled pilot study, participants (n=27, 78% female) completed assessments pre- and post intervention. Data on recruitment, adherence to treatment, treatment activity, satisfaction and credibility was collected to assess feasibility. Self-reported insomnia symptoms, sleep parameters as well as depressive symptoms, anxiety and daytime function were also assessed.

Results: Participants showed good adherence to treatment and found the intervention overall credible and satisfactory. From pre- to post- assessment, significant improvements were found for insomnia symptoms (p<0.001; d=1.02), sleep onset latency (p<0.001; d=0.39), wake after sleep onset (p=0.001; d=0.34), sleep efficiency (p<0.001; d=0.5) and depressive symptoms (p=0.01, d=0.37). Changes in scores of total sleep time, generalized anxiety, daytime sleepiness and functional disability were not significant.

Conclusions: The present study suggests that ICBT-I is well accepted by adolescents, that insomnia symptoms and sleep parameters can improve following the intervention, and that co-morbid symptoms of depression can be reduced. Due to the limited sample size and the uncontrolled design, the results indicated should be replicated in well-powered controlled clinical trials.

Lemborexant does not impact waketime cognition in subjects with comorbid insomnia disorder and mild obstructive sleep apnea

M. Moline[1], J.Y. Cheng[1], D. Kumar[1], B. Ramos[2], A.D. Lowe[3]
[1]Eisai Inc., Nutley, United States, [2]Eisai Limited, Mississauga, Canada, [3]University of Toronto, Toronto, Canada

Background: Insomnia and obstructive sleep apnea (OSA) are frequently comorbid (COMISA). Because both untreated insomnia and OSA are associated with cognitive difficulties, an appropriate hypnotic should avoid impairing cognition. Lemborexant (LEM) is a competitive dual-orexin-receptor-antagonist approved in >10 countries for treatment of adults with insomnia. Using data from a pivotal study, potential waketime effects of LEM on cognitive function were assessed in a post-hoc analysis of those subjects with both insomnia disorder and mild OSA.

Materials and Methods: Study E2006-G000-304 (Study 304; NCT02783729) was a 1-month, randomized, double-blind, placebo (PBO)- and active-comparator (zolpidem [ZOL] 6.25 mg extended-release)-controlled study of LEM 5 mg (LEM5) and LEM 10 mg (LEM10). Subjects aged ≥55 y who met criteria for insomnia disorder per *DSM-5* and with verified sleep maintenance problems were enrolled. If other criteria were met, subjects whose apnea-hypopnea index (AHI) was ≥5 and <15 events/h of sleep (mild OSA) were eligible. A cognitive performance assessment battery (CPAB) was conducted during the single-blind placebo run-in (baseline) and in the mornings following the first 2 post-randomization doses (Days 2/3) and last 2 doses (Days 30/31). Change-from-baseline (CFB), reported as least squares mean visit estimates, for power-of-attention (PoA), continuity-of-attention (CoA), quality-of-memory (QoM), and speed-of-memory retrieval (SoMR) were analyzed using mixed-effect model repeated measurement.

Results: Of 1006 subjects in the Full Analysis Set, 410 (40.8%) had mild OSA. The median age in this subgroup was 65y, 83.9% were female, median BMI was 27.6. Mean (SD) AHI on screening polysomnogram was 9.3 (2.9) events/h of sleep. Within each CPAB domain, baseline scores were similar across treatment groups. On Days 2/3 and Days 30/31, CFB for PoA, CoA, QoM, and SoMR for LEM5 and LEM10 were not significantly different than PBO. In contrast, on Days 2/3, CFBs in PoA and QoM were significantly worse with ZOL vs PBO: PoA (ms): 31.1 vs PBO -15.6; P=0.012; QoM (U): −12.3 vs PBO 4.6; P=0.011, whereas CFBs in QoM (U) were significantly larger (better) with LEM5 (5.3; P=0.003) and LEM10 (0.3; P=0.041) vs ZOL (−12.3). Similarly, on Days 30/31, CFB in SoMR (ms) was significantly larger (slower) with ZOL (15.0) vs PBO (−255.5; P=0.004) and was significantly faster with LEM5 (−231.7; P<0.004) and LEM10 (−241.4; P=0.003) vs ZOL (15.0). LEM safety in subjects with mild OSA was consistent with that of the overall study safety population.

Conclusion: Memory and attention domains were not adversely impacted by LEM in subjects with insomnia and OSA, the COMISA subgroup. By contrast, ZOL treatment was associated with significant differences in some domains compared with both PBO and LEM. LEM was well-tolerated, with no new safety findings. These data add to previously reported polysomnography (objective) results showing that LEM treatment resulted in improved sleep onset and maintenance parameters compared to PBO and ZOL as assessed at the end of 1 month, supporting the use of LEM in the COMISA population.

Lemborexant improves polysomnographic sleep parameters in older adults with insomnia disorder and objective short sleep duration

A.D. Krystal[1], J.D. Edinger[2], D. Kumar[3], M. Moline[3]
[1]University of California, San Francisco, United States, [2]National Jewish Health, Denver, United States, [3]Eisai Inc., Nutley, United States

Introduction: Patients with insomnia can be classified into 2 phenotypes as determined by polysomnography (PSG): insomnia with short (<6 hours) sleep duration (I-SSD) and insomnia with objectively longer (≥6 hours), more normal sleep duration. Patients with insomnia and I-SSD may have a diminished response to cognitive behavior therapy for insomnia (CBT-I), and pharmacologic therapy may be needed. Lemborexant (LEM), a competitive dual-orexin inhibitor antagonist, is approved in the United States, Japan, Canada, Australia, and several Asian countries for the treatment of adults with insomnia disorder. The impact of LEM on PSG sleep parameters in subjects with I-SSD was evaluated.

Materials and methods: Study E2006-G000-304 (NCT02783729) was a phase 3 randomized, double-blind, placebo-controlled, active-comparator (zolpidem tartrate extended-release 6.25 mg [ZOL]) clinical trial. Subjects (females age ≥55 years, males age ≥65 years) were randomized to receive placebo (PBO), ZOL, LEM 5 mg (LEM5) or 10 mg (LEM10) for 1 month. Total sleep time (TST) was evaluated using paired and averaged PSGs performed during the single-blind PBO run-in, Nights (NT)1/2, and NT29/30. Change from baseline (CFB) was analyzed using mixed-effect model repeated measurement analyses of the I-SSD subgroup.

Results: Overall, 710 (70.6%) of 1006 subjects comprised the I-SSD subgroup. In the I-SSD subgroup, mean (SD) baseline TST (minutes) was similar across treatment groups: PBO, 310.49 (39.39); ZOL, 303.28 (47.59); LEM5, 304.06 (47.61); and LEM10, 302.15 (44.24). On NT1/2, LEM5 and LEM10 led to statistically significantly greater ($P < 0.0001$) CFB (increased TST) LSM (SE): PBO, 31.73 (3.36); ZOL, 72.10 (3.04); LEM5, 82.08 (3.01); and LEM10, 95.72 (2.97) versus PBO. TST CFB for LEM10 was also significantly larger versus ZOL ($P < 0.0001$). On NT29/30, both LEM5 and LEM10 led to statistically significantly greater ($P < 0.0001$) CFB (increased TST) LSM (SE): PBO, 41.98 (3.75); ZOL, 58.24 (3.37); LEM5, 77.32 (3.34); and LEM10, 83.95 (3.29) versus PBO and ZOL.

Conclusions: In older patients with I-SSD, LEM treatment led to improvement in TST; LEM may also be more effective than ZOL in the I-SSD subgroup. LEM may be an appropriate treatment option in older patients with I-SSD, a population in which CBT-I may have lower efficacy.

Support: Eisai Inc.

Longan flower extract relieves insomnia by inducing melatonin biosynthesis

S.-Y. Lee[1], C.-H. Yu[1], P.-C. Huang[1]
[1]Percheron Bioceutical, R&D, Taichung, Taiwan

Introduction: Insomnia is a global problem causing huge social burden, commonly due to circadian rhythm sleep disorders. The circadian rhythm is majorly regulated by melatonin and serotonin. Reduced melatonin levels are often observed in insomnia patients, who need to rely on sleeping pills and chemically synthesized melatonin. Longan fruit is a traditional food in Asia, providing multiple benefits to health, such as anti-inflammation, anti-oxidant, and anti-cancer properties. Our preliminary research suggested that the longan flower actually contains more polyphenols and flavonoids than longan fruit. Therefore, the functions of longan flower are worthy of further study. In this research, longan flower was extracted using ethanol, and the functions of regulating the Melatonin Biosynthesis Pathway and circadian rhythm were investigated.

Materials and Methods: Functions of Longan Flower Extract (LFE) were evaluated through cell experiments and clinical trials. Serotonin and melatonin content were measured by ELISA method; melatonin biosynthesis gene expressions were evaluated through qPCR; ROS, SOD, GSH, COX2 and iNOS were monitored by colorimetric methods of commercial kit. In clinical studies, participants took 0.4g LFE before sleep for 28 days. Melatonin from saliva and serotonin from blood were measured, and sleep quality was revealed via the Athens Insomnia Scale (AIS) and the Pittsburgh Sleep Quality Index (PSQI). The results were collected on day 0, day 3, and day 28 of the trial.

Results: By using HPLC, LFE shows to contain a large amount of polyphenols, flavonoids, and proanthocyanidins. In cell experiments, LFE increases serotonin secretion and melatonin biosynthesis gene expressions significantly (*TPH1, DDC, AANAT, ASMT*). Moreover, LFE can protect microglial cells from oxidative and inflammatory damage. LFE is able to lower both the ROS content and COX2 and iNOS levels during LPS treatment. By contrast, the SOD level and the GSH content are increased. In clinical experiments, LFE is observed to have an effect on relieving insomnia after taking LFE for 3 days. Secretion of serotonin and melatonin are 1.17-fold and 2.21-fold higher respectively compared to day 0; having significant differences. At the endpoint of the experiments (Day 28), secretion of serotonin and melatonin dramatically increase 2.33-fold and 9.15-fold, respectively, compared to day 0. Furthermore, the insomnia severity level decreases 69% in AIS, and the sleep quality is enhanced 60.6% in PSQI.

Conclusions: According to our findings, LFE enhances melatonin secretion rapidly *in-vitro* and *in-vivo* by activating melatonin biosynthesis gene expressions. Serotonin, as the precursor of melatonin, also shows an increase in blood. Due to higher melatonin secretion, LFE significantly relieves insomnia and improves sleep quality within a 28-day consumption period according to the AIS and PSQI investigation. In summary, this present study suggests that Longan Flower Extract can improve circadian rhythm and has the potential to be a natural supplement to relieve insomnia and improve sleep quality through an induction of melatonin secretion.

Mindfulness-based stress reduction compared with cognitive behavioral therapy to improve sleep and mental health in university students with insomnia

A. Vézina[1], M. El Gewely[1], H. Ivers[1], C.M. Morin[1]
[1]Université Laval, Psychology, Québec, Canada

Introduction

University students undergo a unique set of bio-psycho-social changes that can cause stress and contribute to sleep disturbance. Sleep difficulties are amongst the most common health problems for students, with evidence suggesting that 30% of students meet the DSM-5 criteria for insomnia. Cognitive-behavioral therapy for insomnia (CBT-I) is the first line treatment in the general adult population. However, there is much less evidence about effectiveness of sleep interventions in university students, a particularly vulnerable population. Evidence from meta-analyses suggests that relaxation and mindfulness-based interventions warrant further investigation as they have been shown to produce strong effects on improving student mental health (i.e., anxiety, depression), often comorbid to insomnia. The mindfulness-based stress reduction (MBSR) program is of particular interest since its primary target is stress reduction and some past evidence has shown its efficacy to reduce insomnia symptoms in adults with insomnia. This study was a comparative trial of MBSR and CBT-I for the treatment of insomnia among university students.

Materials and Methods

This was a randomized controlled non inferiority trial involving university students with insomnia disorder. They were recruited through email announcements from Laval University, in Québec, Canada, from September 2021 to February 2023. Assessments were conducted at baseline, after the 8-week treatment program, and at a 3-month follow-up. Both interventions were offered via eight, in-person small group, 90-minute sessions led by a doctoral-level psychology student. The noninferiority margin was set at 4 points on the Insomnia Severity Index (ISI). Secondary outcomes included anxiety, depressive symptoms, and quality of life.

Results

Of 94 students screened, 57 were included and randomly assigned to receive the allocated intervention (CBT-I, n=28; MBSR, n=29). Simple main effects tests indicated that insomnia severity was significantly lower at posttreatment ($p < .001$) and at 3 months follow-up ($p < .001$) in both treatment conditions. However, contrast estimates found MBSR to be inferior to CBT-I for improving insomnia severity at posttreatment, [95% CI, -5.7,-0.7], and at follow-up, [95% CI, -5.8, -0.6]. Both conditions reduced depressive symptoms at posttreatment (MBSR, $p = .007$; CBT-I, $p < .001$) and at 3 months follow-up (MBSR, $p = .004$, CBTI, $p < .001$), whereas only MBSR significantly reduced anxiety at posttreatment ($p = .003$) and at 3 months follow-up ($p = .003$). Both groups increased quality of life at posttreatment (MBSR, $p = .014$; CBT-I, $p = .025$) and the effects were durable 3 months after the intervention for both conditions (MBSR, $p = .002$; CBT-I, $p = .019$).

Conclusions

While MBSR produced clinically significant improvements in insomnia symptoms, standard CBT-I produced larger and more durable reductions of insomnia severity. Although psychological symptoms were improved in both groups, MBSR demonstrated an advantage in improving anxiety and quality of life. Considering MBSR's objective of reducing hyperarousal by teaching adaptive ways to respond to stressors, the findings suggest that it may be a valuable complement to standard CBT-I for the treatment of insomnia in university students.

Keywords: Insomnia, Students, Cognitive-behavioral therapy, Mindfulness-based stress reduction.

Modulation of brain oscillations by continuous theta burst stimulation in patients with insomnia

X. Zhu[1], J. Deng[2], L. Jiang[3], F. Li[3], T. Wu[4], Q. Yang[5], P. Xu[5], L. Lu[2]
[1]Peking University Sixth Hospital, Peking University Institute of Mental Health, Beijing, China, [2]Peking University Sixth Hospital, Beijing, China, [3]University of Electronic Science and Technology of China, School of Life Science and Technology, Center for Information in Medicine, Chengdu, China, [4]Peking Union Medical College, Beijing, China, [5]University of Electronic Science and Technology of China, Chengdu, China

Introduction: Widespread global decreased slow oscillations and elevated high frequency activity in patients with insomnia. Continuous theta burst stimulation (cTBS) has been proven to induce long-lasting inhibitory effect on cortical excitability, but it remains little known about how cTBS influence spontaneous brain oscillations in insomnia. The present study sought to investigate the effect of cTBS on resting state electroencephalogram (rsEEG) during waking and subsequent sleeping states in patients with insomnia.

Materials and Methods: Forty-one patients with insomnia were recruited and completed a counterbalanced crossover study for active/sham cTBS intervention on two separate nights. The closed-eyes rsEEG recordings were acquired pre and post-cTBS for three sessions. Then patients were allowed an 8-hour sleep opportunity monitored with polysomnography (PSG). After preprocessing procedures of rsEEG, 1) power spectrum density (PSD) was calculated using the Welch's averaged modified periodogram method; 2) phase locking value (PLV) was calculated the phase synchronization among pairwise signals with FDR correction; 3) network properties were calculated based on the constructed PLV network by using the brain connectivity toolbox, which included the clustering coefficient (CC), global efficiency (GE), and local efficiency (LE). After preprocessing procedures of PSG, 1) sleep stages were calculated manually according to the AASM scoring rules; 2) the PSD of slow wave activity (SWA) during NREM of first sleep cycle was compared between night after active and sham intervention; 3) dissipation rate of SWA across the night was calculated by an exponential decay function.

Results: The PSD of the delta and theta activity exhibited a significant increase following TBS intervention, accompanied by enhanced PLV connection between the stimulated frontal areas and occipital areas ($p<0.05$, FDR correction). Both PSD and PLV exhibited a cumulative effect of delta and theta activity with increasing pulses of stimulation ($p<0.05$, FDR correction). The CC, GE, and LE of PLV network showed an upward trend in delta and theta band, and indicated that the efficiency of information communication was enhanced specifically in the theta activity within frontal-occipital networks. During the sleep after stimulation, the SWA power during the NREM of first sleep cycle was higher after active intervention (159.74 % ± 32.14 %) than that after sham intervention (138.49 % ±32.73 %, $p < 0.05$). The dissipation rate of SWA power overnight, reflecting homeostatic sleep drive, was also higher after active intervention than that after sham intervention.

Conclusions: We found that cTBS induces and enhances spectral power and phase synchronization of low frequency oscillation during waking and sleeping states in patients with insomnia. Our findings contribute to a more comprehensive understanding of the neurobiological mechanisms involved in the modulation of cTBS on brain oscillations, and may provide more effective treatments for insomnia disorder.

Modulation of sleep perception through auditory closed-loop stimulation

C. Schneider[1], K. Fehér[2], E. Hertenstein[2,1], F. Hügli[1], E. Trinca[1], X. Omlin[1], C. Mikutta[3], C. Nissen[2,1]
[1]University Hospital of Psychiatry and Psychotherapy, University of Bern, Bern, Switzerland, [2]Geneva University Hospitals (HUG), Psychiatric Specialties Division, Department of Psychiatry, Geneva, Switzerland, [3]Privat Clinic Meiringen, Meiringen, Switzerland

Introduction: This project aims to better understand the neural basis of sleep-wake perception. We test the emerging concepts that sleep-specific oscillatory brain activity during non-rapid eye movement (NREM) sleep in the form of slow oscillatory activity and sleep spindle activity and its orchestration (cross-frequency coupling) are related to sleep perception and that this orchestration together with sleep perception can be modulated by non-invasive (auditory) stimulation.
Materials & methods: Good sleeper controls and patients with insomnia disorder are tested using high-density EEG (128 electrodes) monitoring across four nights in the sleep laboratory. After an adaptation and baseline night, up to 12 awakenings per participant are performed from NREM sleep on the third and fourth night. Participants are asked to report on their sleep-wake perception via an automatized interview procedure applied through calibrated in-ear headphones. In addition, stimulation protocols (sham, 50ms of 50dB pink-noise up-state and down-state) are performed prior to the awakenings on the fourth night.
Results: We performed 375 awakenings with 354 (94%) successful awakenings out of NREM sleep in night 3 (19 controls, 11 female, 8 male, 40±13 years; 16 patients, 11 female, 5 male, 41±14 years) with 104 congruent (polysomnographic sleep/subjective sleep) vs 94 incongruent events (polysomnographic sleep/subjective wakefulness) in controls and 70 congruent and 86 incongruent events in patients with insomnia. The average event-related potentials of participants demonstrate the efficacy of the stimulation protocol (up-state, down-state, sham stimulation).
Conclusions: Preliminary analyses show feasibility of the study protocol. We demonstrate a frequent discrepancy between polysomnographic sleep and subjective perception of wakefulness. Future analyses aim to further characterize physiological correlates of this discrepancy.
Funded by the SNSF.

Patient-reported outcome measures of sleep in fibromyalgia: a systematic review and content analysis

C. Robertson[1], M. Imamura[1], D. Whibley[2,3], L. Aucott[1], P. Manson[1], A. Abhishek[4], D. Dulake[5], G.J. Macfarlane[2], N.K.Y. Tang[6], M. Brazzelli[1], K. Gillies[1]
[1]University of Aberdeen, Health Services Research Unit, Aberdeen, United Kingdom, [2]University of Aberdeen, Aberdeen Centre for Arthritis and Musculoskeletal Health (Epidemiology Group), Aberdeen, United Kingdom, [3]University of Michigan, Department of Physical Medicine and Rehabilitation, Ann Arbor, United States, [4]University of Nottingham, Academic Rheumatology, Nottingham, United Kingdom, [5]Versus Arthritis, Chesterfield, United Kingdom, [6]University of Warwick, Department of Psychology, Coventry, United Kingdom

Introduction: Patient-reported outcome measures (PROMs) provide a useful way to obtain standardised measurements of outcomes from the patient's perspective. However, the diversity of question items between different PROMs that aim to measure similar constructs can lead to the aggregation of dissimilar items or the measurement of different aspects of the outcome of interest. It is, therefore, important to establish whether items contained in PROMs that reportedly measure the same concept are comparable across different measures to determine whether PROMs data can be meaningfully pooled. We sought to examine the item variability of PROMs of sleep outcomes validated for people with fibromyalgia to establish whether important sleep domains are missing and whether the PROMs are similar enough to be combined in evaluations of interventions to treat fibromyalgia-related sleep problems.

Materials and methods: An update of a published systematic review that examined the psychometric properties of PROMs of sleep outcomes for people with fibromyalgia. We searched five major electronic bibliographic databases (PubMed, Scopus, CINAHL Plus, PsycINFO and ISI Web of Science) for all years up to November 2021 without applying age or language restrictions. We conducted an inductive content analysis. This systematic review forms part of a broader research project funded by the National Institute for Health and Care Research in the UK, which evaluates interventions for the management of poor sleep in people with fibromyalgia.

Results: One new report was combined with those identified in the earlier review to provide a total of eight reports evaluating five PROMs. The five PROMs were: The Fibromyalgia Sleep Diary (FMSD), the Jenkins Sleep Scale (JSS), the Medical Outcomes Study Sleep Scale (MOS-SS), the Pittsburgh Sleep Quality Index (PSQI) and the Sleep Quality-Numeric Rating Scale (SQ-NRS). Our synthesis identified 21 sleep domains from 44 question items. None of the PROMs covered all 21 domains. The domain most frequently identified across PROMs was *sleep maintenance*, with 6 (13.6%) items measuring this concept. The PSQI was considered the most comprehensive tool, including 15/21 identified domains, followed by the MOS-SS with 11 domains. The SQ-NRS contains only one item and is the least comprehensive tool. Whilst we found heterogeneity among the item content, all PROMs capture constructs associated with sleep quality and are deemed conceptually similar. Due to poor reporting of socio-demographic data, it proved difficult to ascertain whether the study participants are fully representative of the wider fibromyalgia patient community. We did not identify any studies that evaluated PROMs for children with fibromyalgia-related sleep problems.

Conclusion: Although the identified PROMs are similar enough to be combined in evaluations of interventions, it remains unclear whether they capture and measure sleep outcomes that are most relevant for all adults and children with fibromyalgia. Future PROMs development work should follow the principles of initiatives such as the NIHR INCLUDE framework to ensure they include items that matter most to a diverse cross-section of patients.

Pharmacologically targeting inflammation in response to experimental sleep restriction and recovery sleep in healthy humans

L.C. Engert[1,2], C. Ledderose[2,3,4], C. Biniamin[1], P. Birriel[1], O. Buraks[1], B. Chatterton[1], R. Dang[1], S. Daniel[1], A. Eske[1], T. Reed[1], A. Tang[1], S.M. Bertisch[2,5], J.M. Mullington[1,2], W.G. Junger[2,3,4], M. Haack[1,2]
[1]Beth Israel Deaconess Medical Center, Department of Neurology, Boston, United States, [2]Harvard Medical School, Boston, United States, [3]Beth Israel Deaconess Medical Center, Department of Surgery, Boston, United States, [4]University of California San Diego, Department of Surgery, San Diego, United States, [5]Brigham and Women's Hospital, Division of Sleep and Circadian Disorders, Department of Medicine, Boston, United States

Introduction: Disrupted or short sleep is known to increase the risk for multiple disease conditions involving immunopathology, including cardiometabolic, neurodegenerative, pain, autoimmune disorders, and cancer. Inflammation is thought to be a mechanism through which inadequate sleep acts as predictor for these chronic diseases. One potential way to mitigate negative health consequences associated with inadequate sleep is to target inflammation. Few studies investigated whether improving sleep affects inflammatory processes, but results suggested that this alone may not be sufficient to mitigate sleep loss-related inflammation. Thus, a complementary approach is to target inflammatory processes pharmacologically. We investigated whether low-dose acetylsalicylic acid (ASA, i.e., aspirin) administered prior to and during exposure to experimental sleep restriction is able to blunt the expected inflammatory response associated with sleep loss.

Materials and Methods: 46 healthy participants (19F/27M) were studied in a randomized crossover trial with three 11-day (10 nights) in-hospital protocols. Each participant was assigned to 1 control stay with daily placebo tablet (PLACEBO) intake and 2 stays with restricted sleep with daily intake of either PLACEBO or low-dose ASA. The in-hospital stays were separated by at least 2 months. Each in-hospital stay started with 2 nights with a sleep opportunity of 8h/night (2300-0700h) for baseline measurements. Then, under the 2 restricted sleep conditions, participants were exposed to 5 nights of restricted sleep with a sleep opportunity of 4h/night (0300-0700h) followed by 3 nights of recovery sleep with a sleep opportunity of 8h/night. Under the control sleep condition, participants had a sleep opportunity of 8 h/night throughout the entire protocol. During each in-hospital stay, participants had 3 days of intensive monitoring (at baseline, after sleep restriction/control sleep, and after recovery sleep), which included blood sampling, polysomnographic recording, and somatosensory testing. Prior to each in-hospital stay, there was a 2-week at-home monitoring phase, which included actigraphy, sleep diary recording, and daily ASA/PLACEBO intake. The outcome variables to assess inflammation were interleukin (IL)-6 and cyclooxygenase (COX)-2 expression in monocytes, C-reactive protein (CRP) levels, and immune cell counts. Data were analyzed using generalized linear mixed models.

Results: The average adherence to intake of ASA/PLACEBO was 96.0% and did not differ between conditions. There were significant condition effects for IL-6 ($p < .05$ for condition*day) and CRP ($p < .01$ for condition). The sleep restriction/PLACEBO condition showed higher values for IL-6 following 5 nights of restricted sleep compared to sleep restriction/ASA, while the sleep restriction/ASA condition did not differ from control sleep/PLACEBO. For CRP, the sleep restriction/ASA condition had lower values following restricted sleep than sleep restriction/PLACEBO and control sleep/PLACEBO.

Conclusions: Targeting inflammation pharmacologically via enhancing inflammatory resolution processes could provide a novel strategy to mitigate future disease risks in those undergoing periods of sleep restriction or prolonged sleep disturbances.

Predictors of behavioral sleep problems and intervention outcomes in early childhood

P. Boran[1], H.E. Barış[1], H. Barlak[2], Ö.Ö. Aşkan[1], Z. Teke[2]
[1]Marmara University, School of Medicine, Social Pediatrics, Istanbul, Turkey, [2]Marmara University, Pendik Training and Research Hospital, Pediatric Behavioral Sleep Outpatient Clinic, Istanbul, Turkey

Introduction: Behavioral sleep problems are highly prevalent among Turkish young children ranging from 20-35%. However, it is under recognized and the provision of integrated, accessible behavioral sleep health care services for young children are lacking. To address this unmet need, an outpatient clinic was founded at the university hospital for evaluation and treatment of behavioral sleep disorders. The primary aim of this study was to identify maternal characteristics associated with pediatric behavioral sleep problems who attended our sleep insomnia clinic.

Materials and Methods: Participants included 759 mothers of children aged between 6 to 36 months with a sleep related concern presenting to the Pediatric Behavioral Sleep Outpatient Clinic at the university hospital, Istanbul, Turkey between Jan 2018 and Dec 2022. Maternal perception of sleep problems was dichotomised according to the expanded version of the BISQ, with a parent-reported sleep problem defined as those who had severe problem and small problem based on previous studies. Maternal sleep deprivation was defined as sleeping less than 6 hours. Maternal perception of sleep quality was based on The Pittsburgh Sleep Quality Index domain, rating their sleep quality on a 4-point Likert scale from 0 "very good" to 3 "very bad".
Maternal depression was assessed using the Beck Depression Inventory, and maternal anxiety was assessed using the Beck Anxiety Inventory. Intervention outcome evaluation was measured through parent-report following the intervention at 3 months. Parents were asked to rate their perceived level of effectiveness of the sleep intervention in reducing infant sleep problems from baseline on a 5-point Likert scale from 1=eliminated completely to 5= not improved. No improvement was coded if the rating was equal or greater than 3. Binary logistic regression was used to assess the associations between predictive variables and perceived sleep problems and intervention outcomes.

Results: Among 759 registered mother-child dyads, the mean age at diagnosis was 15.5 ± 7.5 months. Overall, 23.5% of the mothers considered their child's sleep to be a small problem and 76.5% of those as a severe problem. Maternal short sleep duration was reported in 40.6%. The sleep intervention elicited statistically significant changes in parent reported sleep problem score over time decreasing from 4.5 ± 0.8 to 1.9 ± 1.1 at 3 months post intervention. The odds of parent-reported severe sleep problems were increased in mothers scoring higher on maternal anxiety symptoms and sleep deprivation (OR:1.88, 95% CI: 1.29-2.73). Young child's age, higher maternal educational attainment, maternal anxiety and maternal sleep deprivation (OR:1.53, 95% CI: 1.05-2.25) at baseline were found to be the significant determinants predicting the likelihood of poor sleep intervention outcome at 3 months.

Conclusions: Observational evidence suggests that baseline maternal sleep deprivation, and maternal anxiety are found as the key parent related risk factors of perceived sleep problem and poor intervention response. It is important to integrate interventions in which maternal mental health and well-being is supported into early childhood behavioral sleep intervention services.

Predictors of insomnia severity and sleep medication use: Are there any similarities?

V. Clemente[1,2], D. Ruivo Marques[3,2], J. Serra[1], M. Miller-Mendes[4,2], J. Moita[1], J. Moutinho dos Santos[5], A. Allen Gomes[4,2]
[1]Hospital and University Centre of Coimbra (CHUC), Sleep Medicine Centre, Coimbra, Portugal, [2]University of Coimbra, Center for Research in Neuropsychology and Cognitive Behavioral Intervention (CINEICC), Coimbra, Portugal, [3]University of Aveiro, Department of Education and Psychology, Aveiro, Portugal, [4]University of Coimbra, Faculty of Psychology and Educational Sciences, Coimbra, Portugal, [5]Surgical Centre of Coimbra, Sleep Medicine Unit, Coimbra, Portugal

Introduction: Despite the paradigm shift in the definition of insomnia disorder, different subtypes continue to show clinical potential. It has been proposed that ID heterogeneity should be understood along several dimensions, including but not limited to hyperarousal, worry, rumination, sleep beliefs, personality, and mental health.
CBT-I is the first-line treatment for ID and is also effective in insomnia comorbid with mental disorders (Hertenstein et al., 2022). However, pharmacotherapy is often used as the first treatment option. The current study aimed to identify predictive factors related to insomnia severity and sleep medication use that might better inform clinical practice.

Materials and Methods: A total of 208 patients with ID (ICSD-3), 126 women and 82 men, aged between 18 and 85 years (M=48.7; SD =13.6), recruited at the Sleep Medicine Centre of the Hospital and University Centre of Coimbra were enrolled in the study. The majority were married and employed, with varied educational backgrounds. Insomnia without mental disorder was present in 64.9% of the cases, whereas 35.1% had insomnia comorbid with depression or anxiety. On average, insomnia lasted 12.3 years (SD=11.1), and about half of the participants took sleeping medication (51.4%). Insomnia severity was assessed using the Insomnia Severity Index (ISI). Other self-report instruments were applied to measure sleep arousal (C-SAS), dysfunctional sleep beliefs (DBAS-SF-16), perfectionism (MPS) and psychological distress (BSI).
First, we conducted exploratory analyses to detect potential associations between the criteria variables of interest (insomnia severity and sleep medication), and demographics, clinical characteristics and scale scores variables. Then, we performed a stepwise multiple regression to determine factors influencing insomnia severity and a binary logistic regression to assess predictors of sleep medication use.

Results: Two variables explained 14.6% of the variance in insomnia severity. The model was statistically significant (adjusted R^2=0.146, $F_{(2,202)}$=18.451, p<.001). Higher scores on consequences/helplessness beliefs about sleep [DBAS-SF-16] (β=0.257, p=.000) and on cognitive arousal [C-SAS] (β=0.229, p=.001) were significant predictors of higher ISI scores. Logistic regression analysis showed that being a female (OR [95% CI=4.35 [1.98-9.53], p=.000), long-lasting insomnia (OR [95% CI]=1.06 [1.02-1.10], p=.003) and higher scores on medication/hopelessness beliefs about sleep [DBAS-SF-16] (OR [95% CI]=1.33 [1.05-1.68], p=.017) were significant predictors of sleep medication use. The model was statistically significant, $X^2_{(10)}$=71.270, p<.001, explaining 39.8% (Nagelkerke R^2) of the variance of sleep medication use and correctly classified 72.1% of cases.

Conclusions: This study concluded that comorbidity with depression or anxiety does not act as a predictor for the severity of insomnia or the use of sleep medication in patients with ID. Being a woman does not impact insomnia severity but increases the likelihood of taking sleep medication. Beliefs about consequences/helplessness were better at predicting insomnia severity, while beliefs about medication/hopelessness predicted better sleep medication use.
Dysfunctional beliefs are the only common significant predictor of insomnia severity and sleep medication use. This emphasises the importance of removing obstacles that persist in preventing insomnia patients from accessing CBT-I.

Prevalence and importance of sleep misperception diagnosis: the role of actigraphy

P. Santos Mageste[1], R. Kássia da Rocha[1], D. Siqueira Araújo Lafayette[1], G. Zlotnik Chehaibar[2], R. Hasan[1], A.C. Toscanini[1]
[1]Clinical Hospital of the School of Medicine at the University of São Paulo, Institute of Psychiatry (IPQ), São Paulo, Brazil, [2]Clinical Hospital of the School of Medicine at the University of São Paulo, São Paulo, Brazil

Introduction: Sleep Misperception (paradoxical insomnia) is a diagnosis described in the International Classification of Sleep Disorders 3 rd as a Chronic Insomnia subtype. This condition is a complaint of severe sleep disturbance without corroborative objective evidence or symptoms of the degree of sleep disturbance claimed. The epidemiology of Sleep Misperception is little known, and it may vary from 9.2 to 52% of the patients with insomnia complaints. On the other hand, actigraphy is a promising tool to objectively measure total sleep time, without using information modulated by the individual's perception, cognition, or mood such as sleep diaries. It is a non-invasiveexam that evaluates sleep pattern, including total sleep time, through the interpretation of the variables: patient's movement, environmental light incidence and temperature (room and wrist). Actigraphy is used to diagnose Circadian Sleep-Wake Disorders and Insufficient Sleep Syndrome, and can also be used in the differential diagnosis of insomnia subtypes. Objective: To evaluate Sleep Misperception prevalence in the Sleep Clinic (ASONO) of the Clinical Hospital of the School of Medicine at the University of São Paulo, correlating clinical complaint and actigraphy diagnosis.
Materials and methods: One hundred actigraphy exams were performed between 2020 and 2023, using ActTrust actigraphers (Condor Instruments Ltd). Variables were presented and treated by the ActStudio software using the Cole-Kripe algorithm to score sleep period. The same examiner reviewed and performed all the reports.
Results: Of the total number of actigraphy exams performed, 35 were to evaluate insomnia complaint, of which 17 (52%) were diagnosed with Sleep Misperception. The importance of the differential diagnosis between Chronic Insomnia and Sleep Misperception is given when we choose the treatment and verify that patients with insomnia and shortened total sleep time are candidates for pharmacological treatment and patients with Sleep Misperception are candidates for behavioral treatment. The gold standard for Sleep Misperception treatment is Cognitive and Behavioral Therapy for Insomnia (CBT-I), this therapy uses behavioral techniques such as sleep restriction and stimulus control, besides cognitive restructuring. The precision and reliability obtained through actigraphy can be used not only in the diagnosis, but also throughout the treatment of these patients.
Conclusions: Sleep Misperception is a prevalent condition among patients with insomnia, being undervalued by health professionals and in many cases treated inappropriately. Actigraphy is an important method for diagnosis and follow-up of these patients, however, there are still few studies to validate actigraphy as a diagnostic method for Sleep Misperception.

Real, misreported and backfilled adherence with paper sleep diaries

E. Zhou[1], L. Barnovsky[2], M. Clegg-Kraynok[3]
[1]Harvard Medical School, Boston, United States, [2]University of Maryland, College Park, United States, [3]Ohio Northern University, Ada, United States

Objective/background: Paper-based sleep diaries play an important role in the diagnosis and treatment of insomnia disorder. Accurate self-report data help to guide therapy and track progress, both in the clinic and during research trials. Previous research with paper diaries suggests that timely adherence with self-report diaries may be an issue, which can result in biased event recall.
Patients/methods: University students (N=31) were asked to track their bedtime and wake time within 30 minutes of these events on paper-based sleep diaries. Specially designed binders covertly timestamped when participants actually wrote on their sleep diary. We assessed adherence by comparing timestamped diary usage with what participants documented in their sleep diary.
Results: Participants self-reported they were adherent with sleep diary instructions 97.9% of the time. However, timestamped data revealed that only 37.1% of diary entries were completed within the instructed timeframe. More than half of participants backfilled diary data, and three participants (9.7%) provided data that completely did not match their actual time of completion.
Conclusions: When naïve to the objective tracking of their sleep diary usage, participants greatly over-reported the extent of their adherence. Non-adherence with sleep diary protocols poses a challenge for researchers utilizing this tool as a study outcome in clinical trials and for clinicians attempting to implement behavioral therapies for insomnia.
Acknowledgements: The novel sleep diary technology would not have been possible without the ingenuity of a team at Northeast Biomedical (Timothy M. Looney, Philip Andrusin, and Angela Valente) who made magic happen with some sensors and a 3D printer. Finally, Dr. Arthur A. Stone was beyond kind with his time in discussing his prior research with patient adherence.

Real world evidence of adverse events of prescribed medications for insomnia

P. Saskin[1], A. Ahuja[1], A. Busser[2], R. Sgier[3], W.V. McCall[4], M. Grandner[5]
[1]Idorsia Pharmaceuticals US Inc, US Medical Affairs, Radnor, United States, [2]Idorsia Pharmaceutical Ltd, Clinical Development and Research, Allschwil, Switzerland, [3]IBM Client Innovation Center, Zurich, Switzerland, [4]Medical College of Georgia, Psychiatry and Health Behavior, Augusta, United States, [5]University of Arizona, Psychiatry, Tucson, United States

Introduction: Chronic insomnia disorder (problems falling asleep, staying asleep, and/or early awakenings with associated daytime consequences) (1) is often treated with medications from different classes and different mechanisms of action. Many drugs prescribed for insomnia show potential for dependence and/or abuse. The dual-orexin receptor antagonist (DORA) class of medications have been available since 2015 in the US. Recent post-marketing surveys have found that DORA medications demonstrate markedly less adverse events than other FDA approved sedative-hypnotics as well as commonly used "off-label" treatments (2). This study presents real world evidence of identified symptoms of associated drug dependence and abuse potential among DEA schedule IV approved products for insomnia (benzodiazepines, z-drugs, orexin antagonists).

Materials and methods: This retrospective study is based on US claims data and medical charts. Adverse event endpoints were obtained from claims data. Subjects with insomnia disorder (ICD-10-CM codes) were identified from October 2015 to March 2020 (n=17637). Adverse events (ICD-10-CM codes) were examined for patients who had not received a prescription for an insomnia defined medication for a period of 6 months prior to the index date (first insomnia prescription). A period of 30 days prior to the index date (prescription of an insomnia drug) and for 90 days following treatment was examined. Three cohorts were identified: patients receiving initial prescriptions for FDA approved benzodiazepines (BZDs n=5394), benzodiazepine-receptor agonists (Z-drugs n=11923) and DORA's (n=320). Data (number of events per patient) prior to and following initiation of treatment were analyzed by identifying the change in number of identified events per 100 patient years (number of events per patients x 365 days x 100 years). Drug liking or features consistent with abuse potential were identified from adverse events: alcohol or drug abuse, amnesia, anxiety, cognitive impairment, daytime impairment, dependence, depression, disorientation, euphoria and dysphoria, mania, mood, psychosis, slurred speech, suicidal ideation or attempt, tremor, vertigo.

Results: Benzodiazepines and z-drugs showed significant post treatment changes on most identified measures of drug liking/abuse potential. This included alcohol/drug abuse (BZ: $p<0.007$, Z: $p<0.0001$), anxiety (BZ/Z: $p<0.0001$), cognitive impairment (BZ/Z: $p<0.0001$), dependence (BZ: $p<0.001$, Z: $p<0.001$), euphoria/dysphoria (BZ: $p<0.02$, Z: $p<0.0001$), panic attack (BZ/Z: $p<0.0001$), and suicidal ideation/intent (BZ: $p<0.01$, Z: $p<0.0001$). DORAs showed no evidence of significant associated post-treatment changes that would be consistent with drug liking or abuse potential.

Conclusions: DORA medications prescribed in this large sample of individuals identified with insomnia had fewer overall adverse events reported to physicians within 3 months of initial treatment. Drug liking or dependence were not seen in those patients receiving DORA medication.

Limitations: This real-world study employs claims data, requiring health care provider annotation of a specific adverse event. Data available during the study period for DORA medications are essentially associated with use of suvorexant. Subsequent analyses should also include medicines approved by FDA for sleep disturbances that do not have DEA scheduling and/or medicines commonly used to treat insomnia.

Funding: Idorsia Pharmaceuticals Ltd

References: (1) Sateia M et al, J Clin Sleep Med, 2017 (2) Moline et al, Poster presentation CPDD, June 2023

Real world evidence of automatic sleep tracking in increasing engagement and symptom remission within digital CBTi

G.C. Lamonica[1], J.E.C. Saire[1], F.S. Ruiz[1], M.L.N. Pires[2], L. Baraças[1], G. Hashioka[1], L.S. Castro[1]
[1]Vigilantes do Sono, São Paulo, Brazil, [2]LP Actigrafia & Sono, São Paulo, Brazil

Introduction: Sleep monitoring using accelerometer data from smartphones has gained widespread popularity. It is accessible. As of now, few studies describe such data in the context of digital therapeutics, within a CBTi app. In the Vigilantes do Sono' program, participants can optionally settle the sleep monitor to prefill sleep diaries. Our goal is to describe its use since launch, in February 2022, comparing baseline characteristics, engagement, and changes in insomnia symptoms between those who have or not used the tracker.

Materials and Methods: A virtual assistant interacts with users daily, for 5-10 minutes during ~7 weeks, asking them to fill sleep diaries and delivering CBTi knowledge pills in ~45 sessions, distributed in seven modules. The Insomnia Severity Index (ISI) assesses insomnia symptoms three times, at baseline, in the middle and at the end of the program. The tracker is based on previous smartphone algorithms, and the original Cole–Kripke's for wrist actigraphy. Participants are instructed they can choose to set the time they wish to wake-up and to place the smartphone on the mattress next to the pillow when going to bed. After awakening, they are asked to check the data on the diary and to correct it if in disagreement. Descriptive statistics, including the Chi-square test and analysis of variance were used.

Results: Since 2022, 1.657 new users (38.6±12.3 years; 65% women) with insomnia (ISI>10) have registered in the program and completed at least seven diaries. Of them, 30% had not used the tracker, 38% had used it less than seven nights (2.8±1.8), and 32% for seven or more nights (21.3±16.6), whom we classified as tracker users. Parallel, the average number of diaries among these groups were 33.1±40.9, 35.5±49.1, and 41.6±46.1, respectively. Although participants generally completed more diaries manually than using the tracker, there was a positive correlation between number of diaries and nights using the tracker (p:.40; p<0.001). Tracker users tended to be younger (37.6±11.8) than non-users (40.1±13.0; p=0.003), but there were no gender differences between groups. A higher proportion of tracker users (compared to non-users) have completed at least half of the program sessions (33% vs. 20%; p<0.001) and arrived at the last module (24% vs. 14%; p<0.001). A total of 711 (43%) participants (38% tracker users) had completed the ISI twice with an interval of two or more weeks, and 35% of them had a score reduction of at least 50%. This ISI score reduction rate among individuals who completed the program (n=235) was 55%. Insomnia remission (ISI<10) was slightly higher among tracker users (49% vs. 43%; p=0.028).

Conclusions: The findings suggest that the use of the sleep tracker might increase the chance of engagement and of finishing the program, reinforcing its potential to affect overall therapeutic response among insomnia patients and the need for continued development and validation.

Retrospective cohort study comparing risk of falls and associated incremental costs among adults treated with insomnia medications in the United States

T. Juday[1], S.R. Jang[2], C. Lundwall[1], E. Pappadopulos[3], E. Wickwire[4]
[1]Eisai Inc., US Medical Affairs, Nutley, United States, [2]Eisai Inc., Global Value & Access, Nutley, United States, [3]Eisai Inc., Global Medical Affairs, Nutley, United States, [4]University of Maryland School of Medicine, Department of Psychiatry, Baltimore, United States

Introduction: Untreated insomnia is associated with an increased risk of falls. Middle of the night and next day residual sedative effects from insomnia medications may further raise falls risk, and the level of risk may vary by medication. We examined 6-month falls risk and related costs in adults with insomnia who initiated lemborexant (LEM), trazodone (TZD), zolpidem (ZOL), or benzodiazepines (BZD).

Materials and Methods: This retrospective study used TriNetX's Dataworks -- a research network of longitudinal electronic medical records from over 50 healthcare organizations across the US -- to identify adults age ≥18 years with: (1) ≥1 ICD-10 insomnia code between 1-Jun-2020 and 31-Dec-2021 (patient identification period [PIP]); (2) ≥1 prescription for LEM, TZD, ZOL or BZD during the PIP (earliest prescription = index date); (3) no evidence of falls for 6 months pre-index date (baseline); and (4) ≥1 medical encounter during the 6 month period post-index date (follow-up). Using these inclusion criteria, separate cohorts were created for patients on each of the four medications. Patients in the TZD, ZOL, and BZD cohorts matched 1:1 to patients in the LEM cohort based on age, sex, race, ethnicity and prevalence of relevant comorbidities (type 2 diabetes mellitus [T2DM], hypertension, mood disorders, anxiety disorders, substance abuse, pain management, joint pain, unspecified pain). Mean 6-month fall rates and relative risk (RR) for each medication were assessed using pair-wise comparisons. Fall rates for each medication were applied to hypothetical cohorts of 1,000 patients per medication to calculate the incremental economic impact using published estimated healthcare costs associated with fall events. Results were adjusted to December 2022 levels using the Medical Care Component of the Consumer Price Index. Subgroup analyses in patients age ≥65 years were conducted to assess the impact of age on falls risk and incremental costs.

Results: After matching, each cohort included 716 patients (mean age 54 years, 62% female, 78% white, 77% non-Hispanic). The most prevalent comorbidities (ie, those over 15%) were anxiety disorders (34.5%), followed by hypertension (34.1%), mood disorders (23.6%), and joint pain (15.9%). Over the 6-month follow-up period, LEM (7.8%) had a lower falls risk than all comparators: TZD (9.2%, RR=1.179, 95% Confidence Interval [CI]: 0.828, 1.657]), ZOL (9.9%, RR=1.268, 95% CI: 0.907, 1.772) and BZD (13.8%, RR=1.768, 95% CI: 1.295, 2.413). Similarly, incremental costs for falls for the hypothetical cohorts of 1,000 patients over the 6-month follow-up period were lowest for LEM ($873,067), followed by TZD ($1,029,371), ZOL ($1,107,523) and BZD ($1,544,057), representing a relative savings of $156,304-$670,989 for LEM patients. Patients age ≥65 years had numerically higher fall rates and costs, and trends for each medication cohort were consistent with the findings for the overall cohort.

Conclusions: Risk of falls should be considered when selecting an insomnia medication, given the possible medical and economic consequences. Further research is warranted to better understand these differences.

Shifts in Insomnia Severity Index daytime functioning items with lemborexant treatment

C. Chepke[1], K. Cote[2], K. Pinner[3], J. Yardley[3], M. Moline[4]
[1]Excel Psychiatric Associates, Huntersville, United States, [2]Brock University, St. Catharines, Canada, [3]Eisai Ltd., Hatfield, United Kingdom, [4]Eisai Inc., Nutley, United States

Introduction: One component of insomnia disorder is daytime impairment, which can be assessed by Items 4-7 of the 7-item Insomnia Severity Index (ISI). The ISI was incorporated in the pivotal studies of lemborexant (LEM), a competitive dual orexin receptor antagonist approved for the treatment of adults with insomnia disorder. In Study E2006-G000-303 (Study 303; SUNRISE-2; NCT02952820), the ISI total score and items 4-7 for daytime function (DTF), improved significantly with LEM treatment compared with placebo (PBO) as assessed at 1, 3, and 6 months, with improvements continuing through 12 months. To assess the impact of LEM in more detail based on the level of baseline ISI daytime function item severity, this post-hoc analysis examined the impact of LEM compared with PBO on shifts in these items (improvements in severity level towards no problem) over 6 months, depending on baseline severity.

Materials and methods: Study 303 was a 12-month, randomized, double-blind PBO-controlled (first 6 months) phase 3 study in subjects (age ≥18 years) with insomnia disorder. Subjects were randomized to PBO, LEM 5 mg (LEM5) or 10 mg (LEM10) for 6 months. Individual ISI items are rated on a 5-point Likert scale from 0 (no problem) to 4 (very severe problem); the maximum score for daytime function items is 16. Daytime-related items include sleep satisfaction, and extent symptoms are noticeable to others, cause worry/distress, or interfere with daily function. Data were analyzed by Cochran-Mantel-Haenszel test of general association and Chi-square tests comparing improvement to staying the same or worsening within each baseline group (5-8: mild-to-moderate problem; 9-12: moderate-to-severe problem; or 13-16: severe-to-very severe problem) for LEM5 or LEM10 versus PBO.

Results: Of 949 subjects, 749 (78.9%) completed the ISI at baseline and 6 months: PBO, n=258/318 (81.1%); LEM5, n=257/316 (81.3%); LEM10, n=234/315 (74.3%). Baseline daytime function ISI scores were similar among groups; most scores were 9-12 (66.7-68.6%). At 6 months, more subjects with baseline scores 13-16 shifted to 0-4 with LEM5 (39.1%, P=0.23) and LEM10 (46.3%, P=0.01) compared with PBO (29.6%). Similarly, more subjects with baseline scores of 9-12 shifted to 0-4 with LEM5 (49.7%, P=0.01) and LEM10 (46.2%, P=0.08) compared with PBO (26.6%) at 6 months. Shifts towards improvement occurred in 39-48% of subjects with baseline scores of 5-8, with no significant difference between treatments. Overall, shift distributions from higher (more problematic) daytime function scores at baseline to lower scores at 6 months were significantly different, favoring both LEM groups versus PBO (P<0.01).

Conclusions: More LEM-treated subjects had ISI daytime function scores shift, indicating improvement in daytime functioning as assessed at 6 months compared with PBO. These results add to the previously reported benefit of LEM on sleep onset and sleep maintenance.

Acknowledgements: Funded by Eisai Inc.

Shorter sleep time in the baseline is associated with greater improvement after acute exercise

M.G. Santana[1], S.D. Youngstedt[2], A.R.C. Rozales[1], D.E. de Assis[1], B.P. de Assis[1], G.S. Passos[1]
[1]Universidade Federal de Jataí, Health Sciences Institute, Jataí, Brazil, [2]Arizona State University, Edson College of Nursing and Health Innovation, Phoenix, United States

Introduction: A previous study considered adding exercise to cognitive behavior therapy for insomnia (CBT-I) could be an alternative to minimize the poor adherence of patients with short sleep duration to CBT-I. This hypothesis was based in the acute effects of exercise on sleep duration of patients with chronic insomnia. In this way, the question of this study is whether insomnia patients with objective short sleep duration could have a greater improvement on sleep after acute exercise.
Materials and Methods: We tested a correlation of baseline total sleep time (TST) evaluated by polysomnography with delta TST (post- minus pre-treatment) after acute exercise in patients with chronic insomnia (n=9).
Results: Spearman's rank test showed a significant negative correlation of baseline TST with delta TST (r= - 0.78).
Conclusions: We could conclude that shorter sleep time in the baseline is associated with greater improvement after acute exercise in patients with chronic insomnia. In this way we could consider insomnia patients with shorter objective sleep duration could have more improvements mediated by the exercise on sleep. It could be the way to indicating the association of exercise with other non-drug therapies, such as CBT-I.

Sleep schedule variability moderates outcome trajectories the initial two years after digital Cognitive Behavioral Therapy for Insomnia

C. L. Vestergaard[1], Ø. Vedaa[2], M. R. Simpson[3], S. Lydersen[1], P. Faaland[1], D. Vethe[1], K. Kjørstad[2], B. Sivertsen[2], K. Langsrud[4], J. Scott[1,5], H. Kallestad[1]
[1]Norwegian University of Science and Technology, Department of Mental Health, Trondheim, Norway, [2]Norwegian Institute of Public Health, Department of Health Promotion, Bergen, Norway, [3]Norwegian University of Science and Technology, Department of Public Health and Nursing, Trondheim, Norway, [4]St. Olavs University Hospital, Østmarka, Trondheim, Norway, [5]University of Newcastle, Newcastle, United Kingdom

Introduction: Stabilization of intraindividual variability (IIV) in sleep schedules is a mainstay in Digital Cognitive Behavioral Therapy for Insomnia (dCBT-I) and is believed to be part of the therapeutic effect of the intervention. There is however, lack of evidence whether degree of IIV in sleep schedules at baseline moderate treatment effect. By identifying moderators of dCBT-I, we will be in position to target the intervention to populations most likely to attain positive outcomes. The aim of the present study was to test if IIV in sleep schedule at baseline was a moderator of dCBT-I on insomnia severity the initial two years after the intervention.

Materials and Methods: In a randomized controlled trial comparing dCBT-I (n= 867) with a fixed internet site with patient education about insomnia (PE) (n=853), participants completed the Insomnia Severity Index (ISI) and sleep diaries for 10-14 consecutive days at baseline, 9-week, 33-week and 113-week follow-up. Bayesian baseline estimates of IIV in rise time (RT) and bedtime (BT) were used to calculate IIV in RT and BT and categorize the individuals in respectively low IIV (the 25% lowest IIV data), medium IIV and high IIV (the 25% highest IIV data) groups. Linear mixed models were employed to analyze whether dCBT-I was efficacious in reducing ISI compared to PE for the particular IIV groups. Further, with 3-way interaction analyses we tested whether the degree of IIV at baseline moderated the benefits of dCBT-I on ISI on follow-ups.

Results: For low and medium degree of IIV in RT and BT, dCBT-I was superior to PE on all follow-ups (p-values ≤ 0.05). However, for individuals with high IIV in BT or RT, dCBT-I did not differ from PE in terms of ISI score at 113-weeks follow-up. When using 3-way interaction analyses, there were significant differences in treatment effects between low and high IIV in BT at 113-weeks follow-up (2.43, p=0.023). For RT, there were significant differences in treatment effects between low and high IIV at 33-weeks follow-up (2.71, p=0.003), low and high IIV at 113-weeks follow-up (2.52, p=0.011) and medium and high at 113-weeks follow-up (2.28, p=0.011). With this, it emerged a pattern where low IIV relative to high IIV group was most favorable for insomnia severity reduction.

Conclusions: Baseline IIV in sleep schedules as measured by sleep diaries moderate insomnia severity two years after dCBT-I. Overall, it is possible to deduce a pattern where individuals with lower baseline IIV have more favourable outcomes on ISI the initial two years after dCBT-I. More specifically, individuals with high IIV in sleep schedules do not benefit from dCBT-I compared to a control intervention two years after the intervention. However, to date we have no knowledge whether the individuals with high IIV benefit from dCBT-I in further follow-ups extending two years and one should therefore exercise caution to omit individuals with high IIV from dCBT-I.

Sleep-wake state discrepancy: clinical characteristics and effect of cognitive behavioural therapy for insomnia (CBTi)

D.-B. Bensen-Boakes[1,2], H. Scott[2], L. Lack[2], N. Lovato[2]
[1]Flinders University, College of Education, Psychology and Social Work, Bedford Park, Australia,
[2]Flinders Health and Medical Research Institute: Sleep Health, Flinders University, Bedford Park, Australia

Introduction: Individuals with chronic insomnia often self-report more wakefulness and less sleep than what is derived from objective measures. This is known as sleep-wake state discrepancy and is estimated to affect 9-50% of individuals with insomnia. It has been suggested that addressing this discrepancy could be therapeutic by reducing daytime impairment and worrying thoughts about sleep, and could help avoid the development of further objective sleep deficits. The relationship between this discrepancy and clinical characteristics of insomnia is unclear, despite its potential importance for the presentation and management of the disorder. This study investigated associations between sleep-wake state discrepancy and individual characteristics in older adults with sleep maintenance insomnia before and after receiving Cognitive Behaviour Therapy for Insomnia (CBTi).

Materials and methods: Seventy-three adults (F=53.39%, M=46.61, aged mean±SD=63.2±6.3 years) with sleep maintenance insomnia were recruited from a community-based sample. Participants completed sleep diaries and sleep-related questionnaires and wore an actigraphy device for one week before and after CBTi. Sleep-wake state discrepancy was calculated as the difference between subjective (sleep diary-reported) and objective (actigraphy device-derived) total sleep time at pre- and post-treatment. Correlations were conducted to test associations sleep-wake state discrepancy and sleep and daytime impairment variables at each timepoint.

Results: Prior to treatment, greater total sleep time discrepancy was associated with earlier sleep diary-reported bedtime (r= -.29), more wake after sleep onset (r=.96), less total sleep time (r= -.51), more time in bed (r=.30), and therefore lower sleep efficiency (r= -.78), as well as actigraphy derived total sleep time (r=.31). The degree of discrepancy was not significantly associated with age or any clinical variables (such as level of insomnia severity or fatigue) at pre-treatment. Following treatment, total sleep time discrepancy significantly reduced (p<.001), despite no improvement in objective total sleep time. Furthermore, the reduction of total sleep time discrepancy was significantly associated with better clinical outcomes including insomnia severity (r=-.57), fatigue (r=-.26), sleep-related self-efficacy (r=.33), and beliefs about sleep (r=-.38).

Conclusions: These findings suggest sleep-wake state discrepancy does not correlate with any other routinely-measured clinical characteristic prior to treatment, thus suggesting that clinical characteristics are not helpful for identifying those who are likely to have a significant sleep-wake state discrepancy. Following treatment, the reduction in discrepancy was driven by sleep diary reported total sleep time that more closely matched objective total sleep time, which remained relatively unchanged from pre-treatment. The combination of reduced time in bed due to the sleep restriction therapy component of CBTi and improved self-reported sleep values following CBTi are likely responsible for the significant reduction in discrepancy post-treatment. Given the positive associations of the reduced discrepancy with treatment outcomes, calculating sleep-wake state discrepancy using sleep diaries and actigraphy or PSG to aid therapeutically in CBTi is warranted. This has important implications for CBTi and suggests improvements in the accuracy of perceived sleep is a major therapeutic mechanism.

Stress-reactivity profile measured by heart rate variability in insomnia with short and normal objective sleep duration

Y.-C. Huang[1], J.-Y. Sung[2], H.-C. Lee[3], Y.-T. Shih[1], C.-M. Yang[1]
[1]National Cheng-Chi University, Department of Psychology, Taipei, Taiwan, [2]Taipei Municipal Wanfang Hospital, Department of Neurology, Taiepi, Taiwan, [3]Taipei Medical University, Department of Psychiatry, Taipei, Taiwan

Introduction: Autonomic Nervous System (ANS) dysregulation, with a shift of sympatho-vagal balance toward a predominance of sympathetic modulation, has been suggested to be the pathophysiology of insomnia. However, previous studies measuring ANS with Heart Rate Variability (HRV) showed inconsistent results. Vgontzas and Fernandez-Mandoza (2013) proposed that objective sleep duration as a biomarker for insomnia phenotypes. While the phenotype with short objective sleep duration is associated with stress-related physiological hyperarousal, the one with normal objective sleep duration is more associated with cognitive hyperarousal. The current study aims to compare the stress-reactivity profile of HRV between different insomnia phenotypes to further clarify the mechanisms of insomnia.

Materials and methods: Sixty-six insomnia patients (age mean 32.88 ±9.66, Male: Female= 16:50) without comorbidity of psychiatric, medical or sleep disorders participated in this study. They went through one night of 8-hour PSG recording and were divided into two groups based on their total sleep time with a cutoff of 6 hours. Nineteen participants were in the short-sleep-duration (SSD) group and 47 in the normal-sleep-duration (NSD) group. Psychophysiological stress-reactivity profile recorded with electrocardiogram (EKG) was measured under three conditions: baseline resting state, stress induction (arithmetic word problems solving), and recovery resting state. Time-domain and frequency-domain parameters of HRV were analyzed via CardioPro Infiniti (Thought Technology).

Results: Both groups showed similar psychophysiological responses to stress condition with increased heart rate (HR), standard deviation of NN intervals (SDNN), successive RR intervals that differ by more than 50 ms (NN50), percentage of NN50 (pNN50), root mean square of successive RR interval differences (RMSSD), absolute power of the very-low-frequency band (VLF), absolute power of the low-frequency band (LF), ratio of LF-to-HF power (LF/HF) and total power, and decreased Absolute power of the high-frequency band (HF), as well as opposite responses during recovery resting state. However, the changes of parameters from baseline to stress-induction to recovery phase showed no significant different between the SSD and the NSD groups.

Conclusion: Our results indicate that the insomnia phenotypes with short and normal objective sleep duration are not different in their stress-reactivity physiological responses as measured by HRV. The proposed model that SSD and NSD insomnia phenotypes differed in stress-related physiological arousal was not supported.

Suicide and sleep: a particular kinetics explaining the passage to the act?

I. Poirot[1], V. Jardon[2], M. Wathelet[3], P. Mascarel[4], L. Capy[5], M. Winant[5], E. Saint Paul[5], S. Hartley[6], A. Porte[7], A. Demesmaeker[5], G. Vaiva[5]
[1]CHU de Lille, Service de Psychiatrie Adulte, Unité de Sommeil, Lille, France, [2]CHU de Lille, Service de Psychiatrie Adulte, Vigilan S, Lille, France, [3]Fédération de Recherche en Santé Mentale, Saint-André-lez-Lille, France, [4]EPSM, Saint Paul, France, [5]CHU de Lille, Service de Psychiatrie Adulte, Lille, France, [6]Réseau Morphée, Garches, France, [7]CHU de Lille, Service de Psychiatrie Adulte, Centre et d'Accueil et de Crise, Lille, France

Introduction: Several meta-analyses have confirmed the link between suicide, nightmares and sleep disorders although the underlying mechanism is unclear: it is suggest that sleep complaints and nightmares may be risk factors for attempted suicide. Our aim was to study the evolution of sleep complaints related to suicide attempts through a declarative and retrospective study,
Materials and Methods: Two populations were recruited through the Lille University Hospital psychiatric crisis center, one hospitalized for a first suicide attempt (TS +; n = 33) and the other with suicidal ideation (IDS; n = 28). Outcome measures were questionnaire data: Pittsburgh sleep quality index (PSQI), NDQ, chronotype, and insomnia severity index (ISI) at one month and three months after hospitalization. The study compared the evolution of the ISI at the following timepoints: 15 days, 2 days before hospitalization, 1 and 3 months after hospitalization.
Results: The two populations are similar: mean age (34 and 31 years, respectively), sex (12 men / 21 women and 13 men / 15 women), and for psychiatric and addiction history respectively ($p > 0.01$). PSQI, ISI and Epworth scores are higher in the IDS population except for ISI -2 days ($p < 0.05$). Patients "TS+" had an ISI score above the cut off of 14 essentially two days before the act. "TS+" patients were taking fewer hypnotics before their suicide attempt than the "IDS" group. Populations were not differentiated by nightmares, circadian chronotype, or sleep debt. The evolution of the ISI score differed between the two populations; the TS+ population showing a tendency to suddenly increase ISI scores two days before the act (ISI TS+ / IDS: D-15 15/19; D-2 17/19; M1 8/12; M3 4/12).
Conclusions: This preliminary study shows that chronic insomnia accompanies suicidal ideation. An acute exacerbation of insomnia is associated with suicide attempts, with resolution of the insomnia over time after the attempt. Nightmares and circadian rhythm disturbances were not associated with suicide attempts. It is possible that patients with suicidal ideation without attempted suicide represents a different pathophysiology, characterized by chronic nocturnal ruminations explaining the sleep complaint. The limitations of the study are the declarative nature of sleep disturbances in the immediate course of a suicidal crisis, and the number of patients lost to follow-up at one month and three months. Our study identifies an acute aggravation of insomnia as a risk factor for a potential suicide complaint.

The association between vasomotor symptoms, anxiety and depression in postmenopausal women with insomnia: a cross-sectional study

H. Hachul[1], L. Lucena[1], B. Hachul de Campos[1], L. Dimov[1], S. Tufik[1]
[1]UNIFESP, Psicobiologia, Sao Paulo, Brazil

Introduction: Menopause is an important stage in a woman's life and may have both physical and psychological impacts. The main concerns in postmenopause are vasomotor symptoms, urogenital atrophy, osteoporosis, cardiovascular disease, sexual problems, hormonal changes, sleep disorders, and psychological conditions such as increased level of depression and anxiety. Our study aimed to evaluate the associations between hot flashes and menopausal symptoms as well as levels of anxiety, depression, and insomnia in postmenopausal women with insomnia complaints.

Materials and Methods: In this cross-sectional study, 71 postmenopausal women were distributed in two groups: a vasomotor symptoms group (n=41) and a control group (without vasomotor symptoms, n=30), according to self-reported complaint of hot flashes in the previous month. All participants completed the following socio-demographic and validated instruments: the Blatt-Kupperman menopausal index, the Menopause Rating Scale (MRS), the Beck Anxiety Inventory (BAI), the Beck Depression Inventory (BDI) and the Insomnia Severity Index (ISI).

Results: We identified a significant association between increased levels of anxiety and menopausal symptoms in the group with hot flashes. Considering all the participants, there was a strong positive correlation between levels of anxiety and menopausal symptoms. Moreover, the group with hot flashes presented a higher chance of severe anxiety according to the results of the BAI, than the control group. No significant difference was detected in relation to levels of depression and insomnia severity.

Conclusions: Menopause transition and postmenopause are marked by biological and emotional changes in women's health, which can lead to unpleasant symptoms. We identified an association between increased level of anxiety and greater menopausal symptoms in women with vasomotor symptoms in addition to a higher chance of being classified as having severe anxiety according to the BAI. Our data highlights the possible consequences of hot flashes on postmenopausal women's health and their mood.

The associations between different types of infection and sleep duration, sleep debt, circadian preference, shift work and insomnia: results from the Norwegian practice-based research network in General Practice – PraksisNett

B. Bjorvatn[1,2], G. Rørtveit[1], I.K. Rebnord[1], S. Waage[2,3], K.E. Emberland[1], S. Litleskare[4], I. Forthun[5]
[1]University of Bergen, Department of Global Public Health and Primary Care, Bergen, Norway,
[2]Haukeland University Hospital, Norwegian Competence Center for Sleep Disorders, Bergen, Norway,
[3]University of Bergen, Department of Psychosocial Science, Bergen, Norway, [4]NORCE Norwegian Research Centre, Bergen, Norway, [5]Norwegian Institute of Public Health, Department of Disease Burden, Bergen, Norway

Introduction: The association between sleep and infectious diseases is understudied. It is assumed that sleep of adequate duration and quality may reduce the risk of infections and improve infection outcomes, but evidence is limited. The objective of the present study was to assess the association between self-reported infections and sleep duration, sleep debt (difference between sleep need and sleep duration), circadian preference, shift work, chronic insomnia, and insomnia severity.

Materials and methods: In total, 1023 participants were recruited from the Norwegian practice-based research network in general practice to a cross-sectional online survey with questions about sleep habits, circadian preference, work schedule, and insomnia symptoms (Bergen Insomnia Scale (BIS) and Insomnia Severity Index (ISI)), and whether they had experienced various infections during the last three months. Data were analyzed with chi-square tests and logistic regressions with adjustment for relevant confounders (sex, age, marital status, country of birth, children living at home, educational level).

Results: Self-reported short sleep duration (<6 hours) was significantly associated with increased odds of throat infection (adjusted OR=1.60), ear infection (aOR=2.92), influenzalike illness (aOR=1.81) and gastrointestinal infection (aOR=1.91) whereas long sleep duration (>9 hours) was associated with increased odds of throat (aOR=3.33) and ear infections (aOR=5.82), compared to sleep duration of 6-9 hours, respectively. Sleep debt of >2 hours was associated with increased odds of the common cold (aOR=1.67), throat infection (aOR=2.58), ear infection (aOR=2.84), sinusitis (aOR=2.15), pneumonia/bronchitis (aOR=3.97), influenzalike illness (aOR=2.66), skin infection (aOR=2.15), and gastrointestinal infection (aOR=2.80), compared to no sleep debt. Being an evening type was associated with increased odds of venereal disease (aOR=4.01), compared to being a morning type. Shift work including night shifts was associated with increased odds of influenzalike illness (aOR=1.97), compared to not working shifts. Insomnia (based on BIS and ISI) was associated with throat infection (aOR=2.06, 2.55), ear infection (aOR=2.43, 2.45), sinusitis (aOR=1.82, 1.80), pneumonia/bronchitis (aOR=2.23, 3.59), influenzalike illness (aOR=1.77, 1.90), skin infection (aOR=1.64, 2.06), gastrointestinal infection (aOR=1.94, 3.23), and eye infection (aOR=1.99, 2.95).

Conclusions: These novel findings support the notion that people who have insufficient sleep or sleep problems may be at increased risk of infections. For sleep debt and insomnia severity, these associations were dose dependent. Longitudinal studies are needed for causal inferences.

The effectiveness of stimulus control in cognitive-behavioural therapy for insomnia in adults: a systematic review and network meta-analysis

A. Vallières[1,2,3], M. Demers Verreault[1], É. Granger[4], X. Neveu[3], J.P. Delage[4], C.H. Bastien[5]
[1]Université Laval, École de Psychologie, Quebec, Canada, [2]Centre de Recherche CERVO, Quebec, Canada, [3]Centre de Recherche du CHU de Québec - Université Laval, Quebec, Canada, [4]Université Laval, Quebec, Canada, [5]Université Laval, École de Psychologie, Quebec, Canada

Introduction: Stimulus control is part of the widely used cognitive behavioural therapy for insomnia. However, there is a lack of knowledge about its mechanisms of action and effectiveness when used alone. This systematic review with network meta-analysis aims to evaluate stimulus control efficacy compared to cognitive behavioural therapy for insomnia or its components. The review also documents stimulus control mechanisms of action proposed by the authors.

Materials and Methods: A search was conducted in several bibliographic databases (MEDLINE, PsycINFO, Embase, CINAHL, Psychology Behavioral Sciences Collection, Web of Science, and Cochrane Library) and in two registers from 1972 to June, 2022. Complementary research was conducted in websites and by citation searching. To be included, articles needed to have participants aged 18 years old and older with a diagnosis of insomnia; provide an intervention including at least one stimulus control instruction with no other intervention except sleep hygiene; include a comparison group of a variant of the stimulus control or another intervention and/or a control group; assess the efficacy of stimulus control; present a randomised group design. Risk of bias was assessed with the Quality Assessment of Controlled Intervention Studies. Three networks with Sleep Onset Latency (SOL), Wake After Sleep Onset (WASO), and Total Sleep Time (TST) were computed with effect sizes, confidence intervals, and prediction intervals. The I^2 and Tau statistics were used to assess heterogeneity while the Net Heat Plot and the Net Splitting methods were used to evaluate inconsistency. The meta-analysis is registered in Prospero (#CRD42021166959).

Results: Twenty-three studies were included and published between 1979 and 2019. Quality of included studies was generally poor. Results indicate that stimulus control used alone is an effective intervention to improve insomnia compared to control conditions. Stimulus control is not more effective than any other psychological intervention tested except for TST for which stimulus control is superior to sleep restriction therapy. Not all stimulus control instructions are essential, especially those known to recondition the bedroom to sleep. The main supported mechanism of action is that stimulus control diverts attention from worries that fuel cognitive activation. However, two networks present inconsistancies (SOL, WASO), the TST network being the most stable. Prediction intervals indicate the expected stimulus control effect for future studies for SOL over a placebo is between -6.7 and -44.5 minutes, between -0.6 and -63.5 minutes for WASO, and between 83.5 and 21.6 minutes for TST.

Conclusions: This systematic review with network meta-analysis shows that stimulus control therapy is effective as a single intervention. The hypothesis that the mechanisms of action associated with the reduction of cognitive activation and the stabilisation of the sleep routine is supported whereas the hypothesis of bedroom conditioning for sleep is not. Results should be interpreted cautiously given the small number of studies included, bias risk in most of the studies, and of inconsistencies in the network meta-analysis. Further rigorous research is needed in evaluating stimulus control efficacy and mechanisms of action.

The effect of dual orexin receptor antagonists on next-day driving: a systematic review and meta-analysis

S.R. Jang[1], B. O'Leary[2], M. Moline[1], J. Verster[3]
[1]Eisai Inc., Nutley, United States, [2]Datalytics, Kingston ACT, Australia, [3]Utrecht University, Utrecht, Netherlands

Introduction: Residual sedation from hypnotic drugs is a causal factor for many motor vehicle accidents (MVA). Commonly prescribed insomnia treatments like zolpidem, temazepam, and trazodone have shown to increase risk of MVAs to the same level as those intoxicated with alcohol, above the US legal limit to operate a motor vehicle (a blood alcohol concentration above 0.05%). Previous meta-analysis of next-day driving tests illustrated that the dual orexin receptor antagonists (DORA) lemborexant did not impair next-day driving, while suvorexant caused statistically significant but not clinically relevant driving impairment. A new meta-analysis was conducted to assess the impact of currently available DORAs on next-day driving by including daridorexant, which was approved by the US FDA and European Medicines Agency in early 2023.

Materials and Methods: Searches of Embase, PubMed, and International Clinical Trial Registry Portal were conducted on 29 December 2022 to identify driving tests for lemborexant (LEM), suvorexant (SUV), daridorexant (DAR), and for zopiclone (ZOP). Both on-the-road tests (OTR) and simulator tests were included, but no direct comparisons were made between the two separate types of studies. Primary outcome of the meta-analysis was the mean difference in standard deviation of lateral position (SDLP), i.e. the weaving of the car. Pairwise random-effects meta-analyses were performed to assess statistical differences in SDLP between each active treatment of interest and placebo in healthy individuals. Clinical relevance was concluded if ≥2.4 cm difference was seen in SDLP between active intervention and placebo for the OTR tests. No validated SDLP threshold is established for simulator tests.

Results: Six studies were included. After first administration of the insomnia treatment, no statistically significant or clinically relevant difference was seen for LEM 5 mg and LEM 10 mg. In elderly, SUV 15 mg did not impair driving. However, in adults SUV 20 mg did statistically impair driving, but without clinical relevance. SDLP was also significantly higher with DAR 50 mg compared with placebo after single dosing. After repeated dosing, SDLP for all DORAs were not statistically different from placebo. ZOP 7.5 mg significantly impaired driving in all studies after the first administration, validating the sensitivity of the driving tests.

Conclusions: Patients should be informed about the possible impact of DORAs on driving, particularly after treatment initiation.

The effect of videoconference-delivered cognitive behavioral therapy for insomnia on healthcare workers on disability leave

T. Araújo[1], P. Stenstrom[1], M. Bouchard[1], P. Sévigny-Dupont[1], C. LaRocque[1], R. Denesle[1,2]
[1]HALEO Preventive Health Solutions, Psychology, Montreal, Canada, [2]Center for Advanced Research in Sleep Medicine, Psychology, Montreal, Canada

Introduction: Insomnia has been linked to a higher risk of work disability and prolonged absence from work. However, little is known about the efficacy of cognitive behavioral therapy for insomnia (CBT-I) for employees who are on disability leave. We examined the effects of a CBT-I program (HALEO) on the insomnia symptoms of healthcare workers on disability leave diagnosed with chronic insomnia. The program comprised of five or six weekly 30-min video-conference-enabled sessions with a therapist, supported by a digital platform and a mobile app. Additionally, we assessed the effects of the program on symptoms of depression and anxiety, sleep medication use, and readiness to return to work.

Methods: Thirty-two participants (mean age of 43.9) diagnosed with chronic insomnia and on disability leave participated in the program. Participants were healthcare workers of a Canadian Hospital. The effectiveness of CBT-I was measured by change in Insomnia Severity Index (ISI) scores. The Hospital Anxiety and Depression Scale (HADS) was used to measure changes in depression (HADS-D) and anxiety (HADS-A) symptoms. The ISI and HADS were completed at the beginning of therapy (baseline) and at the final session (post-therapy). Data were analyzed with two-tailed Student paired t-tests. Finally, two additional post-therapy questions measured: 1) changes in sleep medication use across the therapy (the question was: "How did your use of this medication change across the program?"; the answer choices were: stayed the same; increased; decreased), and 2) the impact of the program on returning to work (the question was: "Has your participation in the program made you feel more comfortable returning to work?"; answer choices were: not at all; a little; to some extent; a lot, a great deal).

Results: Twenty-eight out of 32 (87%) participants completed the program. ISI scores were significantly lower post-therapy (M = 10.64, SD = 6.14) versus baseline (M = 18.39 SD = 4.59; $t(27) = 6.02$) $p < .001$, Cohen's $d = 1.14$). HADS-D scores were also significantly lower post-therapy (M = 6.82, SD = 4.91) compared to baseline (M = 9.68, SD = 4.09; $t(27) = 3.87$) $p < .001$, $d = 0.73$). Similarly, HADS-A scores were significantly lower at post-therapy (M = 7.61, SD = 3.91) compared to baseline (M = 9.64, SD = 4.49; $t(27) = 3.01$) $p < .001$, $d = 0.59$). Out of the 18 participants that reported utilising sleep medication, 12 (66%) reported reduced sleep-medication use across therapy, and none (0%) reported an increase. Sixteen out of 28 participants answered the follow-up question concerning returning to work with 5 (31.2%) answering "not at all", 3 (18.7%) "a little", 2 (12.5%) "to some extent', 2 (12.5%) "a lot" and 4 (25%) "a great deal".

Conclusions: The results indicate that a therapist-led, videoconference-delivered CBT-I program can be effective at reducing the symptoms of insomnia, depression, and anxiety in a population of healthcare workers on disability leave. Furthermore, the program may contribute to reduce sleep medication usage and in making some participants feel more comfortable returning to work.

The experience of poor sleep in people with fibromyalgia: a qualitative meta-synthesis

C. Robertson[1], M. Beasley[2], M. Stevens[2], M. Imamura[1], D. Whibley[2,3], L. Aucott[1], P. Manson[1], A. Abhishek[4], D. Dulake[5], G.J. Macfarlane[2], N.K.Y. Tang[6], M. Brazzelli[1], K. Gilles[1]
[1]University of Aberdeen, Health Services Research Unit, Aberdeen, United Kingdom, [2]University of Aberdeen, Aberdeen Centre for Arthritis and Musculoskeletal Health (Epidemiology Group), Aberdeen, United Kingdom, [3]University of Michigan, Department of Physical Medicine and Rehabilitation, Ann Arbor, United States, [4]University of Nottingham, Academic Rheumatology, Nottingham, United Kingdom, [5]Versus Arthritis, Chesterfield, United Kingdom, [6]University of Warwick, Department of Psychology, Coventry, United Kingdom

Introduction: Fibromyalgia is a chronic condition characterised by widespread pain and sleep disturbance. Disturbed sleep is associated with increased pain intensity, poor physical and cognitive functioning, low mood and poor quality of life. It is, therefore, important to understand the role of sleep in fibromyalgia as experienced and reported by patients.

Aims: To explore how people diagnosed with fibromyalgia experience and manage poor sleep.

Method: An update of a qualitative meta-synthesis of qualitative and/or mixed methods studies exploring the experience and/or management of sleep problems in people with fibromyalgia. We searched four major electronic bibliographic databases (PubMed, Scopus, ISI WebofScience and Cinahl Plus) for all years up to November 2021 without applying language restrictions. We conducted a thematic analysis to capture the phenomena described across the identified literature, looking for areas of reciprocity and divergence. Finally, we mapped the relationships between analytical themes to the 'symptom experience' and 'symptom management strategies' domains of the Symptom Management Theory conceptual framework. This meta-synthesis forms part of a broader health technology assessment evaluating interventions for the management of poor sleep quality in people with fibromyalgia.

Results: Nine reports from eight studies were combined with the studies identified in the earlier meta-synthesis to provide a total of 26 reports from 25 studies. The studies reported data from the perspectives of 565 adults with fibromyalgia. The majority (90.4%) were women and were white (80.5%). Reported mean ages of the participants ranged from 41 years to 61 years. Other demographic characteristics (e.g., sociodemographic status) were often not reported. Results were organized into two overarching themes: experience of poor sleep in fibromyalgia and poor sleep quality management strategies in fibromyalgia. Poor sleep was described as amongst the worst symptoms of fibromyalgia. Poor sleep maintenance and sleep disturbance were the problems participants experienced most often. Good quality sleep was perceived as having uninterrupted sleep, feeling rested/renewed upon waking, waking with an absence of fatigue and pain and having enough energy to perform daily activities. Our synthesis confirmed earlier findings regarding the bidirectional relationship between poor sleep and pain. Insufficient sleep was reported to increase pain intensity, which led to a state of fatigue that prevented good sleep and impacted on daily life. Conversely, some participants felt that getting a good night's sleep increased their pain due to being physically immobile while being asleep. Poor sleep was also described as having a negative impact on cognitive functioning, mental health and fibromyalgia symptom 'flare-ups'. Strategies to manage the consequences of a sleepless night included trying to rest/relax during the day and taking medication, although some participants felt that medication was ineffective and/or caused unpleasant side effects.

Conclusion: The findings from our synthesis demonstrate that poor sleep is a common and profoundly disabling aspect of living with fibromyalgia. It is also a core component of fibromyalgia with negative consequences on pain, general health and wellbeing.

The feasibility and efficacy of mindfulness-based therapy for insomnia among young and middle-aged Black women in the United States (US)

S. Nam[1], S. Jeon[1], M. Ordway[1], L. Yau[2], J. Iennaco[1]
[1]Yale University, School of Nursing, West Haven, United States, [2]Stony Brook University, Stony Brook, United States

Introduction: The psychological stress that triggers cognitive and physiological arousal may be associated with the onset and perpetuation of insomnia. In the US, psychological stressors that Black women experience are multifactorial, which include the intersections of race and gender and are often compounded by socioeconomic strains. Poor sleep and sleep deficiency, associated with increased risks of cardiometabolic morbidity and mortality, have been shown to disproportionately affect Black women. However, there are significant research gaps in sleep intervention for Black women. Little is known about whether an intervention to reduce psychological stress can improve sleep in Black women. Mindfulness-based therapy for insomnia (MBTI) is mindfulness meditation, the evidence-based stress reduction practice with behavioral therapy for insomnia using metacognitive processes of the cultivation of non-judgment, self-compassion, and present-focused awareness. The purposes of the study were to evaluate the feasibility and acceptability of online MBTI intervention and compare the efficacy of MBTI and health education (HE) control in improving insomnia symptoms.
Materials and methods: Black women aged 25-45 with the Insomnia Severity Index (ISI) score >7 were randomized to MBTI vs. time and attention HE control. The MBTI (n=21) group received weekly sessions that included mindfulness meditation and behavioral sleep strategies. The control group (n=9) received HE that had healthy eating, physical activity, and sleep hygiene. Both groups received 8-weekly, 90 minute-groups sessions via online video conferences. The primary outcome was insomnia severity measured by the ISI at baseline and week 10. Other self-reported sleep, stress, and mood were measured by: Pittsburgh Sleep Quality Index, Sleep Hygiene Practice, Spielberger State-Trait Anxiety Inventory (STAI), Perceived Stress Scale, and Patient Health Questionnaire-9 (PHQ-9). Objective sleep was measured by Actiwatch™ for 7 days at baseline and week 10.
Results: Thirty Black women completed the intervention as allocated. The attendance rates were similar across the two groups; about 97% of all participants attended 6-8 sessions out of 8. The mean age was 35.70±6.49 years, and the mean ISI score at baseline was 16.53±5.36. The ISI scores were reduced in both groups at week 10 (MBTI vs. HE:-7.67 vs. -7.22, $p < 0.05$). Global sleep quality (MBTI vs. HE:-4.24 vs. -3.11, $p < 0.05$) and sleep hygiene practice also improved in both groups (MBTI vs. HE:-4.57 vs. -7.11, $p < 0.05$). Anxiety and depression symptoms were significantly improved only in the MBTI group (STAI:-9.67 and PHQ-9:-4.67, $p < 0.05$). Perceived stress was reduced in both groups (MBTI vs. HE:-4.67 vs. -3.00, $p < 0.05$). However, there was no statistically significant improvement in sleep measured by actigraphy in both groups.
Conclusions: This is the first MBTI for Black women with insomnia. Online MBTI may be feasible and acceptable for Black women. Both MBTI and HE showed a clinically significant improvement in insomnia symptoms (ISI reduction>7). MBTI may be more effective in improving anxiety and depression symptoms than HE. Our findings encourage further study efforts with a longer follow-up and larger sample size to address sleep disparities among Black women.

The impact of data-driven subtypes of insomnia disorder on the efficacy of cognitive-behavioral therapy for Insomnia

D. Lyu[1], Y. Zhang[1], X. Luo[1], T. Zhang[1], C. Yuan[1], Z. Xiao[1]
[1]Shanghai Mental Health Center, Shanghai Jiaotong University School of Medicine, Department of Sleep Disorders, Shanghai, China

Introduction: Multiple data-driven subtypes of insomnia have been proposed in recent years. The study investigated whether subtypes of insomnia disorder affect the efficacy of cognitive-behavioral therapy (CBT-I) and explore the changes in insomnia and mood symptoms following standard or enhanced CBT-I.

Materials and Methods: A total of 98 participants insomnia disorder and mild anxiety or depressive symptoms completed an 8-week randomized controlled trial of CBT-I and CBT-I plus (CBT-I combined with modules targeting mood symptoms). The optimal number of clusters was determined on silhouette coefficient. K-means clustering analysis was performed. Two-way ANOVA was performed on the change of PSQI, HAMD, and HAMA scores at 8 weeks to explore the impact of subtypes and treatment approaches (CBT-I and CBT-I plus) on insomnia and mood symptoms.

Results: K-means clustering divided the baseline participants into three classes. Significant differences were found among subtypes regarding baseline PSQI ($F = 37.45$, $P < 0.001$), HAMD ($F = 21.11$, $P < 0.001$), and HAMA ($F = 26.18$, $P < 0.001$). Two-way ANOVA revealed that the reduction rate in PSQI scores was significantly influenced only by the subtype of insomnia ($F = 6.02$, $P = 0.003$). The reduction rate in HAMD scores was significantly affected by insomnia subtype ($F = 17.36$, $P < 0.001$), treatment type ($F = 1.88$, $P < 0.001$), and interaction ($F = 1.01$, $P < 0.001$).

Conclusions: Subtypes of insomnia disorder have a significant impact on the efficacy of CBT-I in improving insomnia and depressive symptoms. Different subtypes exhibit significant differences in the effectiveness of CBT-I plus for treating depressive symptoms. These findings underscore the importance of tailor interventional approaches in CBT-I to optimize treatment effectiveness based on insomnia subtypes.

The impact of insomnia on the occurrence of falls in older adults - a systematic review

K. Donato[1], M. Meira e Cruz[2,3,4], M. Gomes da Rosa[5], A. Donato[1], C. Medina[1], D. Sobral[1], A. Carlos[1], C. Salles[1,6,7]
[1]Bahiana School of Medicine and Public Health, Salvador, Brazil, [2]European Sleep Center, Lisboa, Portugal, [3]University of Lisbon, Sleep Unit, Cardiovascular Center, Faculty of Medicine in Lisbon, Lisbon, Portugal, [4]College Sao Leopoldo Mandic, Campinas, Brazil, [5]University of Lisboa, Lisboa, Portugal, [6]Federal University of Bahia, University Hospital Professor Edgar Santos, Salvador, Brazil, [7]Jorge Amado University Center, Salvador, Brazil

Introduction: The leading cause of injury-related death among older adults over 65 years of age is falls. Every year, for every 100 people aged 65 and over, 30 to 40 of them fall. In parallel, sleep disorders are also common among older adults, in which insomnia is the most frequent sleep disorder, whose symptoms affect the lives of 30% to 48% of them, causing consequences related to the impairment of the quality and/or quantity of sleep hours. This population of insomniacs has worse cognitive function, slow motor responses, and daytime sleepiness as consequences, contributing to the occurrence of falls. Studies have shown that the relationship between insomnia and falls in older adults is multifactorial, including impairment of balance and response time to postural reaction, besides the adverse effects of medications used in therapy for sleep disorders.

Materials and Methods: This is a systematic review guided by the PRISMA 2020 protocol. Inclusion criteria were: cross-sectional or longitudinal studies that investigated insomnia and the number of falls in elderly aged $\geq$ 65 years; studies in English and Portuguese languages. Exclusion criteria: abstracts; reviews; conference proceedings; and animal studies.

Results: The search for studies was conducted through electronic databases and by means of a manual search. Initially, 4,574 studies were identified; of these, 9 were included in the systematic review. Insomnia was assessed subjectively in all studies using a questionnaire. The sample size of all studies was significant, with the smallest n being equal to 605 participants. Most studies found an association between the presence of insomnia and an increase in the occurrence of falls. The following results are noteworthy:

1. One of the studies with a sample size of 34,163 elderly people found that those with insomnia fell more than those without insomnia, even after adjusting for variables (OR = 1.52, 95% CI = 1.38 - 1.66).

2. Insomnia was also an independent risk factor for falls in a study comprising a sample size of 605 people (OR = 1.787, 95% CI = 1.106 - 2.877).

3. Another study with n = 6,882 participants showed the additional manifestation of a single symptom of insomnia was sufficient to increase the occurrence of falls in the older adults population by up to 5% (OR = 1.05, 95% CI = 1.01 - 1.11), even after all confounding variables were adjusted for.

Conclusions: Considering the results of this study, it is possible to observe that there is strong evidence that insomnia significantly impacts the occurrence of falls in older adults individuals aged $\geq$ 65 years. This systematic review contributes strategically to the medical profession's awareness that insomnia is one of the modifiable factors associated with the risk of falls in older adults.

The Turkish version of the Revised-Brief Infant Sleep Questionnaire (BISQ-R)

P. Boran[1], H.E. Barış[1], M.C. Us[1], A. Ergin[2]
[1]Marmara University, School of Medicine, Social Pediatrics, Istanbul, Turkey, [2]Pamukkale University, Faculty of Medicine, Department of Public Health and Department of Pediatrics, Denizli, Turkey

Introduction: The prevalence of behavioral sleep problems is high, ranging from 20% to 30%. Brief Infant Sleep Questionnaire (BISQ), a validated screening tool, has already been translated into Turkish and shown to be reliable. It has been revised and a norm referenced scoring system was developed by Mindell et al in 2019. The objectives of this study were to explore psychometric properties of the revised Turkish version of BISQ-R in young children.
Materials and methods: An observational, cross-sectional study was conducted between October 2022 and June 2023 in Istanbul, Turkey. Parents of 320 healthy, term born children between 3 months to 36 months of age completed the online BISQ-R. A higher score reflects better sleep quality, more positive perception of infant sleep, and parent behaviors that promote independent sleep. Concurrent validity was tested by using Receiver operating characteristic (ROC) analysis against the poor sleeper criteria developed by Sadeh. For a test-retest reliability evaluation, a re-test was conducted in 105 participants with a 3 weeks interval between the administrations
Results: A BISQ-R total score and scores for the three subscales (infant sleep (IS), parent perception (PP), parent behavior (PB)) were calculated. All subscales were significantly positively correlated with each other and the total score. The highest correlation coefficient was observed between PP and IS (r=0.54, p<0.001), whereas the lowest was between PP and PB (r=0.29). The Area Under the Curve (AUC) was calculated as 0.78 (0.70-0.86) for the total score, 0.85 (0.78-0.92) for IS, 0.69 (0.60-0.79) for PP, and 0.60 (0.52-0.69) for PB subscales. Paired t tests for the global BISQ-R score, as well as the individual component scores, showed no significant differences between T1 and T2. Intraclass correlation coefficients indicated high positive test-retest reliability for the total, as well as the individual subscale scores, except PB subscale.
Conclusions: Our preliminary findings provide evidence that the Turkish version of BISQ-R provides a useful assessment of a variety of behavioral sleep problems, and can be used in Turkish children aged between 3 to 36 months. Considering that the lowest correlation was observed in PB subscale; future studies are needed to explore the effect of culture in the context of sleep related parental practices.

To examine the long term impact of COVID-19 on sleep patterns and development of sleep disorders

S. Batool-Anwar[1], O. S. Fashanu[1], C. Vassell[1], S. Quan[1]
[1]Harvard University, Division of Sleep and Circadian Rhythm Disorders, Boston, United States

Introduction: A significant proportion of COVID-19 survivors experience a variety of ongoing symptoms also known as post COVID syndrome, "long-haul" COVID(2) or post acute sequelae of COVID-19 (PASC). Fatigue, brain fog, and sleep disturbances are amongst the commonly reported symptoms. Even if only 10% of those with long-haul COVID develop a sleep disorder, there would be an enormous social and economic impact. Therefore, documenting the time course of COVID-19 and subsequently disturbed sleep may better prepare healthcare providers to manage and possibly mitigate the impact of long-haul COVID.

In this study, we report the incidence and prevalence rates of self-reported disturbed sleep symptoms and change in sleep duration in a cohort of individuals who have had a COVID-19 infection. In addition, we document the persistence of these symptoms over the time period after infection.

Materials and Methods: Using the centralized Massachusetts General Brigham (MGB) Research Patient Data Registry (RPDR), SARS-CoV2 positive patients were surveyed about their sleep patterns before and after the viral infection. Information related to co-morbid conditions and medications were obtained through chart review.

Results: Two hundred and forty-five completed surveys were analyzed. Average age was 53.3 ± 16.3 years, and participants were predominantly Non-Hispanic White (84.1%) and female (74.3%). Average BMI (kg/m^2) was 29.9 ± 6.9, and a greater proportion was non-smokers (63.2%). After COVID-19, there was an increase in the percentage of participants reporting difficulty initiating ($31 \pm 46\%$ vs. $39 \pm 49\%$, $P=0.01$), and maintaining sleep ($43 \pm 49\%$ vs. $57 \pm 49\%$, $P<0.001$), and use of sleep aids ($24 \pm 43\%$ vs. $30 \pm 45\%$ $P=0.003$) with an incidence rate of 24.3%, 37.4%, and 12.3% respectively. In addition, there was an increase in daytime fatigue and the need for napping ($58 \pm 49\%$ vs. $36 \pm 48\%$, $P <0.0001$) with an incidence of 8% and 23% respectively. The sleep symptoms persisted beyond 12 months among 28% of the participants and were predominantly seen among women.

Conclusions: Infection with SARS-CoV2 has negative effects on sleep, and a significant proportion of adults experience insomnia and daytime sleepiness beyond 12 months after recovering from the initial infection.

Transitioning between drug classes: data from two studies with lemborexant and Z-drugs

R. Rosenberg[1], M. Ozone[2], M. Moline[3], N. Uchimura[2], H. Hiejima[2], K. Murotani[4], T. Taninaga[5], J.Y. Cheng[3], D. Kumar[3]
[1]NeuroTrials Research, Atlanta, United States, [2]Kurume University School of Medicine, Kurume, Japan, [3]Eisai Inc., Nutley, United States, [4]Kurume University, Kurume, Japan, [5]Eisai Co, Ltd, Tokyo, Japan

Introduction: While switching of medications for insomnia occurs frequently in clinical practice for a variety of reasons, few clinical studies have examined the impact of transitioning patients between different insomnia medications. This should be an important consideration when switching patients between different classes of drugs (eg, GABA-ergic agonists versus dual-orexin-receptor-antagonists [DORA]). Lemborexant (LEM) is a DORA approved in the United States and Japan with the same dosing instructions to treat adults with insomnia. Two studies (United States: E2006-A001-312, Study 312, NCT04009577; Japan: E2006-M081-401, Study 401, NCT04742699) evaluated the success rate of transitioning to LEM in subjects with insomnia who were dissatisfied with their previous hypnotics in terms of efficacy or tolerability. In Japan, the focus was particularly on those who wished to switch from all or some of their previous hypnotics to LEM.

Materials and Methods: Both studies employed an open-label design that examined prespecified dosing paradigms for directly transitioning subjects from a Z-drug to LEM without a down-titration of the Z-drug. Study 312 included a 3-week Screening Period (subjects continued zolpidem [ZOL]), 2-week Titration Period (TITR), 12-week Extension Period (EXT; not reported here), and 4-week Follow-up Period. Adults with insomnia who were intermittent (3-4 nights/week) or frequent (≥5 nights/week) ZOL users were assigned to 1 of 2 cohorts. Cohort 1: Intermittent ZOL users and subjects with 1 week each of intermittent and frequent ZOL usage began TITR with LEM 5 mg (LEM5). Cohort 2: Frequent ZOL users were randomized 1:1 to LEM5 or LEM 10 mg (LEM10). Subjects who successfully transitioned (elected to continue LEM in EXT or to discontinue for reasons other than AE or lack of efficacy) to LEM had the option to enter the EXT. Study 401 was of similar design, with the exception of a 2-week Screening Period during which subjects continued their current Z-drug (ZOL, zopiclone, or eszopiclone); all subjects started with LEM5. The primary endpoint in both studies was the proportion of subjects who successfully transitioned to LEM at the end of TITR. Routine safety evaluations were conducted.

Results: In Study 312, the Full Analysis Set comprised 53 subjects (Cohort 1, n=10; Cohort 2, n=43). Following 2 weeks of LEM treatment, the majority of subjects (overall, n=43/53; 81.1%) transitioned from ZOL to LEM, regardless of prior intermittent or frequent use of ZOL determined during the Screening Period. In Study 401, 25 subjects were taking Z-drugs (n=6 ZOL, n=1 zopiclone, n=18 eszopiclone) during TITR. The proportion of subjects with successful LEM treatment in the Z-drug group was 92.0% (n=23/25). Except for 3 Japanese subjects, all those (n=63/66; 95%) who transitioned to LEM chose to continue in the EXT. No new safety signals emerged during transitioning and the safety profile was similar to pivotal trials.

Conclusions: Results from both studies indicate that adults can successfully transition directly from a Z-drug to LEM. LEM was generally well tolerated; the safety profile was consistent with that observed in the global phase 3 clinical development program.

Funding: Eisai Inc; Eisai Co., Ltd.

Transitioning from Z-drugs to lemborexant: impact on patient satisfaction with treatment

R. Rosenberg[1], M. Ozone[2], M. Moline[3], N. Uchimura[2], H. Hiejima[2], K. Murotani[4], T. Taninaga[5], J.Y. Cheng[3], D. Kumar[3]

[1]NeuroTrials Research, Atlanta, United States, [2]Kurume University School of Medicine, Kurume, Japan, [3]Eisai Inc., Nutley, United States, [4]Kurume University, Kurume, Japan, [5]Eisai Co, Ltd, Tokyo, Japan

Introduction: Few clinical studies have examined outcomes following transitions between different insomnia medication classes (eg, GABA-ergic agonist versus dual orexin receptor antagonist [DORA]). To this end, 2 studies (United States: E2006-A001-312, Study 312, NCT04009577; Japan: E2006-M081-401, Study 401, NCT04742699) were conducted with the DORA lemborexant (LEM). LEM is approved in both countries with the same dosing instructions to treat adults with insomnia. The studies evaluated the success rate of LEM transition in subjects dissatisfied with previous hypnotics in terms of efficacy or tolerability. In Japan, the focus was particularly on those who wished to switch from all or some of their previous hypnotics to LEM. Patient-reported satisfaction with treatment was evaluated using the Patient Global Impression–Insomnia (PGI-I), an assessment that asks subjects to rate their overall perception of treatment success (positive, neutral, or negative).

Materials and Methods: Both studies employed an open-label design that examined prespecified dosing paradigms for directly transitioning subjects with insomnia from a Z-drug to LEM. Study 312 included a 3-week Screening Period, 2-week Titration Period (TITR), 12-week Extension Period (EXT; not reported here), and 4-week Follow-up Period. Adults, either intermittent (3-4 nights/week) or frequent (≥5 nights/week) zolpidem (ZOL) users, were assigned to 1 of 2 cohorts. Cohort 1: Intermittent ZOL users and subjects with 1-week each of intermittent and frequent ZOL usage began TITR with LEM 5mg (LEM5). Cohort 2: Frequent ZOL users were randomized 1:1 to LEM5 or LEM10 mg (LEM10). Study 401 was of similar design, with the exception of a 2-week Screening Period wherein subjects continued their current Z-drug (ZOL, zopiclone, or eszopiclone); all subjects started with LEM5. In both studies, there was no down-titration period between Screening and the beginning of the use of LEM. Subjects who successfully transitioned to LEM (elected to continue on LEM or exited the study for reasons other than AE or lack of efficacy) could enter EXT.

Results: In Study 312, most subjects (overall, n=43/53; 81.1%) transitioned from ZOL to LEM, regardless of prior use of ZOL. In Study 401, 25 subjects took Z-drugs (n=6 ZOL, n=1 zopiclone, n=18 eszopiclone) during TITR. The proportion of subjects with successful LEM treatment was 92.0% (n=23/25). Except for 3 Japanese subjects, all (n=63/66; 95%) who transitioned to LEM chose to continue in EXT. At the end of Screening, 50.9% of subjects on ZOL in Study 312 reported a positive effect and 24.5% reported a negative effect on their sleep. At the end of TITR, 56.6% reported a positive effect of LEM and 18.9% reported a negative effect. In Study 401, the proportion who selected "treatment was beneficial for sleep" was 60.0% at baseline with Z-drug treatment, and 68.0% with LEM at the end of TITR. Fewer subjects reported a negative effect (12% versus 16% with Z-drugs) at the end of TITR.

Conclusions: These studies indicate that adults can successfully transition from Z-drugs to LEM, with an increase in ratings of positive effects on sleep noted within the first 2 weeks of treatment.

Support: Eisai, Inc; Eisai Co., Ltd

Treatment approach for insomnia in patients with asymptomatic periodic limb movement disorder: a case series

P. Prawiroharjo[1,2], Y.T. Martono[2], E. Santawi[2]
[1]Department of Neurology, Faculty of Medicine Universitas Indonesia, Jakarta, Indonesia, [2]Mandaya Royal Hospital Puri, Cognitive and Sleep Center, Tangerang, Indonesia

Introduction: Insomnia is a common sleep disorder characterized by difficulties in initiating or maintaining sleep, leading to impaired daytime functioning. Periodic limb movement disorder (PLMD) is often associated with insomnia, presenting as repetitive and involuntary limb movements during sleep. However, some patients with PLMD may not exhibit observable limb movement symptoms during sleep. This case series explores a treatment approach for insomnia in patients with PLMD, despite the absence of reported limb movement symptoms.

Materials and methods: Four patients presenting with insomnia were included in this case series. Pittsburgh Sleep Quality Index (PSQI) was used to evaluate sleep quality. Diagnostic Polysomnography (PSG) through leg Electromyography (EMG) confirmed the presence of Periodic Limb Movements (PLMs), despite the absence of reported limb movement symptoms during sleep based on patient history and family accounts. Patient A had a PLM index of 27/hour. Patient B had a PLM index of 32/hour. Patient C had a PLM index of 22/hour. Patient D had a PLM index of 26/hour. The patients were given Pregabalin or Pramipexole to treat their PLMD. The patients underwent a multimodal treatment approach, consisting of Cognitive Behavioral Therapy, muscle stretching sessions, transcranial direct current stimulation (tDCS) on the Dorsolateral Prefrontal Cortex (DLPFC), Theta Binaural Beats, and aromatherapy. The duration for the multimodal treatment spanned up to four days, with pharmacological interventions toward PLMD given up to a month.

Results: Following the pharmacological intervention combined with multimodal therapy, all four patients experienced a significant reduction in insomnia symptoms. A decrease in PSQI score was observed during follow-up in all four cases, with the highest being a decrease of 9 points of score, indicating enhanced sleep quality. The patients reported an overall improvement in their ability to fall asleep, stay asleep, and wake up feeling refreshed.

Conclusions: Our findings suggest that pharmacological and multimodal approach involving Cognitive Behavioral Therapy, muscle stretching session, tDCS, Binaural Beats theta, and aromatherapy holds promise in managing insomnia in patients with PLMD, even in the absence of overt limb movement symptoms during sleep. This approach addresses the underlying sleep disorder and associated insomnia symptoms, improving sleep quality and daytime functioning. Further research is warranted to explore the long-term efficacy and mechanisms underlying this treatment approach.

Visualizing insomnia phenotypes using dimensionality reduction techniques

P. Bouchequet[1], T. Andrillon[2], G. Solelhac[3], A. Rouen[1], F. Sauvet[1,4], D. Léger[1]
[1]Université Paris Cité, EA 7330 VIFASOM, Paris, France, [2]Paris Brain Institute, Sorbonne Université, Paris, France, [3]Center for Investigation and Research in Sleep, Lausanne, Switzerland, [4]Institut de Recherche Biomédicale des Armées, Brétigny-sur-Orge, France

Introduction: A large number of features can be extracted from a single hypnogram, such as stages durations, onsets, or transitions probabilities. Those numerous indicators can turn a collection of sleep records into a high dimension space. Dimensionality reduction techniques are then useful to reveal patterns in data. We used 3 dimensionality reduction techniques to visualize insomnia phenotypes from a dataset of insomnia and control sleep records: principal component analysis (PCA), t-distributed stochastic neighbor embedding (t-SNE) and uniform manifold approximation and projection (UMAP).

Materials and methods: 519 sleep records have been included with the following diagnoses: 46 sleep onset insomnia, 83 sleep state misperception, 223 sleep maintenance insomnia, 117 sleep onset and maintenance insomnia and 50 controls (good sleep). We limited the feature extraction to the hypnogram as macrostructure constitute the primary source of information used for diagnosis in polysomnography. We used common macrostructure indicators such as wake after sleep onset (WASO), as well as more intricate features such as stages transitions probabilities. A first set of 54 features per hypnogram was computed. Those features were then projected in a 2 dimensional space using PCA, t-SNE and UMAP.

Results: Co-ranking matrix of the projections was computed for the 3 techniques (PCA: Kmax=103, Qlocal=0.38; tSNE: Kmax=20, Qlocal=0.44; UMAP: Kmax=160, Qlocal=0.44). UMAP was the technique that projected the hypnograms feature sets in the most meaningful way, by reflecting the individual diagnoses. Interestingly in the UMAP representation, group outliers, such as controls having nevertheless experienced nocturnal awakenings were projected next to similar insomnia subjects, which indicate a fine-grained capture of sleep quality at the individual level.

Conclusions: Dimensionality reduction and unsupervised techniques are promising methods when approaching high dimensionality spaces. A fine analysis of projected clusters could show subgroups in already known phenotypes. As literature showed robustness and applicability of those methods to larger datasets, dimensionality reduction of insomnia records could be improved by the addition of new features computed from hypnodensities generated by machine learning algorithms, or by spectral features extracted from polysomnographic signals.

Wake Intrusions in the EEG: A Novel Application of the Odds Ratio Product in Identifying Subthreshold Arousals within COMISA patients

M.K.P. Gratton[1,2], N.A. Hamilton[2], B. Gerardy[3], M. Younes[4], D.R. Mazzotti[1]
[1]University of Kansas Medical Center, Internal Medicine, Kansas City, United States, [2]University of Kansas, Social and Behavioral Sciences, Lawrence, United States, [3]YRT Ltd, Winnipeg, Canada, [4]Sleep Disorders Centre, Winnipeg, Canada

Introduction: Many sleep disorders are characterized by fragmented sleep, for which the conventional measurement is the arousal index (AI). Despite its common application, the correlation between AI and symptoms of insomnia or excessive sleepiness is inconsistent. A novel measurement, the Wake Intrusion Index (WII) captures transient decreases in sleep depth to levels that approach wake levels but do not necessarily result in a conventional arousal. We hypothesized that the WII is more strongly associated with insomnia, obstructive sleep apnea (OSA), and the co-occurring insomnia and OSA (COMISA), than conventionally measured arousals.

Methods: Using cross-sectional data from the Sleep Heart Health Study with high-quality ORP data (n = 5,771), accessed through the National Sleep Research Resource, we defined 'wake intrusions' as the number of times the ORP spiked above a wake threshold of 2.0 (95% agreement in wake scoring among multiple sleep scorers) during sleep. The WII was derived by calculating the quotient of the number of intrusions by total sleep time. Insomnia was defined from self-reported frequency of >15x/month of either insomnia symptoms: delayed sleep onset, difficulty maintaining sleep, or early morning awakenings (n = 617). OSA was defined as an apnea-hypopnea index $\geq$ 15 (n = 1,225). COMISA was defined as the combination of OSA and insomnia (n = 147). First, we examined the relationship between the conventional arousal index (AI) and the WII. Next, we conducted a multiple linear regression adjusted for age, sex, and body mass index to model the associations between OSA, Insomnia and COMISA status on the AI and WII. Sleep disorders were treated as categorical variable, with "No Disorder" as the reference group. Models were also used to test the significance of contrasts between different conditions.

Results: There was a mild, but significant correlation between the AI and WII (r [95%CI] = 0.25 [0.22,0.27], p<0.001). The adjusted linear regression model using WII as the independent variable revealed significant associations between Insomnia Only (β [95%CI] = 12.03 [2.10,21.94], p=0.017), OSA Only (14.73 [9.36,20.08], p<0.001), and COMISA (21.00 [9.86,32.14], p<0.001) and higher WII as compared to those without either sleep disorder. Pairwise comparisons did not reveal significant associations between each group. Conversely, we only observed significant associations between higher AI and the OSA Only (8.77 [8.17,9.35], p<0.001) and COMISA (8.50 [7.27,9.72], p<0.001) groups when compared to those without either disorder. No significant associations with AI were found in the Insomnia Only group (0.54 [-0.53,1.63], p=0.322). Pairwise comparisons indicated significant differences between COMISA and Insomnia Only (7.95 [6.39,9.50], p<0.001), and between Insomnia Only and OSA Only (-8.22 [-9.34,-7.09], p<0.001).

Conclusions: Our study highlights the complex role of wake intrusions in insomnia and OSA, both separately and in comorbidity. Wake intrusions and arousals were significantly associated with OSA and COMISA, but only wake intrusions were related to insomnia. These findings stress the relevance of using more granular measures of cortical activation to improve sleep disorders characterization.

Yoga therapy versus cognitive behavioral therapy for chronic insomnia (CBT-I) – A randomized equivalence trial, an interim analysis

G.S. Sharma[1], L.K. Saini[2], L. Mohan[3], P. Kulshreshtha[3], P. Dhamija[4], R. Rao[5], K. Kundu[1], R. Gupta[1]
[1]All India Institute of Medical Sciences, Psychiatry and Division of Sleep Medicine, Rishikesh, India, [2]All India Institute of Medical Sciences, Pulmonary Medicine and Division of Sleep Medicine, Rishikesh, India, [3]All India Institute of Medical Sciences, Physiology, Rishikesh, India, [4]All India Institute of Medical Sciences, Pharmacology, Rishikesh, India, [5]Central Council for Research in Yoga and Naturopathy, Ministry of Ayush, New Delhi, India

Introduction:

- Treating chronic insomnia can be challenging because both pharmacologic and non-pharmacologic options have their limitations.
- The efficacy of cognitive-behavioural therapy for insomnia (CBT-I) remains undisputed. Still, problems with accessibility and cost limit its use.
- Preliminary evidence suggests that Yoga-based relaxation therapy could effectively improve insomnia[1], however, the data is scarce.
- This study was planned to evaluate yoga therapy's role in managing chronic insomnia.

Materials and Methods:

- A Randomized Equivalence trial was conducted on Chronic Insomnia patients.
- Patients were randomly allocated into groups A (Yoga Therapy) and B (CBT-I).
- Patients in group A were treated with Yoga based relaxation Therapy (including 20 min. Cyclic meditation, 4 min. Vibhagiya pranayama, 4 min. Nadi-Sodhan pranayama, 2 min. Bhramari pranayam) for 30 minutes every day for 16 weeks.
- Group B was treated with Cognitive Behavioral Therapy for insomnia. Videos were prepared for both non-pharmacological therapies and shared with participants.
- Subjects in both groups were given Tab Lorazepam 2 mg/day from day 1.
- Subjective assessment (Insomnia Severity Index (ISI), Dysfunctional Belief and Attitudes about Sleep (DBAS-16), Patient Health Questionnaire (PHQ-9), Generalised Anxiety Disorders (GAD-7), Pittsburgh Sleep Quality Index (PSQI), Depression Anxiety Stress Scale (DASS-21), Hyperarousal scale, General Self efficacy scale (GSE), Ford Insomnia Response to stress test (FIRST), Interpersonal Evaluation list (IPSEL)) and Objective assessment (HRV) were done at baseline and 16 weeks in both groups.
- The primary endpoint of the study was a reduction of the dose or discontinuation of lorazepam.

Results:
In this interim analysis, we have analyzed 28 patients of the CBT-I group and 27 patients of the Yoga group.

- The mean age was 39 and 38.1 years in the CBT-I and Yoga groups, respectively.
- The Male-Female ratio was 9:1 in the Yoga group and 7:1 in the CBT-I group.
- In the CBT-I group, all scores showed statistically and clinically significant improvement after the intervention, except for the Interpersonal scores evaluation list (IPSEL).
- In the yoga arm, all scores except GAD-7, GSE and IPSEL scores were found to be statistically significant post-intervention.
- To assess the equivalence, we used the two-one-sided-t-test, which revealed that ISI (P 0.08, t test value -1.41), DBAS-16 (P 0.11, t test value 1.233), and IPSEL (P 0.84, t test value -0.19) scores showed no significance between the two interventions to treat insomnia. However, rest variables favored the CBT-I arm over the yoga arm.
- A reduction in the dose of lorazepam was noted among 46 and 39 % of participants in the CBT-I and Yoga groups respectively and there was no statistical difference between the groups (p-value 0.67, Chi statistic of 0.1808).

Conclusions: In this interim analysis, we found that for the management of chronic insomnia, yoga therapy is equivalent to CBT-I in improving the ISI and DBAS score and in reducing the dose of lorazepam.

Memory

Exploring the effectiveness of targeted memory reactivation on emotional implicit memory

G. Amicucci[1,2], F. Salfi[2], D. Corigliano[1,2], L. Viselli[2], F. Festucci[2], D. Tempesta[2], L. De Gennaro[1], M. Ferrara[2], A. D'Atri[2]
[1]"Sapienza" University of Rome, Department of Psychology, Rome, Italy, [2]University of L'Aquila, Department of Biotechnological and Applied Clinical Sciences, L'Aquila, Italy

Introduction: Targeted Memory Reactivation (TMR) is a technique employed to enhance memory consolidation by reactivating specific memory traces during sleep. Negative attentional bias (AB), characterized by a tendency to preferentially focus on negative rather than positive stimuli, has been demonstrated to play a role in perpetuating negative emotions and memories. TMR could potentially affect AB by selectively reactivating positive memories, thus influencing emotional memory processing. This study aimed to investigate the effectiveness of TMR in modulating emotional implicit memories to attenuate negative AB.

Materials and Methods: Eight female students (mean age ± standard deviation, 21.50 ± 2.45) participated in a between-subjects design involving the assessment of AB through a modified version of the Dot-Probe Task (DPT) before (T1) and after (T2) a nocturnal sleep with acoustic stimulation (AS_{TMR} vs. $AS_{CONTROL}$) during slow-wave sleep. During the DPT, participants were simultaneously presented with a positive and a negative emotional face, followed by a probe that equally replaced one of the emotional stimuli (positive condition/negative condition). The subjects' assignment was to indicate the position of the probe (left vs. right) using the keyboard. AB in DPT was measured by comparing reaction times (RTs) in positive and negative conditions, with faster responses obtained when the probe appeared in the previously attended spatial location. Concurrently with the keyboard response, participants were exposed to two different auditory cues for positive and negative conditions. In the AS_{TMR} group, participants were exposed during sleep to the auditory stimulus linked to the positive condition during the DPT. In the $AS_{CONTROL}$ group, a novel sound was presented. To assess the effect of TMR, a mixed ANOVA was applied to the RTs of the DPT, with condition (negative/positive), session (T1/T2), and group ($AS_{TMR}/AS_{CONTROL}$) as within/between factors. To evaluate the EEG correlates of TMR during sleep, an event-related spectral power perturbation of nocturnal stimulations was computed, comparing the two experimental groups using independent samples t-Test.

Results: Analysis of DPT showed a significant effect of TMR on RTs (group x session: $p<0.001$). Post hoc comparisons highlighted a reduction of both positive and negative RTs in the AS_{TMR} group compared to the $AS_{CONTROL}$ group. The comparisons on sleep EEG correlates of TMR evidenced an increase in spindle activity around 500 and 1000 ms post-stimulation on the whole topography for AS_{TMR} compared to the $AS_{CONTROL}$ group ($p<0.05$). The midline and parieto-occipital sites in the AS_{TMR} group also showed increased delta/theta activity ($p<0.05$) around 1000 ms post-stimulation.

Conclusions: The findings indicate an effect of TMR in modulating attentional processes associated with emotional stimuli with no specificity for the stimulus valence. The electrophysiological correlates of nocturnal stimulation involve rhythms typically engaged in sleep-dependent memory consolidation, supporting the effectiveness of memory reactivation. The reduction in RTs associated with both positive and negative stimuli seems to suggest that TMR effectiveness may be contingent upon previous associative learning at the explicit level, implying a nuanced interplay between different memory processes. Further research is warranted to unravel these intricate interactions and refine the TMR application also for therapeutic and cognitive enhancement purposes.

Obstructive Sleep Apnea and Alzheimer's disease stage transition: using the NIA-AA research framework to characterize cognitive normal older adults with OSA at heightened risk of developing AD

O. Bubu[1], A. Turner[2], S. Kaur[2], J. Ramos-Cejudo[1], E. Valkanova[3], A. Mbah[3], K. Kam[4], A. Mullins[4], A. Parekh[4], D. Rapoport[4], A. Indu[4], G. Jean-Louis[2], M. de Leon[5], A. Varga[4], R. Osorio[1]
[1]NYU Grossman School of Medicine, Psychiatry and Population Health, New York, United States, [2]Miller School of Medicine, University of Miami, Psychiatry and Behavioral Sciences, Miami, United States, [3]University of South Florida, Epidemiology and Biostatistics, Tampa, United States, [4]Icahn School of Medicine at Sinai, Medicine, Pulmonary and Critical Care, New York, United States, [5]Weill Cornell Medicine, Radiology, New York, United States

Introduction: Clearly establishing which OSA individuals are at heightened risk to develop AD is critical. Using the NIA-AA Research Framework, we aimed to characterize risk profiles of cognitively normal (NL) older-adults with OSA by examining the interactive effects of OSA, Aβ, PTau & tau (ATN), on prospective cognitive decline.

Materials and methods: Longitudinal study utilizing data from 167 community-dwelling NL older-adults participating in NYU studies on memory, sleep and aging. Subjects had baseline CSF AD biomarker data and at least two follow-up clinical and neuropsychological data. OSA was defined using AHI4%. Using the NIA-AA Research Framework, data-driven, clinically relevant thresholds for CSF-Aβ42 (≤375pg/ml), T-tau (≥367 pg/ml) and P-tau (≥53.7pg/ml) characterized OSA participants ATN status. Twenty-four participants with non-AD pathologic change defined as A-T+ were excluded leaving 143 for the analysis. Main outcome was the annual rate-of-change in global cognition (calculated as an average composite Z-score of episodic memory, language and executive function). Linear mixed-effects models with random intercept and slope were used to assess associations between ATN characterized OSA subjects, and longitudinal changes in global cognition controlling for age-at-baseline, sex, APOE4-status, years-of-education, and their interactions with time.

Results: Of the 143 participants, 91 (63.8%) were women. The mean (SD) age was 69.6 (7.3) years and follow-up time was 4.73 (3.45) years. Sixteen subjects (11.2%) were OSA+/A+/T-, and 21 (14.7%) were OSA-/A+/T-. Ninety-two (64.3%) had normal AD biomarkers (OSA+/A-/T- [n=45] and OSA-/A-/T- [N=47]). Aβ and T-tau were each associated with significant faster rate-of-decline in global cognition (β = −0.066, 95%CI, −0.088, −0.046; and β = −0.043, 95%CI, −0.060, −0.028; $P < .01$ for both). OSA and P-tau were not associated with significant faster rate-of-decline in global cognition (β = −0.035, 95%CI, −0.088, 0.018, $P = .071$, P for trend = .02; and β = −0.008, 95%CI, −0.024, 0.008; $P = .433$). The interaction of OSA, Aβ, P-tau and T-tau with time was significant (−0.033, 95%CI, −0.048, −0.018; $P <.001$) suggesting a synergistic effect. Characterization of OSA/ATN groups' risk estimates via post hoc analyses showed both OSA+/A+/TN+ and OSA+/A+/TN- subjects with the highest risk of prospective cognitive decline ((β = −0.042, 95%CI, −0.063, −0.019; $P < .001$, relative to OSA-/A+/T+ and OSA-/A+/T- participants). OSA+/A-/T- participants did not show any significant cognitive change over time.

Conclusions: OSA and Aβ demonstrate synergism related to cognitive decline that might be independent of tau deposition. Thus, placing OSA patients with evidence of AD pathologic change at heightened risk of prospective cognitive decline.

Phase-precise auditory stimulation during REM theta oscillations attenuates fear modulation

J. Patriota[1,2,3], M. Bergers[1], K. Wijers[1], W. Meulmeester[1], L. Talamini[1,2]
[1]Universiteit van Amsterdam, Amsterdam, Netherlands, [2]Universiteit van Amsterdam, Amsterdam Brain and Cognition, Amsterdam, Netherlands, [3]Universiteit van Amsterdam, Swammerdam Institute for Life Sciences, Amsterdam, Netherlands

Introduction: Closed-loop auditory stimulation (CLAS) approaches have been used extensively to investigate the role of brain oscillations and memory consolidation, but most reports are focused in non-REM sleep. Here, for the first time, we apply a new method able to precisely model and predict EEG oscillatory dynamics and to track and phase-target theta oscillations (4-8 Hz) during human REM sleep. To further investigate the link between REM sleep, theta oscillations and emotional memory consolidation, participants underwent a fear conditioning paradigm associated with a memory recollection task taking place before and after a night of sleep, during which we recorded their EEG signals. CLAS was applied overnight, and here we demonstrate that emotional valence associated with the aversive stimuli can only be manipulated if stimulation happens in the ascending phase of theta oscillations in REM sleep, opposed to the descending phase.

Materials and Methods: sixty two subjects (37 females, 25 males; M ¼ 20.46 years, SD ¼ 2.06) were recorded overnight with polysomnography. All participants underwent a fear conditioning procedure where a sound was encoding threat (cs+), and another sound was not (cs-). Such sounds were paired to images belonging to distinct categories (e.g deserts, forests). After the conditioning procedure, participants were asked to perform a memory recollection task. Then, participants were divided in three different groups, UP (n = 19), DOWN (n = 20) and SHAM (n = 23). During periods of REM sleep, an advanced oscillatory phase prediction algorithm was deployed to target auditory stimuli at the start of the positive deflection (0) of ongoing theta oscillations, on the UP group. Similarly, we target auditory stimuli was played at the start of the negative deflection (180) on the DOWN group. SHAM participants did not get any auditory stimulation. In the morning, participants were asked to perform a similar memory recollection task.

Results: The change in image valence for the CS+ related images in the STIM group were significantly positively correlated (r = 0.38, p = 0.01) with the amount of CLAS stimuli presented during the night, whereas this was not the case for the SHAM (r = 0.14, p = 0.34) or DOWN (r = 0.01, p = 0.72) group. Furthermore, the STIM group did not show this correlation for the CS- related images. The amount of CLAS stimuli also did not significantly correlate with change in sound valence or memory retention score of either sound for all groups.

Conclusion: Our study's key finding – the attenuation of fear memories through UP phase auditory stimulation – highlights a promising avenue for influencing emotional memory consolidation. This novel finding demonstrates the potential of sleep manipulation to modulate emotional responses, offering a significant step forward in both understanding memory dynamics and advancing potential therapeutic interventions.

Reactivation of memory-encoding dentate gyrus neurons during memory consolidation is associated with subregion-specific, learning- and sleep-mediated biosynthetic changes

L. Wang[1], S. Aton[1]
[1]University of Michigan, Molecular, Cellular, and Developmental Biology, Ann Arbor, United States

Introduction: Post-learning sleep plays an important role in hippocampal memory processing, including contextual fear memory (CFM) consolidation.

Materials and methods: Here, we used targeted recombination in activated populations (TRAP) to label context-encoding engram neurons in the hippocampal dentate gyrus (DG) in male mice and assessed reactivation of these neurons during post-learning sleep. To further characterize how learning and subsequent sleep or SD affect these (and other) hippocampal subregions, we used subregion-specific spatial profiling of transcripts and proteins.

Results: We find that post-learning sleep deprivation (SD), which impairs CFM consolidation, selectively disrupts reactivation in inferior blade DG engram neurons. This change was linked to more general suppression of neuronal activity markers in the inferior, but not superior, DG blade by SD. We found that transcriptomic responses to sleep loss differed greatly between hippocampal regions CA1, CA3, and DG inferior blade, superior blade, and hilus – with activity-driven transcripts, and those associated with cytoskeletal remodeling, selectively suppressed in the inferior blade. Critically, learning-driven transcriptomic changes, measured 6 h following contextual fear learning, were limited to the two DG blades, differed dramatically between the blades, and were absent from all other regions. These changes suggested an increase in glutamatergic receptor signaling, and a decrease in GABA receptor signaling, during memory consolidation.

Conclusions: Together, these data suggest that the DG plays an essential role in the consolidation of hippocampal memories, and that the effects of sleep and sleep loss on the hippocampus are highly subregion-specific, even within the DG itself.

Reap while you sleep: Consolidation of memories differs by how they were sown

J. Antony[1], E. Schechtman[2]
[1]California Polytechnic State University, Psychology & Child Development, San Luis Obispo, United States, [2]University of California, Irvine, United States

Newly formed memories are spontaneously reactivated during sleep, leading to their strengthening. This reactivation process can be manipulated by reinstating learning-related stimuli during sleep, a technique termed targeted memory reactivation. Numerous studies have found that delivering cues during sleep improves memory for *simple* associations, in which one cue reactivates one tested memory. However, real-life memories often live in rich, complex networks of associations. For this presentation, we will examine and review many recent forays into investigating how targeted sleep reactivation affects memories within *complex* paradigms, in which one cue can reactivate multiple tested memories. A common theme across studies is that reactivation consequences do not merely depend on *whether* memories reside in complex arrangements, but on *how* memories interact with one another during acquisition. We therefore emphasize how intricate study design details that alter the nature of learning and/or participant intentions impact the outcomes of sleep reactivation. In some cases, complex networks of memories interact harmoniously to bring about mutual memory benefits; in other cases, memories interact antagonistically and produce selective impairments in retrieval. Ultimately, although this burgeoning area of research has yet to be systematically explored, results suggest that the fates of complex memories that become reactivated during sleep depend on how they were learned.

Sleep enhances memory for highlighted passages and preserves it over time

K. Bennion[1], S. Altman[1], A. Aung[1], W. Chang[1], M. Le[1], B. Sasia[1]
[1]California Polytechnic State University, Psychology and Child Development, San Luis Obispo, United States

Introduction: For academic performance and otherwise, it is important to understand the many variables that impact memory. Importantly, sleep has been shown to provide an optimal neurobiological environment for consolidation (e.g., Diekelmann & Born, 2010). Prior work also shows that testing oneself on (vs. restudying) material enhances memory (e.g., Roediger & Karpicke, 2006), as does highlighting text (e.g., Yue, Storm, Kornell, & Bjork, 2015). However, what is less clear is whether such benefits still emerge if the participants themselves do not discern what should be highlighted (e.g., when receiving information that is already highlighted or prioritized in some way). The present study tested whether these factors interact and how they influence memory at a 12-hour and two-week delay.

Materials and Methods: Participants ($N = 166$) were pseudorandomly assigned to either a Sleep or Wake condition, which determined the time of their first session (Sleep: 8 or 9 pm; Wake: 8 or 9 am). In Experiment 1, participants read and highlighted a passage on alternative energy sources and were either immediately tested on their memory (Test condition) or asked to re-read the passage (Restudy condition). Experiment 2 followed the same procedure, except instead of highlighting the passage themselves, participants were given a pre-highlighted passage. All participants returned 12 hours later and two weeks later for memory tests.

Results: A repeated-measures ANOVA across both experiments, with Time (Test 2 vs. Test 3) as a within-subjects factor and Group (Sleep vs. Wake) and Strategy (Test vs. Restudy) as between-subject factors, showed a significant main effect of Sleep > Wake on memory ($p < 0.001$). This effect held both when participants highlighted the passage (Exp 1; $p = 0.003$) as well as when they received a pre-highlighted passage (Exp 2; $p = 0.023$). There was also a significant Group x Time interaction ($p = 0.028$), showing that Sleep (vs. Wake) benefited memory and preserved it over time; memory for the Wake group declined between Tests 2 and 3 more than for the Sleep group. Subsequent analyses revealed this finding to be driven by those who highlighted the passage rather than those who received a pre-highlighted passage, as the Group x Time interaction was significant when participants highlighted (Exp 1; $p = 0.017$), but not when they received the pre-highlighted passage (Exp 2; $p = 0.53$).

Conclusions: Results suggest that sleep benefits declarative memory and that these benefits are amplified over time (i.e., greater at two weeks vs. 12 hours after learning). Further, the long-term benefits of sleep on memory are amplified when participants highlight vs. when given a pre-highlighted passage, suggesting that sleep during consolidation may be most helpful when participants are discerning which information is important vs. unimportant, and consistent with prior work showing that sleep benefits memory for prioritized content (e.g., Bennion, Payne, & Kensinger, 2016; Lo, Bennion, & Chee, 2016). Overall, results show that individuals should sleep following learning for optimal long-term performance, especially when discerning which content is particularly important to remember.

Sleep quality, cognitive performance, and glymphatic function in fatigued breast cancer patients

J. Thomadsen[1], M. Andersen[1], K. Brendstrup-Brix[2,3], S. Ancoli-Israel[4], L. Wu[1,5,6], R. Zachariae[1,5], A. Amidi[1,5]

[1]Aarhus University, Sleep & Circadian Psychology Research Group (SCAPE), Department of Psychology & Behavioural Sciences, Aarhus C, Denmark, [2]Copenhagen University Hospital Rigshospitalet, Neurobiology Research Unit, Copenhagen, Denmark, [3]University of Copenhagen, Faculty of Health and Medical Sciences, Copenhagen, Denmark, [4]University of California San Diego (UCSD), Department of Psychiatry, San Diego, United States, [5]Aarhus University Hospital, Unit for Psychooncology & Health Psychology, Department of Oncology, Aarhus C, Denmark, [6]Reykjavik University, Department of Psychology, Reykjavik, Iceland

Introduction: Insomnia and cognitive impairment are highly prevalent and co-occurring late effects in breast cancer (BC) survivors affecting between 30-50% of all women. Such late effects have major detrimental impact on survivor's daily functioning and general quality of life. Given the important role of sleep for optimal brain health and functioning, there is reason to believe that disturbed sleep in BC survivors may be causally linked with impaired cognitive function. However, associations between sleep and cognitive function in BC populations, as well as the underlying neurobiological mechanisms are relatively unexplored. One function of sleep is related to the clearance of metabolic waste through the glymphatic system, which is a transport system enabling an efficient exchange and drainage pathway for cerebrospinal fluid along the arterial perivascular spaces. Recent advances in imaging methodology have allowed for the indirect and non-invasive estimation of glymphatic function through diffusion tensor image analysis along the perivascular space (DTI-ALPS). The aim of the present study was to investigate possible associations between sleep quality and cognitive function in a group of fatigued breast survivors, as well as to explore associations with glymphatic function as measured by DTI-ALPS.

Materials and Methods: Data for the present cross-sectional study stem from baseline data from a randomised controlled trial investigating the effects of systematic light exposure on fatigue. Forty-six clinically fatigued BC patients (FACIT-Fatigue ≤ 34) who had completed radiotherapy were included. Participants responded to questionnaires, underwent broad neuropsychological assessment (vigilance, processing speed, verbal memory and fluency, executive function) and magnetic resonance imaging (T1-weighted + DTI). Sleep quality was measured with the Pittsburgh Sleep Quality Index (PSQI). Neuropsychological tests included the Psycho-motor Vigilance Test (PVT) and Connors Continuous Performance Test (CCPT). All tests were z-transformed and a global composite score (GCS) was calculated indicating overall cognitive performance. Glymphatic function was quantified using DTI-ALPS and the calculation of an ALPS-index, with low indices indicating poorer glymphatic function.

Results: Impaired sleep quality (PSQI ≥ 8) was observed in approximately 70% (36/42) of all participants. A higher PSQI global score was associated with lower performance on PVT (slowest 10% reaction time[RT], r=.36, p=.022, and mean RT, r=.28, p=.06) and CCPT (r=-.34, p=.021). No associations were observed between the PSQI global score and ALPS-indices. For the cognitive outcomes, a lower left hemisphere ALPS-index was associated with poorer PVT outcomes (mean RT, r=-.33, p=.072, and slowest 10%, r=-.40, p=.028), and a lower mean (right/left hemispheres) ALPS-index was associated with poorer PVT outcomes (median RT, r=-.33, p=.06).

Conclusions: The majority of the fatigued BC patients also reported impaired sleep quality (70%). Associations were observed between poor sleep quality and worse psychomotor vigilance and sustained attention. Moreover, associations were observed between worse psycho-motor vigilance and lower glymphatic function. These findings indicate associations between sleep, cognitive and glymphatic function in BC patients and suggest that treating underlying sleep disturbances may potentially be beneficial for associated cognitive dysfunction in BC patients. Further research is needed to confirm these initial findings.

The missing link between acoustically evoked K-complexes and verbal memory consolidation during sleep

S. Leach[1], E. Krugliakova[1], G. Sousouri[1], S. Snipes[1], J. Skorucak[1], S. Schühle[1], M. Müller[1], M.L. Ferster[2], G. Da Poian[3], W. Karlen[2,4], R. Huber[1,5]
[1]University Children's Hospital Zurich, Child Development Centre and Children's Research Centre, Zurich, Switzerland, [2]ETH Zurich / Institute of Robotics and Intelligent Systems, Department of Health Sciences and Technology, Zurich, Switzerland, [3]ETH Zurich, Department of Health Sciences and Technology, Zurich, Switzerland, [4]Ulm University / Institute of Biomedical Engineering, Computer Science and Psychology, Ulm, Germany, [5]University Children's Hospital Zurich, Department of Child and Adolescent Psychiatry and Psychotherapy, Zurich, Switzerland

Introduction: Despite the well-established significance of sleep in memory consolidation, the precise electrophysiological components driving this process have remained elusive. In humans, unraveling this process requires the utilization of a neuromodulation approach that enables the specific manipulation of targeted oscillations during sleep.

Methods: Here, we combined phase-targeted auditory stimulation (PTAS) in combination with high-density electroencephalography (hd-EEG) to specifically evoke K-complexes (KCs) during sleep. First, we reanalyzed existing data to confirm our assumption that auditory stimuli presented during the down-phase of slow waves (down-PTAS), a time period characterized by cortical hyperpolarization, minimize slow-wave responses other than KCs. In this dataset, twelve participants underwent three nights, one with down-PTAS, the other with up-PTAS, and a third without stimulation (SHAM). Next, over the course of two nights (down-PTAS and SHAM), we specifically evoked KCs in 14 young healthy adults and assessed their performance in a verbal declarative memory task before and after sleep. Auditory stimuli (50 ms pink-noise) were presented during NREM sleep in ON windows (16 s), allowing stimulation, followed by OFF windows (8 s), withholding stimulation.

Results: Our reanalysis confirmed our assumption that up- and down-PTAS result in different slow-wave-response profiles. Event-related spectral potential (ERSP) analyses revealed that early slow-wave activity (SWA; 1–4 Hz; STIM−SHAM; 0.25–1.75 s after stimulus onset), reflecting the KC-like response, was indistinguishable between up- and down-PTAS, $t(11) = 0.16$, $p = .877$, $d = 0.03$, while late SWA (4–6 s after stimulus onset; STIM−SHAM) was exclusively enhanced after up-PTAS, $t(11) = 2.25$, $p = .046$, $d = 0.19$, and larger after up-PTAS when compared to down-PTAS, $t(11) = 2.99$, $p = .012$, $d = 0.81$.

In our new data, down-PTAS improved the consolidation of verbal declarative memory, $t(12) = 2.58$, $p = .023$, $d = 0.72$, and resulted in a robust KC-like response. The KC-like nature of the response became evident in an auditory evoked potential (AEP) with all characteristic components typical for KCs (P200, N350, N550, P900, all $p \leq .05$). Furthermore, ERSP analyses showed responses typical for KCs, such as in the low slow-wave band (1–1.5 Hz) around 0.7–1.3 s, as well as in the sigma band (12–16 Hz) around 0.9–1.5 s after stimulus presentation ($p \leq .05$, cluster corrected). Strikingly, our results suggest that KCs enhanced verbal memory consolidation via enhanced cross-frequency coupling between slow waves and spindles in a right frontal region, as indicated by a positive correlation (spearman's rank correlation) in a cluster of five electrodes in a right frontal region ($p \leq .05$, cluster corrected; mean $r(12) = 0.78$, mean $p = .001$).

Conclusions: Acoustically evoked KCs are sufficient to drive the consolidation of verbal memory during sleep. Their intimate relation to cross-frequency coupling suggests that evoked KCs actively participate in the hippocampal-neocortical dialogue that drives the consolidation of memories during sleep.

Movement Disorders

Detecting periodic leg movements during sleep (PLMS) in restless legs syndrome (RLS) using the NTX100 tonic motor activation (TOMAC) system

S. Rigot[1], H. Singh[2], F. Baker[3], J. Ojile[4], B. Adlou[1], J. Charlesworth[1]
[1]Noctrix Health, Clinical Research, Pleasanton, United States, [2]Sleep Medicine Specialists of California, San Ramon, United States, [3]SRI International, Center for Health Sciences, Menlo Park, United States, [4]Clayton Sleep Institute, St. Louis, United States

Introduction: Periodic leg movements during sleep (PLMS) are the most important objective correlate of restless legs syndrome (RLS). Therefore, longitudinal in-home monitoring of PLMS could be beneficial for managing RLS treatment. We sought to develop a system for PLMS monitoring using inertial measurement unit (IMU) movement sensors within an existing therapeutic device for refractory RLS – the NTX100 tonic motor activation (TOMAC) system. Here, we evaluate this approach (NTX-IMU).

Materials and Methods: Eighteen individuals with RLS completed 25 total nights of polysomnography (PSG) while wearing bilateral NTX100 TOMAC units in the anatomical location used for TOMAC therapy – externally on the lower legs at the head of the fibula. Each TOMAC unit was configured to continuously record accelerometer and gyroscope data from a 6-axis IMU. Ground truth PLMS assessment was based on tibialis anterior EMG collected as part of PSG and scored without excluding movements related to respiratory events. Our NTX-IMU algorithms were developed by adapting the American Academy of Sleep Medicine (AASM) criteria for PLMS and optimizing algorithm parameters through leave-one-out cross-validation. Two separate algorithms – for accelerometer (NTX-Acc) and gyroscope (NTX-Gyro), respectively – were developed and compared. For each, the algorithm defined a rolling noise floor based on filtered/smoothed IMU data, identified candidate leg movements based on threshold crossings relative to the noise floor, excluded candidate leg movements that did not surpass an area under the curve threshold, and classified leg movements as periodic based on AASM criteria. Classification metrics, Pearson correlations, and Bland Altman plots were used to evaluate the agreement, variability, and bias between the NTX-IMU algorithms and ground truth, based on the ability to estimate periodic leg movement index (PLMI) for each hour and ability to screen for pathological PLMS based on the diagnostic cutoff PLMI > 15 for each night. This work was supported by NIH/NINDS R44NS117294.

Results: For estimating PLMI for each hour (n=158 hours), NTX-Acc was strongly correlated with ground truth (r = 0.903), showed minimal bias (mean ± SD= 0.80 ± 14.05), and had high accuracy (94.9%), sensitivity (0.882), and specificity (0.957). For classifying the potential presence/absence of pathological PLMS for each night, NTX100-Acc correctly classified 90.7% of nights, with a sensitivity of 0.750 and specificity of 0.943. NTX-Gyro had similar results on all metrics.

Conclusions: NTX-IMU showed strong agreement with PSG-based ground truth for detecting PLMS frequency and screening for the potential presence of pathological PLMS. This suggests that the NTX100 TOMAC system – a therapeutic platform – might also offer the possibility for long-term in-home PLMS monitoring.

Moderate RBD symptoms in narcoleptic versus iRBD mice

M. Grenot[1], A. Roman[1], S. Arthaud[1], P.A. Libourel[1], C. Peyron[1,2]
[1]University Lyon1, Lyon Center for Research in Neuroscience, Bron, France, [2]CNRS UMR5292, INSERM U1028, Bron, France

Introduction: Narcolepsy type 1 (NT1) is a rare neurological sleep disorder caused by the specific loss of the wake-promoting orexin/hypocretin neurons of the lateral hypothalamus. REM sleep behavior disorder (RBD) is frequently reported in NT1 patients including at young age, in men and women. However, in contrast to the isolated form of RBD (iRBD), RBD symptoms in NT1 (NT1-RBD) are less severe and not associated with a-synucleopathy. In order to provide evidence for the physiopathology of NT1-RBD, we evaluated whether the lack of orexin would disturb REM sleep muscle atonia in prepro-hypocretin knockout mice (orexin-KO) and if the severity of these RBD-symptoms would be similar to RBD-symptoms in a mouse model of iRBD.

Materials and Methods: We carried out a compared analysis of EMG signal during REM sleep of orexin-KO mice (n=8), a group of WT mice (n=8), and an iRBD mice group (n=8). The iRBD phenotype on mice was induced by the specific invalidation of glutamatergic transmission of the sublaterodorsal nucleus (SLD), generator of muscle atonia during REM sleep, with a bilateral injection of AAV virus in SLD in orexin-KO mice.

Results: We found a significant alteration of muscle atonia during REM sleep in NT1 mice, with a higher number of REM sleep episodes without atonia (2.05% (WT) vs. 14.29% (NT1), p=0.029), and an increase in the amount of phasic movements per minute of REM sleep (0.096 (WT) vs. 0.818 (NT1), p=0.04) compared to WT mice. However, compared to iRBD mice, these movements were fewer (0.818 (NT1) vs. 4.904 (iRBD), p=0.032), shorter and less complex in NT1 mice (number of movements per minute of REM sleep (mvt/min) of 1-5 sec duration: 0.502 (NT1) vs. 2.816 (iRBD), p=0.032 ; mvt/min longer than 5 sec: 0.041 (NT1) vs. 0.636 (iRBD), p= 0.012). Interestingly, in contrast to the iRBD group, we observed a large variability of alterations within the NT1 group.

Conclusions: Taken together, our results show that the lack of orexinergic transmission is sufficient to cause an alteration of REM sleep muscle atonia with the expression of abnormal movements in NT1 mice although with a lower density and a lower duration than observed in iRBD mice when glutamatergic neurotransmission is also altered. Our experimental results provide new evidence for the physiopathology of RBD in NT1.

Modification and validation of a diagnostic questionnaire for Restless Legs Syndrome: modified- Restless Legs Syndrome Diagnostic Questionnaire (m-RLS-DQ)

R. Kumar[1], V. Krishnan[2], A. Das[2], N. Kumar[3], R. Gupta[4]
[1]All India Institute of Medical Sciences, Psychiatry, Jodhpur, India, [2]All India Institute of Medical Sciences, Psychiatry, Rishikesh, India, [3]All India Institute of Medical Sciences, Neurology, Bibinagar, India, [4]All India Institute of Medical Sciences, Psychiatry and Division of Sleep Medicine, Rishikesh, India

Introduction: Diagnosis of RLS using questionnaires is challenging as most of the questionnaires do not eliminate RLS mimics, thus lead to inclusion of false positive cases.. This study was aimed at modification of RLS-Diagnostic Questionnaire and its validation.

Materials and Methods: Additional items including RLS mimics were identified, and were subjected to evaluation and content validation by experts. Based on their responses, content validity indices (item, scale average and scale universal agreement) were calculated. This was followed by translation of modified questionnaire in Hindi and validation in clinical population. Patients reporting RLS, somatic symptoms disorder, anxiety, other RLS mimics and osteoarthritis were requested to complete modified questionnaire and clinical diagnosis of RLS was ascertained. Additionally, a group of healthy controls was also included. Face, concurrent, and discriminant validities were calculated for the modified RLS diagnostic questionnaire.

Results: Among 209 subjects, nearly 40 subjects had clinical diagnosis of RLS, osteoarthritis, somatic-symptoms-disorder and anxiety disorder, each. In addition, 16 patients had other RLS mimics (akathisia, varicose veins, BFS, leg-cramps, chronic insomnia) and 30 were healthy controls. After three revisions, content validity indices achieved score of 1 for m-RLS-DQ. Sensitivity and specificity of m-RLS-DQ for the diagnosis of RLS were 94.9% and 94.1%, respectively. For the diagnosis of RLS, PPV was 78.7% and NPV was 98.7% with accuracy of 94.3%.

Concurrent validity with clinical diagnosis of RLS was 0.83 ($P<0.001$). Discriminant validity with somatic symptoms disorder was -0.14 ($P=0.03$) and with osteoarthritis was -0.24 ($P<0.001$).

Conclusions: m-RLS-DQ is a valid instrument with acceptable psychometric properties which can be used for the screening as well as diagnosis of RLS in clinical practice and research studies.

Neurotransmitter regulation as common pathways between sleep phenotypes, restless leg syndrome and Tourette syndrome

M. Paschalidis[1], M. Moysés-Oliveira[1], A. Kloster[1], B. Marquezini[1], L. Cunha[1], L. N. G. Adami[1], P. Guerreiro[1], A. C. Mosini[1], M. L. Andersen[1,2], S. Tufik[1,2]
[1]Sleep Institute, Associação Fundo de Incentivo à Pesquisa, São Paulo, Brazil, [2]Universidade Federal de São Paulo, Departamento de Psicobiologia, São Paulo, Brazil

Introduction: Tourette syndrome (TS) is a neurodevelopmental disorder characterized by motor and vocal tics. Sleep disorders, including restless leg syndrome (RLS), have been frequently reported among TS patients. Additionally, RLS has been associated with TS by studies that describe pathophysiological similarities among both. However, the convergent pathogenetic mechanisms between these comorbidities are largely unknown.

Materials and Methods: We aim to (1) test if there is a shared genetic architecture between TS and RLS (TS/RLS); (2) address the shared genetic architecture between TS and a broader list of sleep traits (TS/SLEEP); (3) determine molecular pathways enriched among these shared genes. We manually curated 3 sets of genes. The first list mainly encompassed discoveries driven by recent large-scale genome-wide association studies and included genes that code known circadian cycle regulators and genes associated to sleep phenotypes (e.g. insomnia, narcolepsy, sleep apnea, chronotype, sleep latency, sleep efficiency, sleep duration, and daytime sleepiness). The second list focused specifically on genes related to RLS and was a result of hits from linkage analysis, meta-analysis, mutational load analysis and transcriptome-wide association study. The third one was related to TS and was heavily driven by genes implicated in whole exome sequencing studies. Using Fisher's exact test and considering a total 21,196 genes in the human genome, we tested the statistical significance, with a significance threshold of *p-value*<0.05, of the overlap between TS/RLS genes and TS/SLEEP genes and generated two gene lists, each one containing one of these intersections. Next, considering a significance threshold of adjusted *p-value*<0.05, we used Benjamini-Hochberg test, adjusting for multiple comparisons, to identify enriched Gene Ontology (GO), Reactome Pathway Database and Kyoto Encyclopedia of Genes and Genomes (KEGG) terms that were over-represented among the intersect gene lists.

Results: The intersection between TS (606 genes total) and RLS (102 genes total), which resulted in 4 overlapping genes, was not statistically significant (*p-value*=0.33, OR=1.4). However, there were 43 overlapping genes between TS and sleep traits (1,133 genes total) gene lists, indicating significantly more overlap than expected by chance (*p-value*=0.035, OR=1.4). Significantly enriched pathways among the TS/SLEEP intersect gene list were related to neurotransmitter regulation, such as "neurotransmitter clearance" (*p-value*=2.4e-2, OR=121.64). Those pathways include 1 out of the 4 genes dissected by the TS/RLS intersection.

Conclusions: We demonstrated that there is a shared genetic architecture between TS and sleep traits although this overlap could not be recapitulated when comparing TS and RLS associated genes. An over-representation analysis identified enriched pathways regarding neurotransmitter regulation as potential shared mechanisms between sleep traits, RLS and TS. This result may explain the pathophysiological similarities between RLS and TS and the high prevalence of sleep disorders in TS patients. Therefore, these findings may serve as preliminary stepping-stones for further functional investigations of sleep and TS shared mechanisms.

Non-invasive vagus nerve stimulation therapy for severe pharmacoresistant restless legs syndrome: efficacy and tolerance at 6 months

S. Hartley[1], G. Bao[2,3], A. Russo[2,3], M. Zagdoun[2,3], S. Chevallier[4], F. Lofaso[1,2,5], A. Leotard[1,5], E. Azabou[2,3]
[1]Raymond Poincaré Hospital, Assistance Publique-Hôpitaux de Paris (AP-HP), Sleep Unit, Department of Physiology, Garches, France, [2]Raymond Poincaré Hospital, Assistance Publique-Hôpitaux de Paris (AP-HP), Clinical Neurophysiology and Neuromodulation Unit, SMART_VNS Platform, Department of Physiology, Garches, France, [3]University of Versailles Saint-Quentin en Yvelines (UVSQ), Paris-Saclay University, Laboratory of Infection and Inflammation (2I) Inserm UMR 1173, Paris, France, [4]University of Versailles Saint Quentin en Yvelines (UVSQ), Versailles Engineering Systems Laboratory (LISV), Vélizy, France, [5]University of Versailles Saint-Quentin en Yvelines (UVSQ), Paris-Saclay University, Laboratory « End:icap », Inserm UMR 1179, Paris, France

Introduction: Severe pharmacoresistant restless legs syndrome (RLS) is difficult to manage, requiring frequent changes of treatment and is a source of suffering to patients. Weekly sessions of trans auricular vagus nerve stimulation (tVNS)has been shown to be reduce symptoms over the short term. Our aim was to study the effects of self-administered tVNS in the home over a period of 6 months.
Materials and methods: Patients with severe pharmacoresistant restless legs syndrome were recruited to an unblinded study of tVNS. Inclusion criteria were: severe RLS according to the international diagnostic criteria (Allen et al., 2014) with an IRLS >20 despite optimal pharmacotherapy, absence of augmentation syndrome as defined by international agreed criteria (García-Borreguero et al., 2007) and a ferritin level > 50 µg/L. Following an initial hospital based study of 8 hour long tVNS sessions one weekly in the hospital setting, patients were trained to administer tVNS at home and followed up for 6 months. The primary outcome measure was the score on the international restless legs rating scale (IRLS), secondary outcome measures were quality of life (RLSQOL) and mood (Hospital Anxiety and Depression subscales for depression (HADD) and anxiety (HADA)).
Results: 15 patients were included. 53% were male with a mean age 62,7 ± 12,3 years. 13/15 patients continued tVNS at 6 months. RLS severity decreased (IRLS baseline 31.9±2.9 vs 6 month 22.2±9.32, p=0.0005). 2/15 had an IRLS of 5. Quality of life significantly improved (baseline 49.3 ± 18.1 vs 6 months 65.66±22.58 p=0.0005) as did anxiety (HADA baseline 8.9 ± 5.4 vs 6 months 7.53 ±4.42, p=0.029) and depression (HADD baseline 5.2 ± 4.5vs 6 months 4.73±4.44, p=0.03). Treatment was well tolerated and no adverse events were reported.
Conclusions: Self-administered tVNS has a potential role in long term management of patients with severe pharmacoresistant restless legs syndrome. Randomized controlled trials are needed to confirm the utility of tVNS.

Physiological Movements during sleep in healthy adults and across all ages: Video-Polysomnographic analysis reveals difference in sex and specific motor patterns

A. Montini[1], G. Loddo[2], C. Zenesini[3], G. Mainieri[1,3], L. Baldelli[1,3], F. Mignani[3], S. Mondini[3], F. Provini[1,3]
[1]University of Bologna, Department of Biomedical and NeuroMotor Sciences (DIBINEM), Bologna, Italy, [2]Azienda AUSL di Bologna, Department of Primary Care, Bologna, Italy, [3]IRCCS Istituto delle Scienze Neurologiche di Bologna, Bologna, Italy

Introduction: Movements are part of physiological sleep. Defining features of movements during sleep, including motor patterns (MP), in healthy subjects of different ages is necessary for the differential diagnosis with pathological phenomena.

Materials and Methods: 50 healthy volunteers (10 for decade, 20-70 yo), underwent a video-polysomnography (vPSG). All sleep-related movements were classified according to the International Classification of Sleep Disorders (ICSD-3) if included, or, if not, the movements were described according to typology (elementary, complex and oro-buccal automatisms) and topography (focal, segmental, multifocal and generalized). Elementary movements (EM) consisted of single motor events; complex movements (CM) were a sequence of movements. Focal movements involved 1 body part, segmental movements included 2 contiguous body parts, multifocal movements included 2 non-contiguous body parts and generalized movements involved more than 3 body parts. Additionally, we analyzed the onset of CM and EM identifying specific MP. Data were presented as number of movements per hour of sleep (Movement index-MI) and stratified according to sleep stages, time-distribution throughout the night, sex and age of subjects.

Results: The median age was 43 yo, with a homogeneous male/female ratio in the respective decades (27 M/23 F). A total of 4057 movements were analyzed: 1710 fulfilled the current criteria (80% Limb Movements); the remaining included 1861 CM, 355 EM and 131 oro-buccal automatisms. CM were mainly generalized (70%); EM were frequently multifocal (40%) or focal (30%). The commonest MP were "scratching" and "stretching" (30% and 50%), followed by "changes in body positions" and "comfort movements" (overall 10%), "preparatory food carrying behaviors" (5%) and "novelty seeking" (3%). Eye-opening and interaction with objects at movement onset were rare (both 1%). The median MI was 11 (IQR 8 – 15) and the median duration was 4 s (2 – 8 s). Men showed a higher MI (11.5, P = 0.044), particularly in the first third of the night (Male/Female=12.5/7; P = 0.002) and a reduced movement duration (P = 0.030). Men presented a significantly higher frequency of "preparatory food carrying behaviors", "changes in body positions" and "comfort movements"; among women "stretching" and "novelty seeking" appeared more frequently. The younger subject presented more focal movements (20-29 age group vs 60-69, P = 0.002), oro-buccal automatisms (which peaked in the range of 30-39 yo, P = 0.07) and "preparatory food carrying behaviors" (median 32 yo). In the middle age group "scratching" and "stretching" were the more frequent patterns (median, respectively, 41 and 43 yo) while older subjects showed more "changes in body positions" and "comfort movements" (median 46 yo). MI decreased from N1/REM>N2>N3 stages; EM were significantly increased in REM stage. During REM sleep "stretching" was increased (+8%) while "scratching" and "preparatory food carrying behaviors" were reduced (respectively, -10% and -16%). In N2 stage "preparatory food carrying behaviors" was more frequent (+25%).

Conclusions: Sleep-related movements in healthy subjects were characterized by complex motor sequences that frequently involve the whole body. Physiological MP showed a different distribution across sex, age groups and sleep stages, suggesting modifications of the motor pathway during sleep through life.

Proteomic profiling in periodic limb movements and restless legs syndrome

K. Cederberg[1], V. Peris Sempere[1], L. Lin[1], J. Zhang[1], E. Leary[1,2], H. Moore[2], A.M. Morse[3], A. Blackman[4], P. Schweitzer[5], S. Kotagal[6], R. Bogan[7], C. Kushida[1], E. Mignot[1]
[1]Stanford University, Psychiatry & Behavioral Sciences, Palo Alto, United States, [2]Axsome Therapeutics, New York, United States, [3]Geisinger Commonwealth School of Medicine, Division of Pediatric Sleep Medicine, Scranton, United States, [4]University of Toronto, Department of Psychiatry, Toronto, Canada, [5]St. Luke's Hospital, Chesterfield, United States, [6]Mayo Clinic, Rochester, United States, [7]Medical University of South Carolina, Charleston, United States

Introduction: Periodic limb movements(PLMs) are episodes of involuntary, repetitive muscle movements affecting the limbs and are strongly associated with restless legs syndrome(RLS). Genetic association studies have identified single-nucleotide polymorphisms for RLS and PLMs. However, it is unclear how genetic effects relate to either phenotype, particularly considering the lack of a direct, obvious link to the proposed pathology of RLS (i.e., iron deficiency). We used a high-throughput assay of 5,000 plasma proteins to explore underlying pathobiological mechanisms and identify biomarkers associated with PLMs and RLS.

Materials and Methods: Participants (n=1,410) of the Stanford Technology Analytics and Genomics in Sleep (STAGES) study had blood collected, completed a sleep questionnaire and underwent overnight polysomnography with scoring of PLMs. An aptamer-based array (SomaScan) was used to quantify 5,000 proteins in plasma. A second cohort(n=697) that had serum assayed using a previous iteration of SomaScan (1,300 proteins) was used for replication and in a combined analysis(n=2,107). A 5% False Discovery Rate(FDR) was used to assess significance and account for multiple testing.

Results: Multivariate analyses in STAGES identified 68 proteins associated with the PLM Index (PLMI) after correction for multiple testing. Most significantly decreased proteins were iron-related and included Hepcidin (LEAP-1), Ferritin, and Ferritin light chain. Most significantly increased proteins included RANTES, Cathepsin A and SULT 1A3. Of 68 proteins significant, 17 were present in the 1,300 panel, and 15 of 17 replicated. Machine learning models suggest that that RLS classification in combination with proteins will give the strongest prediction of PLMI, although RLS classification alone was stronger than proteins alone. Exploration of proteins in RLS vs non RLS controls identified Cathepsin Z, Heme oxygenase 2 (HO-2), Interleukin-17A (upregulated in the combined cohort) and Megalin (upregulated in STAGES only), although results were less significant than for proteins associated with PLMI likely due to the smaller number of subjects with RLS.

Conclusions: These results confirm the association of PLM with low iron status and suggest involvement of catabolic enzymes in PLM/RLS. Collectively, these findings support use of hepcidin, ferritin, and Cathepsin A as biomarkers in conjunction with RLS in the ascertainment of PLMs. Considering the link between these conditions and increased risk of cardiovascular disease, hypertension, stroke, depression and anxiety, this study further clarifies the pathobiology of PLMs and improves our understanding of their biological and clinical relevance.

Sleep disorders in Parkinson's disease, an early and multiple problem

P. Dodet[1,2], M. Houot[3,4,5], S. Leu-Semenescu[1,2], J.-C. Corvol[2], S. Lehéricy[2,6], M. Vidailhet[2,3], E. Roze[2,3], I. Arnulf[1,2]
[1]Sleep Unit, Pitié-Salpêtrière Hospital, Paris, France, [2]Sorbonne University and Paris Brain Institute, Paris, France, [3]Center of Excellence of Neurodegenerative Disease, Paris, France, [4]Institute of Memory and Alzheimer's, Department of Neurology, Paris, France, [5]Clinical Investigation Centre (CIC) Neuroscience, Paris, France, [6]Department of Neuroradiology, Paris, France

Introduction: In Parkinson's disease (PD), it remains unclear whether sleep disorders including insomnia, REM sleep behavior disorder (RBD), excessive daytime sleepiness (EDS), restless legs syndrome (RLS) and sleep-disordered breathing (SDB), are isolated or combined, interact with each other and are associated with clinical factors. We sought to determine the prevalence and combinations of the main sleep disorders, as well as their clinical and polysomnographic associations in early-stage PD.

Materials and Methods: Sleep disorders were systematically diagnosed after medical interview and video-polysomnography. In 162 participants with early-stage PD and 58 healthy controls from the ICEBERG cohort. Demographic, clinical (motor, cognitive, autonomic, psychological and sensory tests), therapeutic and polysomnographic associations of sleep disorders were investigated.

Results: Sleep disorders were frequent (71.3%) and combined in half the patients. Insomnia was the most common (41%), followed by definite RBD (25%), EDS (25%), and marginally RLS. These disorders were more frequent than in controls (unlike SDB, which was rare, moderate and similar in both groups). Insomnia (mainly difficulties into maintaining sleep) was associated with female gender, objectively short sleep time and RLS, but not with motor or psychological symptoms. RBD was associated with dysautonomia and advanced age, but not with motor and cognitive measures. EDS had central determinants (including psychiatric and motor symptoms as well as the sedative effects of dopamine agonists) but was not the consequence of sleep disorders.

Conclusions: Sleep disturbances are an early problem in patients with PD because they are frequent, and combined. Their determinants and markers are more organic than psychological.

Structural and functional frontal-executive dysfunction suggests compensatory mechanisms in patients with isolated REM Sleep Behavior Disorder: a clinical-MRI longitudinal study

L. Baldelli[1,2], M. Mitolo[3,2], L. Sambati[2], S. Evangelisti[1,2], G. Sighinolfi[1,2], P. Guaraldi[2], A. Colangelo[1], M.J. Rochat[2], D.N. Manners[2], G. Calandra-Buonaura[1,2], R. Lodi[1,2], P. Cortelli[1,2], C. Tonon[1,2], F. Provini[1,2]
[1]University of Bologna, Department of Biomedical and NeuroMotor Sciences (DiBiNeM), Bologna, Italy, [2]IRCCS Istituto delle Scienze Neurologiche di Bologna, Bologna, Italy, [3]University of Parma, Department of Medicine and Surgery, Parma, Italy

Introduction: Isolated REM Sleep Behavior Disorder (iRBD) is a well-recognized prodromal state of an underlying α-synucleinopathy, occurring several years before an overt neurodegenerative disorder can be fully manifest. iRBD has been related to poorer cognitive performances and to higher frequency of mild cognitive impairment (MCI). Albeit impairment in executive functions, attention, and visuospatial abilities has been described towards the development of a full-blown dementia and structural and functional alterations at magnetic resonance imaging (MRI) have been outlined in respect of controls, cognitive and MRI biomarkers fail to grasp alone the underlying trajectories of the neurodegenerative process. Within this framework we longitudinally explored cognitive dysfunction in idiopathic RBD patients, assessing its relationship with structural and functional MRI variables.

Materials and Methods: Fifty-six patients (males 76.8%; mean age 68 years) with videopolysomnography-proven iRBD underwent a thorough neuropsychological assessment at baseline (B) and were compared with 30 healthy controls. Of these, 33 iRBDs were followed-up (FU) longitudinally (mean FU 3 years), repeating the same assessments annually. 32 iRBDs underwent a multimodal brain MRI protocol, including T1-w volumetric sequence, diffusion weighted imaging (with tract-based spatial statistics – TBSS for microstructural alterations) and resting-state. MRI parameters were compared with matched healthy controls and correlations between these parameters and neuropsychological variables were explored (Spearman's test).

Results: At baseline iRBDs showed worse performance than healthy controls on tests pertaining to attentional-executive, memory and visuospatial functions (i.e., Barrage score $p=0.041$, verbal analogies $p=0.015$, 15-words recall $p=0.004$, and simple copy design $p=0.007$). Attention function showed a worsening dependent on the duration of the iRBD and the FU time (i.e., Barrage time $p=0.013$ and $p=0.022$). The same tests worsened more as conversion to synucleinopathy approached. MRI structural imaging showed volume reduction in left rostral anterior cingulate ($p=0.005$). TBSS highlighted increased anterior corpus callosum and forceps minor Radial Diffusivity in iRBD patients ($p<0.05$); significant correlations were found between this alteration and executive dysfunctions (i.e., Stroop test, $r=0.46$, $p=0.009$). fMRI data showed 'Executive control' network alteration in iRBD patients presenting increased connectivity with cortical (i.e., superior and middle frontal gyrus, opercular cortex, paracingulate and precentral gyrus) and subcortical structures (i.e., putamen and caudate), these data correlated with more prominent difficulties at executive-attentive tests (i.e., Barrage time, $r=-0.45$, $p=0.018$ and frontal assessment battery, $r=0.44$, $p=0.023$).

Conclusions: In iRBD executive and visuospatial functions may represent early markers of neurodegeneration. Their decline is potentially indicative of phenoconversion, and implies structural and functional alterations, suggesting a compensatory mechanism in the more impaired patients. Further studies on cognitive and neuroimaging characteristics will solidify their role as a promising combined biomarker.

Symptoms compatible with rem sleep behavioural disorders in Parkinson's disease outpatients

V.A. Kakazu[1], D. Poyares[1], S. Tufik[1], H. Ballalai Ferraz[2], G.N. Pires[1]
[1]Universidade Federal de São Paulo, Psicobiologia, São Paulo, Brazil, [2]Universidade Federal de São Paulo, Neurologia, São Paulo, Brazil

Introduction: REM Sleep Behavioral Disorder (RBD) is a parasomnia characterized by the maintenance of muscle tone during REM sleep. This allows dreams to be acted out, including vocalizations and violent behavior during sleep. It is known that 80% of people diagnosed with RBD will develop PD (Parkinson Disease) within 14 years. Although current research has focused mostly on the progression of PD into RBD, little is known about the prior occurrence of this parasomnia in clinical samples of PD. Assessing this relationship will allow for a more detailed understanding of progression and the association between both diseases. This study investigate whether people with PD have more symptoms of RBD than non-PD matched controls and what the most common symptoms are.
Materials and Methods: An observational case-control study was designed with participants with PD diagnosis (recruited at a UNIFESP's PD outpatient clinic) and with than non-PD matched controls (matched by sex and age). The evaluation of symptoms compatible with RBD was performed using the Brazilian version of the RBD Screening Questionnaire (RBDSQ-BR). A score of 5 or more in this questionnaire denotes cases compatible with RBD. Mean RBDSQ-BR scores were compared between control and PD groups using Student's t-test. Based on the frequency of PD and RBD diagnoses, prevalence, odds ratio (OD), sensitivity, specificity, positive predictive value and negative predictive value were calculated.
Results: The sample consisted of 73 controls and 73 with PD outpatients. The prevalence of symptoms compatible with RBD was 65.75% for PD and 10.09% for controls. The RBDSQ-BR score was significantly higher in the PD group (6.03 ± 0.35) in comparison to the control group (2.38 ± 0.23; $t_{(144)}=-8.486$; $p<0,05$). The most commonly RBD symptom among PD patients was having a neurological disease (100%), followed by having dreams that seemed real (65.8%). For controls, the most common symptom was remembering dreams well (46.5%). The odds ratio for presenting previous RBD-compatible symptoms was 12.09 in favor of positive PD cases. PD diagnosis has the following diagnostic properties in relation to presenting RBD symptoms: sensitivity of 0.65, specificity of 0.86, positive predictive value of 0.82 and negative predictive value of 0.71.
Conclusions: This study demonstrated that 65% of the PD patients in an outpatient clinic setting present previous symptoms compared with RBD, being significantly more common than among than non-PD matched controls matched by sex and age. The odds of having symptoms compatible with RBD is 12 times higher among patients with PD. These results reinforces the relationship between PD and RBD, demonstrating it is also valid on a case-control design comprising outpatient PD cases.

The comparison of AASM and WASM rules to score respiratory event-related leg movements in obstructive sleep apnea patients

C.S. Park[1], J.H. Cho[2]
[1]St. Vincent's Hospital, College of Medicine, The Catholic University of Korea, Department of Otorhinolaryngology, Head and Neck Surgery, Suwon, Korea, Republic of, [2]Yeouido, St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Department of Otorhinolaryngology, Head and Neck Surgery, Seoul, Korea, Republic of

Introduction: To compare scoring methods(auto vs manual) and evaluate the accuracy of the American Academy of Sleep Medicine (AASM) and World Association of Sleep Medicine (WASM) for respiratory event-related limb movements (RRLMs) in diagnostic and continuous positive airway pressure (CPAP) titration polysomnography (PSG).

Materials and methods: We retrospectively re-scored movement-related parameters like RRLMs of both diagnostic and CPAP titration PSGs in 16 patients with obstructive sleep apnea (OSA) by manually scoring with both rules, the AASM (mAASM) and WASM (mWASM), which were compared to auto-**scoring** by the AASM (aAASM).

Results: In diagnostic PSG, significant differences were found in LMs ($p < 0.05$), RRLM ($p = 0.009$) and the mean duration of PLMS sequences ($p = 0.013$). In CPAP titration PSG, there was a significant difference in RRLM ($p = 0.008$) and PLMS with arousal index ($p = 0.036$). aAASM underestimated LM and RRLM, especially in severe OSA. Changes in RRLM and PLMS with arousal index between diagnostic and CPAP titration PSG were not significantly different between mAASM and mWASM. The ratio of PLMS and RRLM changes between diagnostic and CPAP titration PSG was 0.257 in mAASM and 0.293 in mWASM.

Conclusions: Despite intuitive differences in **the definition of** RRLM between AASM and WASM rules, RRLM results **between mAASM and mWASM** were not significant and about 20-30% of RRLMs **might be** scored as PLMS by both scoring rules.

The relationship between clinical characteristics and brain iron content in patients with Restless Legs Syndrome

M. Tang[1], Y. Wang[1], Y. Zhang[1], Q. Sun[1], Z. Wang[1]
[1]The First Hospital of Jilin University, Department of Neurology, Sleep Center, Chang Chun, China

Introduction: We aimed to analyze the correlation between brain iron and clinical features in patients with Restless Legs Syndrome (RLS) using Quantitative Susceptibility Mapping (QSM), and to investigate the feasibility of using QSM to diagnose RLS.

Materials and methods: Forty-two patients with RLS were screened, and 30 cases were included as the RLS patient group. They were devided into two groups according to the scores of International Restless Legs Syndrome Study Group severity scale (IRLS): mild to moderate:1-20, severe-very severe: 21-40. Fifteen sex- and age-matched healthy controls were recruited. All subjects underwent blood routine tests and iron metabolism including iron, ferritin and total iron binding capacity. MRI were performed on all subjects. QSM data were post-processed using meditoobox software on the Matlab platform to obtain QSM maps, and ITK-SNAP software was used to obtain the susceptibility values of the region of interest (ROI).

Results: The mean susceptibility values of each ROI were significantly lower in RLS than in healthy controls, and the susceptibility value of the dentate nucleus was significantly lower in RLS than in healthy controls. When comparing the susceptibility values of each ROI, differences were found in the susceptibility values of the dentate nucleus and substantia nigra. Further pairwise comparisons showed that severe to very severe RLS had a lower susceptibility values of the substantia nigra than mild to moderate RLS patients and healthy controls; mild to moderate RLS and severe to very severe RLS had a significantly reduced susceptibility values of the dentate nucleus compared to healthy controls. Periodical limb movement index was negatively correlated with susceptibility values of the dentate nucleus and the substantia nigra, wake time after sleep onset was negatively correlated with susceptibility values of the putamen. Positive correlations were found between serum ferritin and susceptibility values of the dentate nucleus, red nucleus and caudate nucleus. There was a negative correlation between total iron binding capacity and susceptibility values of the dentate nucleus and red nucleus, while no significant correlation was found between serum iron and transferrin saturation and susceptibility values of the ROIs. ROC curve analysis of the sensitivity values in each ROI was done using clinical confirmation of RLS as a positive status variable, and the area under the curve of the dentate nuclei was 0.795, whereas $P = 0.002$, 95%CI:0.652-0.939. The cut point of the dentate nuclei sensitivity values was 106.7364 ppm (sensitivity: 71.40%, specificity: 86.70%, Youden's index: 0.581).

Conclusions: Dentate nucleus iron levels were significantly reduced in RLS patients. Iron levels in the substantia nigra were lower in severe to very severe RLS patients. The lower the dentate nucleus or substantia nigra iron content of RLS patients, the higher the periodical limb movement index; the lower the putamen iron content, the longer the wake time after sleep onset. Peripheral iron metabolism in RLS patients may reflect their brain iron content to some extent. Using QSM to detect iron levels of the dentate nucleus has some diagnostic value for RLS. The sensitivity is 71.40% and the specificity is 86.70%.

Validity and reliability of REM sleep behaviour disorder screening questionnaire (RBDSQ) Indonesian version among Indonesian Parkinson's disease patients: a pilot study

R. Anggreani[1], M. Kembuan[1], W. Wariki[2], A. Mawuntu[1]
[1]Sam Ratulangi University, Neurology, Manado, Indonesia, [2]Sam Ratulangi University, Public Health, Manado, Indonesia

Introduction: The REM sleep behavior disorder screening questionnaire (RBDSQ) developed by Stiasny-Kolster has been used worldwide and could be applied as a screening tool to detect REM sleep behavior disorder (RBD) in the general population and among Parkinson's disease patients. However, no validity-and-reliability test has been performed for this tool in its Indonesian version.
Materials and methods: We used a previously translated and linguistically validated 10 questions of RBDSQ Indonesian version to be answered by eligible Parkinson's disease patients in our neurology outpatient clinic in three interview sessions. The subjects were examined by two trained raters. The first rater did the first and second interviews while the third rater did the last interview. The first rater had to explain the diseases mentioned in question number 10. Validity was assessed using Pearson's correlation. Reliability for internal consistency was tested using Cronbach's alpha, while the Kappa coefficient measured inter-rater reliability.
Results: Pearson's correlation coefficient will become valid when the questionnaire is repeated; all those data are shown in the table. The Cronbach's alpha value increases from the first to the third session. The Kappa value failed to show a substantial agreement. Questions about having Parkinson's disease cannot be assessed since all subjects have a similar answer and will have bias.
Conclusions: RBDSQ Indonesian version is valid and reliable for Parkinson's disease cases. However, we advise omitting the last question about having Parkinson's disease when the questionnaire is used to screen Parkinson's disease patients.

Narcolepsy

Acute effects of suvorexant on the proportions and architecture of the sleep-wake cycle stages in wild-type rats: induction of narcoleptic traits

C. Carrera-Cañas[1,2], M. Rivas[3], M. Callejo[1], I. De Andrés[1], P. Torterolo[3], M. Garzón[1]
[1]Universidad Autónoma de Madrid / Faculty of Medicine, Anatomy, Histology and Neuroscience, Madrid, Spain, [2]Recipient of a Predoctoral Fellowship from the Tatiana PGB Foundation, Madrid, Spain, [3]Universidad de La República / Faculty of Medicine, Physiology, Montevideo, Uruguay

Introduction: Narcolepsy is a central disorder of hypersomnolence that presents dysregulation of the sleep-wakefulness cycle (SWC) with night-sleep fragmentation, excessive daytime sleepiness, and partial or total intrusions of rapid eye movement (REM) sleep into other stages. Narcolepsy is associated with a deficit in the hypothalamic hypocretinergic/orexinergic (Hcrt/Ox) transmission system, which is involved in wakefulness maintenance and REM sleep inhibition. In the present study, we have treated wild-type rats with a high dose of suvorexant, an antagonist of the two Hcrt/Ox receptors -Hcrt/OxR1 and Hcrt/OxR2-, to study its acute effect on the SWC, including the appearance of narcoleptic traits.

Materials and Methods: Sixteen male rats were chronically implanted with electrodes for polysomnographic recording (electroencephalogram -EEG- and electromyogram -EMG-). After recovery, at the beginning of the dark period, 9 rats received single i.p. injections of 30 mg/Kg of suvorexant, and the remaining 7 received vehicle (DMSO)**.** The first 8 hours of the dark-period recordings were staged in 10-second epochs according to the rat SWC pattern (wakefulness -W-, light sleep -LS-, slow-wave sleep -SWS-, intermediate sleep -IS- and REM sleep -REM-). Amount and architecture of the SWC stages, and presence/absence of cataplectic and direct sleep onset REM (SOREM) episodes were analyzed in suvorexant and control groups. Unpaired t-tests, two-way ANOVAs and post-hoc Fisher PLSD test were used for statistical comparisons.

Results: Acute blockade of Hcrt/Ox transmission with a high dose of Suvorexant produced a statistically significant reduction of sleep latency compared to the control group. Throughout all the dark period the hourly time in wakefulness was significantly decreased in the suvorexant group at the expense of a sequential increase in LS, SWS and finally IS and REM. The number of W episodes was increased but its average duration was reduced. Regarding LS there was a greater number of episodes -more prominent in the first 4 hours- but with the same length as the control group. There was also a significant increase in the number of SWS episodes, but its mean duration was significantly reduced. Finally, the number of IS and REM episodes significantly increased in the last 4 hours without changes in average length. No cataplectic or direct SOREM episodes were observed.

Conclusions: The blockade of Hcrt/Ox transmission induces a fragmentation of the SWC due to the inability to maintain wakefulness -and temporarily other sleep stages-, as it occurs in narcoleptic patients. Suvorexant treatment effects on the sleep stages occur sequentially, first affecting non-REM sleep and later REM sleep. Overt narcoleptic features such as cataplexy or direct SOREMs did not occur.

A narcolepsy detection paradigm: automated nocturnal detection and notification of sleep onset rapid eye movement periods

A. Cairns[1], R.K. Bogan[2], A. Zheng[3], W. Macfadden[4], V. Mysliwiec[1], J. Black[5,6]
[1]BioSerenity, Inc, Colombia, United States, [2]University of South Carolina School of Medicine, Colombia, United States, [3]Huneo, Freemont, United States, [4]Jazz Pharmaceuticals, Philadelphia, United States, [5]Jazz Pharmaceuticals, Palo Alto, United States, [6]Stanford University Center for Sleep Sciences and Medicine, Palo Alto, United States

Introduction: Rapid eye movement (REM) sleep detected by polysomnography (PSG) occurring within 15 minutes of nocturnal sleep (sleep onset REM period; SOREMP) is a known biomarker for hypocretin-deficient narcolepsy (NT1). Recent revisions of the CNS Hypersomnias diagnostic criteria (*ICSD–Third Edition-TR;* published March 2023) underscored the significance of the NT1 biomarker, such that the presence of a nocturnal SOREMP is now sufficient for diagnosing NT1 if cataplexy is also present. Despite this progressive nosological modification, the nocturnal SOREMP is often unrecognized, or underappreciated when recognized, in patients undergoing *routine* diagnostic sleep testing, evidenced by the paucity of further evaluation for hypersomnia in these individuals. To enhance identification and clinician visibility of nocturnal SOREMPs, we developed an automated process to detect and advise sleep clinicians of SOREMPs. This study aimed to evaluate the impact of automated SOREMP notification on clinician recommendations for hypersomnia evaluation that included a multiple sleep latency test (MSLT).

Materials and Methods: The automated SOREMP notification program was offered to all sleep clinicians within a large multicenter sleep clinic network. De-identified sleep studies were uploaded to a secure data cloud for real-time automated SOREMP detection. Algorithmic-determined SOREMPs underwent human adjudication by expert registered sleep scorers prior to clinician notification. Clinicians were apprised of a SOREMP within the interpretation platform via a visual banner. Front-end procedures (detection/adjudication) were carefully designed to ensure visual banner deployment *prior* to clinical interpretation. Clinician recommendations, future MSLT testing, and associated outcomes were tracked.

Results: Of 26,860 sleep studies processed over 5 years, 184 exhibited a sleep-scorer-verified SOREMP (0.7%). In 34 patients (20%), the clinician emphasized the SOREMP, 24 (71%) of whom were recommended for further narcolepsy evaluation/MSLT. Seven of these (29%) had a prescheduled MSLT (the following morning); eventual diagnoses were narcolepsy (n=3), idiopathic hypersomnia (n=1), "normal" (n=2), pending (n=1). Out of the non-excluded 24 patients, 5 (21%) had an MSLT (narcolepsy, n=4; "normal", n=1) and 12 (50%) have had an MSLT ordered (which has yet to occur). Excluding the PSG SOREMP, MSLT outcomes for the 5 patients who underwent testing after the banner notification were #1: 2 SOREMPs and MSL=4.7 min; #2: 3 SOREMPs and MSL=3.0 min; #3: 5 SOREMPs and MSL=4.6 min; #4: 0 SOREMPs and MSL=11.7 min; #5: 3 SOREMPs and MSL=0.4 min.

Conclusions: This study implemented real-time identification and subsequent clinician notification of nocturnal SOREMPs using a novel detection paradigm. Out of 184 SOREMPs identified, this methodology resulted in 24 (13%) patients being recommended for narcolepsy evaluation (17 of whom may otherwise not have had an MSLT ordered). Subsequent MSLT resulted in a narcolepsy diagnosis rate of 80% in patients with unexpected PSG SOREMP episodes. This is a call to action for medical providers to critically evaluate patients who exhibit a PSG SOREMP, as this provides a unique opportunity to identify and treat narcolepsy. Further research is needed to better understand the low referral rate for subsequent MSLT.

A novel, wearable, in-ear EEG technology to assess sleep and daytime sleepiness

B. Tracey[1], S.-H. Hsu[2], M. Joyner[2], J. Dwyer[2], C. Dong[3], P. Saini[3], K. Borodin[2], S. Martin[4], P. Crum[2], D. Volfson[1], J.B. Berent[2], D.L. Buhl[5], D.B. Rye[3]
[1]Takeda Development Center Americas, Inc., Cambridge, United States, [2]NextSense, Inc., Mountain View, United States, [3]Emory University School of Medicine, Emory Sleep Center, Atlanda, United States, [4]NextSense, Inc., (at the time of the study), Mountain View, United States, [5]Takeda Development Center Americas, Inc., (at the time of the study), Cambridge, United States

Introduction: AASM guidelines rely upon polysomnography (PSG) to assess sleep and excessive daytime sleepiness (EDS); however, such in-laboratory assessments are time and labor intensive with suboptimal diagnostic accuracy. There is an unmet clinical need for in-home technologies to detect sleep and EDS. Here, we describe interim data on usability and validation of an in-ear electroencephalogram (ear-EEG) device when used simultaneously with conventional PSG and maintenance of wakefulness testing (MWT) in healthy participants (NCT05114616) and participants with narcolepsy or idiopathic hypersomnia (IH), on and off prescribed wake-promoting medications (NCT05066009).

Materials and methods: Participants with narcolepsy and IH who normally take wake-promoting medications underwent standard MWTs during two sleep laboratory visits while wearing NextSense's ear-EEG device. One visit occurred during a site-blinded, randomized drug holiday to assess treatment effect. Healthy participants underwent PSG and next-day MWT with sleep restricted to 3–4 hours to increase sleep pressure. All subjects rated device comfort. PSG and ear-EEG recordings were scored independently and blind to subject and condition by three experienced sleep scorers trained to interpret ear-EEG signals on independent data sets. Within-rater agreement was assessed for ear-EEG-based and PSG-based staging of sleep states. Each rater's ear-EEG scoring was compared to consensus scores from the three raters scoring PSG according to AASM standards.

Results: Interim analyses were conducted at pre-defined study midpoints (8 healthy and 4 with narcolepsy/IH). Participants found the ear-EEG device comfortable (average rating 8.3 of 10). Combining all participants, the mean difference in MWT sleep latency between ear-EEG scoring and PSG consensus was small (-0.9 min, 95% CI [-1.7, -0.1]). Mixed models showed MWT latency depended significantly on rater ($p<0.05$) and MWT session ($p<0.01$) but not on data source (i.e., ear-EEG vs PSG). Ear-EEG devices were sensitive to narcolepsy/IH participant medication status. Nocturnal sleep stages derived from ear-EEG signals averaged an agreement of 82.7%, and Cohen's kappa of 0.745 when compared to consensus stages derived from PSG signals.

Conclusions: These interim results demonstrate the promise of using in-ear EEG technology to inform accurate scoring of sleep-wake stages and to capture clinically meaningful MWT parameters.

Application of AASM clinical significance thresholds to once-nightly sodium oxybate for improvement in narcolepsy symptoms

T. Roth[1], M.J. Thorpy[2], C.A. Kushida[3], A.M. Morse[4], J. Dubow[5], J. Gudeman[5], Y. Dauvilliers[6]
[1]Sleep Disorders and Research Center, Henry Ford Health System, Detroit, United States, [2]Albert Einstein College of Medicine, New York, United States, [3]Stanford University School of Medicine, Stanford, United States, [4]Geisinger Commonwealth School of Medicine, Geisinger Medical Center, Janet Weis Children's Hospital, Danville, United States, [5]Avadel Pharmaceuticals, Chesterfield, United States, [6]Sleep-Wake Disorders Center, Department of Neurology, Gui-de-Chauliac Hospital, Institute for Neurosciences of Montpellier INM, INSERM, University of Montpellier, Montpellier, France

Introduction: Extended-release sodium oxybate taken once at bedtime (LUMRYZ™, sodium oxybate for extended-release oral suspension [FT218; once-nightly sodium oxybate (ON-SXB)]), was evaluated for the treatment of narcolepsy in adults in the phase 3 REST-ON clinical trial (NCT02720744). The 3 coprimary endpoints, mean sleep latency on the Maintenance of Wakefulness Test (MWT), Clinical Global Impression-Improvement rating, and weekly number of cataplexy attacks (NCA), and the secondary endpoint of Epworth Sleepiness Scale (ESS) score were significant for ON-SXB vs placebo at weeks 3 (6-g dose), 8 (7.5-g dose), and 13 (9-g dose; all $P<0.001$) and the treatment was well tolerated (most common adverse drug reactions: dizziness, nausea, vomiting, headache, enuresis). These data were published after the cutoff for inclusion in the 2021 American Academy of Sleep Medicine (AASM) clinical practice guidelines for narcolepsy treatment; thus, REST-ON results were analyzed according to AASM clinical significance thresholds (CSTs).
Materials and Methods: Individuals with narcolepsy type 1 [NT1] or 2 [NT2] and age ≥16 years were randomized 1:1 to receive double-blind ON-SXB (4.5 g, 1 week; 6 g, 2 weeks; 7.5 g, 5 weeks; 9 g, 5 weeks) or matching placebo. For each dose (6 g, week 3; 7.5 g, week 8; and 9 g, week 13), least-squares mean (LSM) difference from placebo was calculated for change from baseline in mean sleep latency on the MWT, ESS score, and percentage reduction in NCA. Percentage of participants with improvement (very much/much/minimally improved) on the CGI-I was also calculated. As defined in the 2021 AASM guidelines, CSTs were the following changes from baseline vs placebo: MWT, ≥2-minute increase; ESS, ≥2-point decrease; and cataplexy, ≥25% decrease in NCA. The CST for CGI-I was ≥33% reporting improvement from baseline.
Results: 190 participants (ON-SXB, n=97 [NT1, n=73]; placebo, n=93 [NT1, n=72]) were in the modified intent-to-treat population. On the MWT, difference in LSM change from baseline was 5.0, 6.2, and 6.1 minutes for ON-SXB 6, 7.5, and 9 g vs placebo, respectively. Differences in LSM change from baseline ESS scores were −2.1, −3.2, and −3.9 for ON-SXB 6, 7.5, and 9 g vs placebo, respectively. Differences in LSM percentage reduction in NCA were 26.0%, 34.2%, and 36.1% for ON-SXB 6, 7.5, and 9 g vs placebo, respectively. Percentage of participants with improvement (very much/much/minimally improved) on the CGI-I for ON-SXB 6 g (80.5%), 7.5 g (88.0%), and 9 g (92.8%) met the AASM CST.
Conclusions: Clinically significant improvement in excessive daytime sleepiness (EDS), cataplexy, and overall condition per AASM-established criteria was met with ON-SXB 6, 7.5, and 9 g doses. FDA-approved ON-SXB is a once-at-bedtime treatment for improving EDS and cataplexy in adults with narcolepsy.

Applying a model of nap detection from actigraphy data to a study of patients with narcolepsy type 1 and healthy participants

R. Ghosal[1], R. Torres[2], S. Gill[2], Y. Pyatkevich[2], S. Bermingham[2], D.L. Buhl[2], V. Zipunnikov[3], D. Volfson[2]
[1]University of South Carolina, Department of Epidemiology and Biostatistics, Columbia, United States, [2]Takeda Development Center Americas, Inc., Cambridge, United States, [3]Johns Hopkins University, Department of Biostatistics, Baltimore, United States

Introduction: Excessive daytime sleepiness (EDS) is a defining symptom of narcolepsy, often manifesting as daytime naps, and is highly refractory to current therapies. Clinical trials traditionally capture naps via self-report, which may produce subjective or inaccurate results. There is evidence that actigraphy is a highly sensitive instrument for quantifying daytime naps. We aimed to develop an objective measure estimating daytime naps by leveraging a large actigraphy dataset to approximate sleep-wake transitions and evaluate this algorithm in a clinical trial of people with narcolepsy type 1 (NT1) and controls.

Materials and Methods: Data were collected from the Multi-Ethnic Study of Atherosclerosis (MESA) database and included a sample of 2,237 people who wore wrist actigraphy devices for seven days and underwent in-home polysomnography. Activity counts were used to predict sleep-wake epochs using simple (e.g., Cole-Kripke) and complex (e.g., convolutional neural networks [CNNs]) methods. Thirty-second sleep-wake epochs were grouped into naps, then post-processed using pruning and fusion. Following validation, our algorithm was utilized in a Phase 0 device evaluation clinical trial (NCT04445129) including 16 untreated NT1 participants and 16 sex- and age-matched controls. Algorithm-derived nap predictions were compared with subjective self-reports of naps.

Results: Our actigraphy-based nap detection algorithm was highly sensitive (88.9%) and specific (F1 area 84.4%) using the MESA dataset. Although Cole-Kripke and CNN methods produced similar results, we favored the former for its simplicity. Deriving two biomarkers from ground-truth naps in MESA, we found modest correlations to self-reported sleepiness (R = -0.16, p<0.001; R = 0.15, p<0.001), suggesting sleepiness was associated with fewer nap-free days and more daytime sleep. Our statistical models reported people with NT1 had 11 fewer nap-free days (p<0.001) in a 4-week period and slept an average of 54 more minutes during the day (p<0.001) relative to controls.

Conclusions: We developed an actigraphy-based algorithm for detecting naps with high sensitivity and specificity that can enable objective and accurate outcome reporting in clinical trials. Future work will focus on combining actigraphy with heart rate measurements to improve accuracy of naps detection.

A preliminary report on clinical and polysomnographic features of comorbid insomnia and sleep apnea in type 1 and type 2 narcoleptic patients

C. Bahia[1], V.M. Oliveira[2], E. Mignot[3], S.V. Leon[4], L.C. Porto[2], C.O. Brandão[5], B.F. Dias[3], K. Zhang[3], M. Meira e Cruz[6]
[1]Rio de Janeiro State University/Pedro Ernesto University Hospital, Neurology, Rio de Janeiro, Brazil, Rio de Janeiro, Portugal, [2]Rio de Janeiro State University, Rio de Janeiro, Brazil, [3]Stanford University, Department of Sleep Medicine, Palo Alto, United States, [4]Rio de Janeiro Federal University, Department of Neurology, Rio de Janeiro, Brazil, [5]Neurolife, Rio de Janeiro, Brazil, [6]Centro Cardiovascular da Universidade de Lisboa, Sleep Unit, Lisbon, Portugal

Introduction: Comorbid insomnia and sleep apnea (COMISA) is recently receiving great attention for scientific community because of its significant prevalence, its health-related risks and its common interaction with other sleep conditions. Yet, COMISA wasn't study in the context of narcolepsy. The better understanding of such interactive roles should be important for both pathophysiological and clinical contexts of narcolepsy. This work aimed to explore the most prominent clinical, together with polysomnographic features of COMISA in patients with narcolepsy and test whether their relationship may impact the clinical significance of this rare but highly disturbing sleep disorder.

Methodology: Narcolepsy diagnosis was made using polysomnography, multiple sleep latencies test (MSLT), and the classification in type 1 (NT1) or type 2 narcolepsy (NT2) was based on hypocretin dosage by radioimmunoassay. We classified as COMISA patients who had sleep latency (SL) OR time awakened after sleep onset (WASO) > 30 minutes AND apnea-hypopnea index ≥5 events/hour. We compared NT1 versus NT2 and COMISA versus Non-COMISA using SPSS26© with The Mann-Whitney test, t-Student test and exact Fisher's exact test. Association between numeric variables was analysed using Spearman correlation coefficient. The significance level was $p < 0,05$.

Results: 27 (24 females; 13 NT1 and 14 NT2) narcoleptic patients with a mean age of 34,3±13,9 years old, BMI=26,3±5,0 Kgm2 were enrolled for this study. While there were no differences regarding age (p=0,80), Type 1 patients (12 females) had higher BMI than type 2 (31,6±5,3 vs 26,3±5,0; p=0,01) ones. Type 1 narcoleptic patients also revealed lower LS (5 vs 16 min; p=0,003), higher percentage of N1 stage (7,9% vs 3%; p=0,03) and lower percentage of REM (17% vs 25%; p=0,03). Compared with the non COMISA group, narcoleptic patients with COMISA revealed to be older (38,6±14,9 vs 27,0±8,3 years old; p=0,03), with lower sleep efficiency (82% vs 93%; p=0,0009), higher number of arousals (129 vs 68; 0,04) and WASO (80 vs 18; p=0,0009). Although AHI was not different between groups (p=0,09), there was a moderate correlation between AHI and WASO in COMISA (r=0,56; p=0,02) but not in NCOMISA group. And although body mass index was not different between groups, in COMISA we found a moderate correlation between BMI and somnolence parameters (r=0,65 p=0,004) for Epworth scores and r=-0,58; p=0,014 for mean sleep latencies in MLST.

Conclusion: Narcolepsy often affects young people. Similarly to general population, age was significantly higher in the COMISA group. Further, a higher BMI was associated with worse sleepiness parameters in the COMISA group, with low hypocretin patients (NT1) having a higher BMI than patients with NT2. This may suggest that low levels of hypocretin in narcoleptic patients with COMISA may be associated with a clinical phenotype with increased sleepiness. On the other hand, since hypocretinergic system mediate the existence of nighttime arousals and eventually maintenance insomnia, whether such model may serve to better understand COMISA pathophysiology remains to be clarified. Studies with larger populations should be carried out in order to better understand the relationship between these conditions.

Association of hypocretin dosage, HLADQB1*06:02 status, clinical and neurophysiological features of 37 patients with primary hypersomnia, and evaluation of a novel ELISA kit for hypocretin measurement

C. Martins Correa da Silva Bahia[1], V. Mendes de Oliveira[2], B. de Freitas Dias[3], D. Angst secco[2], R. Vianna[2], C.O. Brandão[4], E. Mignot[3], J. Zhang[3], S. Vieira Alves-Leon[5], L.C. Porto[2]
[1]Rio de Janeiro State University/ Pedro Ernesto University Hospital, Neurology, Rio de Janeiro, Brazil, [2]Rio de Janeiro State University/ Policlinica Piquet Carneiro, HLA lab, Rio de Janeiro, Brazil, [3]Standford University, Sleep Medicine, Palo Alto, United States, [4]Neurolife, Rio de Janeiro, Brazil, [5]Rio de Janeiro Federal University, Neurology, Rio de Janeiro, Brazil

Introduction: According to the third version of the International Classification of Sleep Disorders, CSF hypocretin levels below 110 pg/ml or ≤ 1/3 of the reference value have become major criteria for diagnosing type 1 narcolepsy (NT1), regardless of multiple sleep latency test (MSLT) and cataplexy. The gold standard for measuring hypocretin is the radioimmunoassay, however, it is not wide accessible, leading to efforts to validate other techniques, such as immunoenzymatic ELISA. We analyzed HLA sequencing, hypocretin dosage, clinical and neurophysiological features in a cohort of 37 patients with primary hypersomnia and evaluated the efficacy of a novel ELISA kit for measuring hypocretin levels in CSF.

Materials and methods: We included 37 CSF samples from patients with primary hypersomnia, who were attended by Hyppersomnia Research Center of Pedro Ernesto University Hospital in Rio de Janeiro State University . Clinical data, polysomnography and MSLT, HLA sequencing, and hypocretin measurement were obtained. HLA sequencing was conducted using Next Generation Sequencing (Omixon HLA Twin™), enabling resolution of up to three fields. Seventeen CSF samples were sent to Mayo Clinic through a partnership with Neurolife© and at another moment, 20 to Stanford University to dosage hypocretin by radioimmunoassay. We retest the first 17 aliquots using the Human OrexinA/Hypocretin 1 ELISA Kit (NBP2-80230) from Novus Biologicals© (ZMTJY4PTQ6). Curve analysis was performed using 32 CSF samples from patients without primary hypersomnia.

Results: Among 37 patients, thirty patients fulfilled narcolepsy criteria with MSLT and 7, for idiopathic hypersomnia (IH). Sixteen showed undetectable hypocretin and met the criteria for NT1. Of these, all had MSLT compatible with narcolepsy (mean latencies <8min and ≥ 2 SOREMP), all but one had cataplexy and fifteen had HLA-DQB1*06:02 in at least one of the alleles. Twenty-one patients presented normal hypocretin, 14 met neurophysiological criteria for narcolepsy (NT2) and of those, 5 had cataplexy- like symptoms. However, they did´t present HLADQB1*06:02. Among patients NT2 without cataplexy-like symptoms (n=9), only two (22%) presented HLA-DQB1*06:02. Four out of 7 patients who met criteria for IH presented HLA-DQB1*06:02. Mean hypocretin levels in NT2(n=14) and IH (n=7) groups were close (347,64 ± 80.31 x 366,57 ± 63.86; p=0.6). NT2 patients with cataplexy-like symptons (n=5) presented lower hypocretin levels than NT2 without cataplexy-like symptoms (n=9), however, there was no statistical difference between groups (324,4 ± 62,5 x 360,5 ±84,5 p=0.4). Regarding ELISA kit, a satisfactory standard curve was obtained from patients with and without hypersomnia, indicating appropriate laboratory procedures. However, ELISA results were not predictive of low CSF hypocretin.

Conclusion: The data obtained is aligned with literature, demonstrating that in the presence of HLA-DQB1*06:02, patients with narcolepsy and cataplexy usually have low hypocretin, so that hypocretin measurement might be unnecessary for the diagnosis of NT1 in these cases. However, if HLA-DQB1*06:02 is absent, hypocretin dosage should be done, and if t´s normal, NT2 diagnosis may be more accurated . Unlike other hypocretin-specific ELISA kits described in the literature, this kit hasn´t been validated for CSF measurement in patients with narcolepsy.

Autonomic dysfunction in patients with narcolepsy type 1 during wakefulness

Y. Wang[1], D. Wang[1], Y. Zhang[1], W. Li[1], Z. Wang[1]
[1]The First Hospital of Jilin University, Department of Neurology, Sleep Center, Chang Chun, China

Introduction: We aimed to study autonomic dysfunction in patients with narcolepsy type 1 during wakefulness and the relationship between cerebrospinal fluid hypocretin-1 levels and autonomic dysfunction.

Materials and methods: We collected 25 patients with narcolepsy type 1 (NT1) who visited the Neurological Sleep Center of the First Hospital of Jilin University between January 2022 and February 2023. Twenty healthy individuals matched for gender, age, and body mass index (BMI) were selected as control group. All subjects were evaluated for autonomic function using the Scale for Assessment of Autonomic Function in Parkinson's Disease (SCOPA-AUT), heart rate variability (HRV), plasma catecholamine and metabolite assays. The data were analyzed to compare autonomic function between the two groups and the correlation between cerebrospinal fluid hypocretin-1 levels and autonomic dysfunction in patients with NT1.

Results: Patients with NT1 had significantly higher SCOPA-AUT scores than control group. The scores of digestive system, urinary system, cardiovascular system and sexual function score were significantly higher in patients with NT1 than controls ($P<0.05$). In overall, the sympathetic nerve index was significantly higher in patients with NT1 than controls (1.10 ± 1.02 vs. 0.35 ± 0.93, $P<0.05$). In time domain, compared with control group, patients with NT1 had significantly shorter mean RR interval (719.68 ± 98.65 ms vs. 806.65 ± 91.99 ms, $P < 0.05$), increased mean heart rate (84.84 ± 11.57 bpm vs. 75.35 ± 8.47 bpm, $P < 0.05$), increased maximum heart rate (94.40 ± 12.83 bpm vs. 88.35 ± 9.26 bpm, $P < 0.05$), and lower number of pairs of adjacent normal-to-normal intervals differing by more than 50ms entire recording divided by the total number of all normal-to-normal intervals [pNN50, 19.04 $(8.10, 32.89)$ % vs. 35.70 $(28.40, 45.33)$ %, $P < 0.05$]. In frequency domain, there were no significant differences in total power, very low frequency (VLF), low frequency (LF), high frequency (HF), normalized LF, normalized HF, and LF/HF between NT1 and controls ($P > 0.05$). In nonlinear analysis, compared with control group, patients with NT1 had significantly lower standard deviation along the line of identity (SD2) to standard deviation perpendicular the line of identity (SD1) ratio [1.18 ± 0.24 vs. 1.45 ± 0.34, $P < 0.05$], and higher DFA α2 [0.40 $(0.31, 0.50)$ vs. 0.34 $(0.27, 0.38)$, $P < 0.05$]. There were no significant differences in plasma dopamine, norepinephrine, epinephrine, methoxynorepinephrine, and methoxynorepinephrine levels between NT1 and controls ($P > 0.05$). There was no significant correction between the concentration of hcrt-1 in cerebral fluid and SCOPA-AUT total score, SNS index, mean RR interval, mean heart rate, maximum heart rate, pNN50 or SD2/SD1 （$P>0.05$）

Conclusions: Patients with NT1 had significantly higher SCOPA-AUT scores, most notably in the digestive system, urinary system, cardiovascular system and sexual function. Autonomic dysfunction in patients with NT1 was manifested by increased sympathetic activity, decreased parasympathetic activity, and decreased heart rate variability.

Blood pressure changes after treatment with low-sodium oxybate in oxybate-naive patients with narcolepsy or idiopathic hypersomnia: a post hoc analysis

W. Macfadden[1], S. Candler[1], D.S. Fuller[1], T.J. Measey[1], W.B. White[2]
[1]Jazz Pharmaceuticals, Philadelphia, United States, [2]Calhoun Cardiology Center, University of Connecticut School of Medicine, Farmington, United States

Introduction: Excess sodium intake is associated with increased blood pressure (BP) and cardiovascular risk. Low-sodium oxybate (LXB; Xywav®), an FDA-approved treatment for excessive daytime sleepiness or cataplexy in patients 7 years and older with narcolepsy and for idiopathic hypersomnia in adults, contains the same active moiety as all high-sodium oxybates (including Xyrem® [SXB] and Lumryz™ [fixed-dose SXB]) but with 92% less sodium. The FDA has recognized LXB for its significant reduction in chronic sodium burden compared with high-sodium oxybate products and formulations, which "will be clinically meaningful in reducing cardiovascular morbidity in a substantial proportion of patients for whom the drug is indicated." This post hoc analysis evaluated changes in BP during 2 phase 3 trials of LXB (NCT03030599 [participants with narcolepsy with cataplexy]; NCT03533114 [participants with idiopathic hypersomnia]) in individuals naive to oxybate therapy.

Materials and Methods: A total of 79 oxybate-naive participants (aged 18–70 years) with narcolepsy with cataplexy and 108 oxybate-naive participants (aged 19–75 years) with idiopathic hypersomnia were included in this analysis. Participants received LXB during a 12-week (narcolepsy) or 10- to 14-week (idiopathic hypersomnia), open-label, optimized treatment and titration period, followed by a 2-week stable-dose period. Seated BP measurements were recorded at all study clinic visits. Change from baseline in mean systolic BP (SBP) at each visit was analyzed using 2 linear mixed models (1 for each trial) for repeated measures controlling for baseline SBP, study visit, and within-subject repeated visits. These analyses were not intended to measure differences in BP when changing from other medications.

Results: The mean (SD) participant age was 36.8 (12.3) years (narcolepsy) and 40.7 (13.7) years (idiopathic hypersomnia); females comprised 69.6% of oxybate-naive participants with narcolepsy and 72.2% of oxybate-naive participants with idiopathic hypersomnia. Baseline mean (SD) SBP was 122.1 (12.8) mmHg for the narcolepsy group and 122.8 (13.8) for the idiopathic hypersomnia group. Least squares (LS) mean (95% CI) change from baseline in SBP for the narcolepsy group was −0.2 (−2.6, 2.2) mmHg at week 4, −1.6 (−3.9, 0.7) mmHg at week 8, 0.2 (−2.1, 2.5) mmHg at week 12, and 0.3 (−2.1, 2.6) mmHg at the end of the stable dose period; for participants with idiopathic hypersomnia it was 1.0 (−0.6, 2.6) mmHg at week 1, 0.6 (−1.3, 2.4) mmHg at week 4, 1.1 (−0.8, 2.9) mmHg at week 8, and −0.8 (−2.9, 1.3) mmHg at the end of the stable dose period.

Conclusions: This post hoc analysis found no increases in SBP in 2 patient populations treated with LXB during open-label study periods. While this was an exploratory, post hoc analysis of studies that were not designed to examine changes in BP, the data suggest that treatment with LXB does not meaningfully impact BP.

Burden of pediatric narcolepsy on patients and caregivers

D.A. Nichols[1], W. Macfadden[2], E.B. Leary[3], F. Gwadry-Sridhar[4], J. Owens[5]
[1]Jazz Pharmaceuticals, Palo Alto, United States, [2]Jazz Pharmaceuticals, Philadelphia, United States, [3]Former Employee of Jazz Pharmaceuticals, Palo Alto, United States, [4]Pulse Infoframe, London, Canada, [5]Boston Children's Hospital, Harvard Medical School, Waltham, United States

Introduction: Narcolepsy is a rare, chronic sleep disorder with symptoms including excessive daytime sleepiness (EDS), cataplexy, hypnagogic/hypnopompic hallucinations, sleep paralysis, and disrupted nighttime sleep that present primarily between the ages of 7 and 25. At present, no real-world studies have assessed the burden of narcolepsy on pediatric patients and their caregivers. To address this need, the Children, Adolescents, and Their providers: the Narcolepsy Assessment Partnership (CATNAP, NCT04899947) registry collects data about the burden of pediatric narcolepsy on patients and their caregivers based on participant and caregiver reports of quality of life, social functioning, and work productivity. This cross-sectional analysis includes 29 participants enrolled at clinical sites with complete enrollment data.

Materials and Methods: CATNAP is a prospective, longitudinal, multicenter registry that is collecting real-world data from 16 clinical sites (starting in September 2020) and a decentralized virtual site (starting in August 2022). This analysis includes children and adolescents aged 18 or younger, with a clinician-confirmed narcolepsy diagnosis, enrolled at the clinical sites through February 2023. Leveraging web-based portals, participants, caregivers, and clinicians answered questions on sociodemographic characteristics; diagnostic, medical, and treatment history; comorbidities; and disease progression. Patient burden was measured by the Epworth Sleepiness Scale for Children and Adolescents (ESS-CHAD; higher scores indicate more sleepiness), Pediatric Quality of Life Inventory (PedsQL; higher scores indicate better outcome), and Patient-Reported Outcomes Measurement Information System: Peer Relationships (PROMIS; higher scores indicate better relationships). Caregiver burden was measured by the Caregiver Well-Being–short form (CWB-sf; higher scores indicate greater well-being) and Work Productivity and Activity Impairment (higher percentages indicate greater impairment and less productivity) questionnaires.

Results: Participants (N=29) were 14.3 (3.1) years of age (mean [SD]) and mostly White (12/29, 41%) or Black (11/29, 38%). The mean (SD) ESS-CHAD score was 14.0 (4.8); 69% of participants had a score indicating that EDS was clinically significant (mild score=11–12: 3/29, 10%; moderate=13–15: 7/29, 24%; or severe=16–24: 10/29, 34%). Mean (SD) PedsQL total and domain scores were below normative values: total, 62.1 (20.1); physical functioning, 63.3 (26.9); emotional functioning, 60.2 (20.1); social functioning, 75.0 (23.5); and school functioning, 49.5 (22.4). The mean (SD) PROMIS score was 44.2 (11.6), below the population-standardized value. Most caregivers were employed (19/29, 66%). Mean (SD) missed work time was 1.5% (3.2%), presenteeism was 30.0% (19.0%), work productivity loss was 31.5% (19.6%), and activity impairment was 35.0% (21.3%) due to problems related to pediatric narcolepsy. Caregivers also reported a mean (SD) well-being score of 51.7 (9.7) on the CWB-sf.

Conclusions: This descriptive study of children/adolescents and their caregivers in the CATNAP registry illustrates the broad burden of narcolepsy on both groups. Patient-reported scores suggested pathologic sleepiness, compromised quality of life, and impaired peer relationships; the greatest burden was related to daytime sleepiness and school functioning. The greatest burden on caregivers was observed regarding work and activity impairment.

Cataplexy response with once-nightly sodium oxybate: post hoc responder analysis from the Phase 3 REST-ON clinical trial

M.J. Thorpy[1], C.A. Kushida[2], A.O. Ajayi[3], J. Dubow[4], J. Gudeman[4]
[1]Albert Einstein College of Medicine, New York, United States, [2]Stanford University School of Medicine, Stanford, United States, [3]Florida Pediatric Research Institute, Winter Park, United States, [4]Avadel Pharmaceuticals, Chesterfield, United States

Introduction: In the phase 3 REST-ON trial (NCT02720744), participants with narcolepsy type 1 (NT1) treated with a once-at-bedtime oxybate (LUMRYZ™, sodium oxybate for extended-release oral suspension, CIII [FT218; once-nightly sodium oxybate (ON-SXB)]), had significant reductions in cataplexy episodes (ON-SXB vs placebo: 4.5 g, $P<0.05$ [post hoc]; 6, 7.5, and 9 g, all $P<0.001$) and the treatment was well tolerated. This post hoc responder analysis further characterized improvements in mean weekly cataplexy episodes in trial participants.

Materials and Methods: In REST-ON, participants aged ≥16 years with NT1/NT2 were randomized 1:1 to double-blind ON-SXB or placebo for 13 weeks. Participants took 4.5 g (1 week), 6 g (2 weeks), 7.5 g (5 weeks), and 9 g (5 weeks). Participants with NT1 recorded number of cataplexy episodes per day (0, 1, 2, 3, 4, or ≥5) in a diary. Percentage of participants with ≥25%, ≥50%, ≥75%, and 100% reductions in weekly cataplexy episodes from baseline were compared (ON-SXB vs placebo; Fisher exact test).

Results: In the modified intent-to-treat population, 145 participants had NT1 (ON-SXB, n=73; placebo, n=72). Baseline mean (SD) number of weekly cataplexy episodes was 18.9 (8.7) for the ON-SXB group and 19.8 (8.9) for placebo. At week 1 (4.5 g), significantly more participants taking ON-SXB had ≥25% reduction in cataplexy (43.8% vs 26.4%; $P<0.05$). Significantly more participants receiving ON-SXB had ≥25%, ≥50%, or ≥75% reduction in cataplexy vs placebo at weeks 3, 8, and 13 and complete resolution of cataplexy at weeks 8 and 13 (6-g dose: ≥25%, 68.5% vs 40.3% [$P<0.001$]; ≥50%, 38.4% vs 20.8% [$P<0.05$]; ≥75%, 23.3% vs 4.2% [$P=0.001$]; 100%, 2.7% vs 0 [$P=NS$]; 7.5-g dose: ≥25%, 67.1% vs 43.1%; ≥50%, 53.4% vs 25.0%; ≥75%, 32.9% vs 8.3% [all $P<0.001$]; 100%, 6.8% vs 0 [$P<0.05$]; 9-g dose: ≥25%, 58.9% vs 41.7% [$P<0.001$]; ≥50%, 49.3% vs 26.4% [$P<0.001$]; ≥75%, 32.9% vs 15.3% [$P<0.01$]; 100%, 11.0% vs 2.8% [$P<0.05$]).

Conclusions: In this post-hoc analysis, ON-SXB significantly reduced cataplexy episodes by week 1 (4.5 g). Approximately 10% of participants taking the 2 highest doses of ON-SXB (7.5 and 9 g) experienced complete elimination of their cataplexy. ON-SXB is an efficacious once-at-bedtime treatment option for adults with narcolepsy. These data may be useful for clinicians when setting expectations of ON-SXB effectiveness for patients with cataplexy.

Characterization of patients who had ≥5% weight loss with once-nightly sodium oxybate: post hoc analysis from REST-ON

T. Roth[1], A.M. Morse[2], R. Bogan[3], A. Roy[4], J. Dubow[5], J. Gudeman[5], Y. Dauvilliers[6]
[1]Sleep Disorders and Research Center, Henry Ford Health System, Detroit, United States, [2]Geisinger Commonwealth School of Medicine, Geisinger Medical Center, Janet Weis Children's Hospital, Danville, United States, [3]University of South Carolina School of Medicine, Columbia, United States, [4]Ohio Sleep Medicine Institute, Dublin, United States, [5]Avadel Pharmaceuticals, Chesterfield, United States, [6]Sleep-Wake Disorders Center, Department of Neurology, Gui-de-Chauliac Hospital, Institute for Neurosciences of Montpellier INM, INSERM, University of Montpellier, Montpellier, France

Introduction: Narcolepsy, particularly type 1 (NT1), is often comorbid with obesity. Efficacy and safety of a once-at-bedtime oxybate (LUMRYZ™, sodium oxybate for extended-release oral suspension, CIII [FT218; once-nightly sodium oxybate (ON-SXB)]), were shown in the phase 3 REST-ON clinical trial (NCT02720744).

Materials and Methods: REST-ON was a 13-week, randomized (1:1), double-blind, placebo-controlled multicenter study in patients ≥16 years old with NT1/NT2. ON-SXB doses were 4.5 g for 1 week, 6 g for 2 weeks, 7.5 g for 5 weeks, and 9 g for 5 weeks. Stable concomitant stimulant use was permitted. A post hoc analysis to further characterize participants in the ON-SXB group experiencing ≥5% weight loss (weight-loss group) in REST-ON was conducted.

Results: In REST-ON (n=212), mean participant age was 31.2 years (range, 16–72), 67.9% were female, 75.5% were white, 76.4% had NT1, mean baseline BMI was 28.1 kg/m^2 (range, 16.9–71.9), and 61.3% were taking stimulants. At the end of the study, mean (SD) weight had decreased by 1.3 (3.6) kg in the ON-SXB and had increased by 0.2 (2.6) kg in the placebo group; least squares mean (LSM; SE) change from baseline was –0.51 (0.13) kg/m^2 with ON-SXB and 0.08 (0.13) kg/m^2 with placebo (LSM difference [95% CI], –0.59 [–0.95 to –0.23] kg/m^2; P=0.001). At week 13, 17.8% (19/107) of participants receiving ON-SXB experienced ≥5% weight loss vs 3.8% (4/105) of participants receiving placebo (P<0.001). Compared to the REST-ON population without weight loss, the weight-loss group had similar age and proportion of NT1 diagnosis, a smaller proportion was female, and a higher proportion was white and was taking stimulants. At baseline, mean BMI was 25.6 kg/m^2 (range, 20.3–34.0) in the weight-loss group, 47.4% (9/19) were overweight (BMI 25.0–29.9kg/m^2) or obese (BMI >30kg/m^2); none were underweight (BMI <18.5kg/m^2). At week 13, 31.6% (6/19) remained overweight or obese; none were underweight. Excessive daytime sleepiness was significantly improved from baseline to week 13 (ON-SXB 9 g) in the weight-loss group vs the group without weight loss (Maintenance of Wakefulness test, P<0.05; Epworth Sleepiness Scale score, P<0.001). On the Clinical Global Impression of Improvement, 84.6% of participants in the weight loss group were classified as "much" or "very much improved" at week 13 vs 69.8% in the group without weight loss (odds ratio, 2.4; 95% CI, 0.5–10.7). Adverse events of nausea and vomiting were more frequent in the weight-loss group (42.1%) vs the group without weight loss (19.7%); however, rate of discontinuations owing to AEs in the weight-loss group was half that of the ON-SXB group without weight loss (10.5% vs 21.1%, respectively).

Conclusions: These data expand the body of knowledge regarding weight loss during treatment with sodium oxybate. Given the high proportion of comorbid obesity among people with narcolepsy, the additional benefit of potential weight loss with sodium oxybate may further inform treatment selection. Efficacy of ON-SXB for treatment of narcolepsy symptoms was demonstrated overall; further exploration of possible increased pharmacologic response in certain subgroups should be evaluated.

Characterization of patients with narcolepsy treated vs not treated with sodium oxybate: a propensity score–matched cohort study

M.C. Lipford[1], S. Asfahan[2], G. Pal Singh[2], J.L. Moore[1], M. Tippmann-Peikert[1], P. Kumar-M[2], W. Ip[3], S. Awasthi[3], J. Gudeman[4], L. Krahn[5]
[1]Mayo Clinic, Rochester, United States, [2]Nference Labs, Bengaluru, India, [3]Nference, Cambridge, United States, [4]Avadel Pharmaceuticals, Chesterfield, United States, [5]Mayo Clinic, Phoenix, United States

Introduction: Narcolepsy is a chronic sleep disorder with a complex phenotype including many associated symptoms and multiple comorbid conditions. Sodium oxybate (SXB) is strongly recommended for treatment of narcolepsy. This study used aggregate electronic health record (EHR) data and a natural language processing (NLP) algorithm to characterize demographic characteristics and comorbidities of patients with narcolepsy treated with or without SXB.

Materials and methods: An EHR-based search identified first-time Mayo Clinic patients between 1975–2020. Patients had ≥1 narcolepsy-specific *ICD-9/-10* code and ≥1 diagnostic mention of narcolepsy in clinical notes (NLP). Patients with narcolepsy treated with SXB were age/sex matched with a cohort without SXB treatment. Common comorbidities were identified using *ICD-9/-10* codes and compared between cohorts (odds ratio [OR]). *P* values were calculated and adjusted based on Bonferroni correction.

Results: A total of 4387 patients with narcolepsy were identified in the EHR database; 8% received SXB treatment (n=351; mean [IQR] age at first diagnosis code observed at Mayo Clinic, 32 [23.2-46.1] y; 65.5% female; 92.3% white) and 4036 patients had no SXB treatment (mean [IQR] age at first diagnosis code observed at Mayo Clinic, 44.8 [29.8-59.0] y; 58.0% female; 88.9% white). In the overall population, the 10 most frequent comorbidities were insomnia, fatigue, depression, hypertension, hyperlipidemia, obstructive sleep apnea, diabetes mellitus, arrhythmia, idiopathic hypersomnia (IH), and coronary artery disease. A cohort of 351 patients without SXB were age/sex matched to patients with SXB for comparison of comorbidities. In the unadjusted analysis, *P* values were significant for differences between cohorts (OR [95% CI] SXB vs no SXB) for fatigue (0.72 [0.54-0.97]; *P*<0.05; adjusted *P*>0.9) and IH (0.60 [0.43-0.84]; *P*<0.01; adjusted *P*=0.29). After *P* value adjustment (Bonferroni correction), there were no significant differences between these cohorts in ORs for any comorbidity. Numerically lower rates of these diagnoses (except fatigue and IH in patients without SXB and depression in patients with SXB) were observed in the matched cohorts vs the overall population.

Conclusions: Among age-/sex-matched cohorts of patients with/ without SXB, there were no significant differences in comorbidities. Prevalence of conflicting IH diagnosis among patients with narcolepsy highlights the diagnostic challenge of differentiating IH from narcolepsy type 2 and the path of many patients to receiving a definitive diagnosis. SXB is highly effective but used by <1:10 patients with narcolepsy in the Mayo Clinic health system.

Cognitive deficits in Chinese narcolepsy patients

M. Wang[1], X. Liu[1], S. Yue[1], H. Wang[1], F. Xiao[1], F. Han[1]
[1]Peking University People's Hospital, Sleep Medicine Center, Beijing, China

Introduction: Impaired cognition complaints are common in narcolepsy patients and can overlap with daytime sleepiness features. Few studies attempted to characterize executive function in narcolepsy leading to controversial results in China. We aimed to assess executive function in narcolepsy patients.

Materials and methods: Eighty patients with narcolepsy (NC; age 19.83±10.43 years) and 75 age-, gender-, and education-matched controls, which consists of 29 patients with subjective hypersomnia (SH; age 22.59±11.17 years) and 46 healthy controls (HC; age 15.65 ± 6.44 years), were enrolled. The choice reaction time task, the Stroop task, and the Switch task were performed. We assessed the mean response time (RT), the standard deviation of RT, and the number of correct buttons separately.

Results: Narcolepsy patients presented with slower reaction times compared to controls (464.43±204.15 vs 366.95±82.24, $p < 0.001$). The mean RT of narcolepsy patients were slower than controls (930.46±264.56 vs 805.50±193.64, $p < 0.05$), and the numbers of correct button were less than controls (89.89±6.50 vs 91.80±3.45, $p < 0.05$) in the Stroop task performance. There were no differences as to the whole mean RT and the whole percentage correct between narcolepsy and controls in the Switch task. However, the percentage correct of switch subtasks in narcolepsy decreased (61.83±13.84 vs 67.48±15.43, $p < 0.05$).

Conclusions: Narcolepsy patients showed an impairment of processing speed, attentional inhibition, and shift ability relative to controls, especially inhibition. Future research should address questions about underlying mechanisms and focus on executive function. Clinicians should carefully consider cognitive deficits in the clinical assessment and management of patients with narcolepsy.

Comparison of demographics and baseline narcolepsy symptoms between participants with NT1 and NT2 from the Phase 3 REST-ON clinical trial

Y. Dauvilliers[1], T. Roth[2], M.J. Thorpy[3], A.M. Morse[4], C.A. Kushida[5], J. Harsh[6], L.E. Ortiz[7], J. Dubow[8], J. Gudeman[8]
[1]Sleep-Wake Disorders Center, Department of Neurology, Gui-de-Chauliac Hospital, Institute for Neurosciences of Montpellier INM, INSERM, University of Montpellier, Montpellier, France, [2]Sleep Disorders and Research Center, Henry Ford Health System, Detroit, United States, [3]Albert Einstein College of Medicine, New York, United States, [4]Geisinger Commonwealth School of Medicine, Geisinger Medical Center, Janet Weis Children's Hospital, Danville, United States, [5]Stanford University School of Medicine, Stanford, United States, [6]Colorado Sleep Institute, Boulder, United States, [7]Johns Hopkins All Children's Hospital, St. Petersburg, United States, [8]Avadel Pharmaceuticals, Chesterfield, United States

Introduction: Narcolepsy is classified into 2 subtypes: narcolepsy type 1 (NT1; with cataplexy and orexin deficiency) and narcolepsy type 2 (NT2; without cataplexy or orexin deficiency). Limited data are available regarding subtype differences in clinical characteristics and disease severity. The efficacy and safety of a once-nightly formulation of sodium oxybate (ON-SXB; FT218; LUMRYZ™) was investigated in patients with NT1 and NT2. ON-SXB demonstrated significant improvements for the 3 coprimary endpoints of change from baseline in mean sleep latency on the Maintenance of Wakefulness test (MWT), Clinical Global Impression of Improvement rating, and weekly cataplexy attacks (all $P<0.001$) and was well tolerated. The objective of this post hoc analysis from the REST-ON trial was to compare baseline clinical characteristics between participants with NT1 and NT2.
Materials and Methods: REST-ON was a multicenter, phase 3, randomized, double-blind, placebo-controlled clinical trial (NCT02720744). Participants were ≥16 years of age with NT1 or NT2 and had excessive daytime sleepiness (sleep latency <11 min on the MWT and Epworth Sleepiness Scale [ESS] score >10) and cataplexy (average of 8 episodes per week; NT1 only). Stable concurrent alerting agent use was permitted. Randomization (1:1 to ON-SXB or placebo) was stratified by narcolepsy type; the study population was oversampled for NT1. Baseline characteristics were compared between narcolepsy types.
Results: The safety analysis set included 212 participants (NT1, n=162; NT2, n=50). At baseline, characteristics of participants with NT1 vs NT2 were as follows: mean (SD) age, 32.1 (11.1) vs 28.3 (10.0) years, respectively; sex, 72.8% vs 52.0% female; race, 76.5% vs 72.0% white and 17.9% vs 14.0% Black; body mass index, 28.9 (7.5) vs 25.7 (5.6) kg/m^2; and use of concurrent alerting agents, 59.2% vs 68.0%. The modified intent-to-treat population included 190 participants (NT1, n=145; NT2, n=45). Mean (SD; 95% CI) baseline clinical characteristics in patients with NT1 vs NT2 were as follows: sleep latency (MWT), 4.9 (2.9; 4.4–5.3) vs 4.9 (2.9; 4.1–5.8) minutes; Clinical Global Impression scores (CGI-Severity), 5.2 (1.1; 5.0–5.4) vs 4.7 (1.1; 4.4–5.0); ESS scores, 17.6 (4.0; 16.9–18.2) vs 15.4 (3.2; 14.4–16.3); number of sleep stage shifts to lighter stage of sleep or wake measured by polysomnography (PSG), 61.5 (22.2; 57.9–65.2) vs 55.8 (23.5; 48.8–62.9); number of nocturnal arousals by PSG, 81.5 (42.4; 74.6–88.5) vs 73.2 (35.9; 62.4–84.0); sleep quality (visual analog scale [VAS; 1 = did not sleep and 100 = slept very well]), 54.5 (22.0; 50.9–58.2) vs 55.8 (20.8; 49.5–62.1); and refreshing nature of sleep (VAS; 1 = not refreshed and 100 = refreshed), 49.9 (22.6; 46.2–53.6) vs 42.6 (21.6; 36.1–49.1).
Conclusions: When comparing baseline characteristics between patients with NT1 and NT2, numerical differences were observed with respect to the proportion of female participants and concomitant use of alerting agents. At baseline, 95% CIs of mean values did not overlap for subjective measures, but did overlap for objective measures of EDS, suggesting that those with NT2 perceived themselves as more sleepy than those with NT1.

Composite response with once-nightly sodium oxybate: symptom improvement in participants with narcolepsy type 1 in REST-ON

L.E. Ortiz[1], T. Roth[2], A.M. Morse[3], M.J. Thorpy[4], J. Harsh[5], C.A. Kushida[6], J. Dubow[7], J. Gudeman[7], Y. Dauvilliers[8]
[1]Johns Hopkins All Children's Hospital, St. Petersburg, United States, [2]Sleep Disorders and Research Center, Henry Ford Health System, Detroit, United States, [3]Geisinger Commonwealth School of Medicine, Geisinger Medical Center, Janet Weis Children's Hospital, Danville, United States, [4]Albert Einstein College of Medicine, New York, United States, [5]Colorado Sleep Institute, Boulder, United States, [6]Stanford University School of Medicine, Stanford, United States, [7]Avadel Pharmaceuticals, Chesterfield, United States, [8]Sleep-Wake Disorders Center, Department of Neurology, Gui-de-Chauliac Hospital, Institute for Neurosciences of Montpellier INM, INSERM, University of Montpellier, Montpellier, France

Introduction: A novel once-nightly formulation of sodium oxybate (ON-SXB; FT218; LUMRYZ™) was investigated in patients with narcolepsy type 1 (NT1) and 2 (NT2) in the phase 3 REST-ON trial. ON-SXB treatment resulted in statistically significant improvements vs placebo for the coprimary endpoints of change from baseline in mean sleep latency on the Maintenance of Wakefulness test (MWT), Clinical Global Impression-Improvement (CGI-I) rating, and number of weekly cataplexy attacks, as well as the secondary endpoint of improved excessive daytime sleepiness (EDS) using the Epworth Sleepiness Scale (ESS; all $P<0.001$ vs placebo). ON-SXB was well tolerated; most common adverse drug reactions were dizziness, nausea, vomiting, headache, and enuresis (consistent with the known safety profile of sodium oxybate). The objective of this responder analysis was to assess the proportion of participants with NT1 achieving clinically significant improvement on a composite of these endpoints.

Materials and Methods: REST-ON was a multicenter, randomized, double-blind, placebo-controlled phase 3 clinical trial (NCT02720744) designed to evaluate the efficacy and safety of ON-SXB for the treatment of narcolepsy. Participants (aged ≥16 years with NT1 or NT2) who had continuing presence of excessive daytime sleepiness (sleep latency <11 min on the MWT and ESS score >10) and continuing cataplexy (average of 8 episodes/week) were randomly assigned to ON-SXB or placebo. Doses were 4.5 g week 1; 6 g weeks 2−3; 7.5 g weeks 4−8; and 9 g weeks 9−13. This post hoc analysis examined the proportion of participants with NT1 who had clinically significant improvement according to thresholds defined in the 2021 American Academy of Sleep Medicine Clinical Practice Guidelines in 2, 3, or all 4 of the following endpoints: MWT (2-min improvement), CGI-I (1-point improvement), cataplexy (25% decrease), or ESS (2-point improvement) for each of the doses examined.

Results: The mean age of participants with NT1 was 32.1 years, 72.8% were female, and most were white (76.5%). The modified intent-to-treat population included 145 participants with NT1 (ON-SXB, n=73; placebo, n=72). At week 3 (6 g), more participants treated with ON-SXB vs placebo had clinical improvement in ≥2 endpoints (79.5% vs 48.6%; all $P<0.01$), ≥3 endpoints (54.8% vs 25.0%; $P<0.001$), and in all 4 endpoints (28.8% vs 11.1%; $P=0.012$). At week 8 (7.5 g), more participants treated with ON-SXB vs placebo had clinical improvement in ≥2 endpoints (86.4% vs 59.4%; $P<0.01$), ≥3 endpoints (62.1% vs 31.9%; $P<0.001$), and in all 4 endpoints (33.3% vs 10.1%; $P<0.001$). At week 13 (9.5 g), more participants treated with ON-SXB vs placebo had clinical improvement in ≥2 endpoints (87.3% vs 62.9%; $P<0.01$), ≥3 endpoints (76.4 vs 43.5%; $P<0.001$), and in all 4 endpoints (47.3% vs 14.5%; $P<0.001$).

Conclusions: These data support the robust clinical efficacy of ON-SXB, a once-at-bedtime oxybate for treatment of cataplexy or EDS in adults with narcolepsy, using multiple disease state metrics compared with placebo.

Consistent efficacy of once-nightly sodium oxybate regardless of patient demographic and baseline disease characteristics

M.J. Thorpy[1], T. Roth[2], C.A. Kushida[3], A.M. Morse[4], J. Harsh[5], L.E. Ortiz[6], J. Dubow[7], J. Gudeman[7], Y. Dauvilliers[8]
[1]Albert Einstein College of Medicine, New York, United States, [2]Sleep Disorders and Research Center, Henry Ford Health System, Detroit, United States, [3]Stanford University School of Medicine, Stanford, United States, [4]Geisinger Commonwealth School of Medicine, Geisinger Medical Center, Janet Weis Children's Hospital, Danville, United States, [5]Colorado Sleep Institute, Boulder, United States, [6]Johns Hopkins All Children's Hospital, St. Petersburg, United States, [7]Avadel Pharmaceuticals, Chesterfield, United States, [8]Sleep-Wake Disorders Center, Department of Neurology, Gui-de-Chauliac Hospital, Institute for Neurosciences of Montpellier INM, INSERM, University of Montpellier, Montpellier, France

Introduction: Once-nightly formulation of sodium oxybate (ON-SXB; LUMRYZ™) was investigated in patients with narcolepsy in the phase 3 REST-ON trial; treatment with 6, 7.5, and 9 g resulted in significant improvements (all $P<0.001$) for the coprimary endpoints of change from baseline in mean sleep latency on the Maintenance of Wakefulness Test (MWT), Clinical Global Impression-Improvement (CGI-I) rating, and weekly number of cataplexy attacks (NCA), and the secondary endpoint, Epworth Sleepiness Scale (ESS) score. ON-SXB was well tolerated; the most common adverse events were nausea, dizziness, headache, enuresis, and vomiting. As narcolepsy is a chronic disease with different phenotypes, this post hoc analysis assessed ON-SXB efficacy in various subgroups.

Materials and methods: Participants in the REST-ON clinical trial (NCT02720744) were aged ≥16 years with narcolepsy type 1 (NT1) or 2 (NT2) and were randomized to ON-SXB (4.5 g for 1 week, 6 g for 2 weeks, 7.5 g for 5 weeks, and 9 g for 5 weeks) or matching placebo for 13 weeks. Differences in least squares mean (LSM) changes from baseline for ON-SXB vs placebo were compared for mean sleep latency on MWT, NCA (NT1 only), and ESS and odds ratios for "much"/"very much" improved on CGI-I among subgroups of baseline demographics (age [<35 y/≥35 y], sex, race [white/other], body mass index [BMI] category [underweight/normal; overweight/obese]) and narcolepsy disease characteristics (NT1/NT2; concomitant alerting agent use).

Results: The modified intent-to-treat population included 190 participants (ON-SXB, n=97; placebo, n=93). LSM differences for ON-SXB 9 g vs placebo in change from baseline on the MWT in minutes at week 13 revealed significant improvements ($P<0.05$) for subgroups based on age (<35 years: 7.3; ≥35: 4.2), sex (female: 6.8; male: 5.3), race (white: 7.0; non-white: 4.8), BMI (low: 10.0; high: 4.0), narcolepsy type (NT1: 6.0; NT2: 6.3), and alerting agent/no alerting agent use (6.0 and 6.3, respectively). Odds ratios were significant in favor of ON-SXB 9 g vs placebo for "much" or "very much" improved on CGI-I at week 13 ($P<0.05$) for both low/high age, female sex, white/non-white, high BMI, NT1, and alerting agent/no alerting agent use, and ranged from 3.3 (no alerting agent) to 7.1 (age <35); 3 subgroups (male, low BMI, and NT2) could not be calculated. LSM differences were significant in favor of ON-SXB 9 g vs placebo for change from baseline in NCA ($P<0.05$) in all subgroups, except non-white and male. Among the subgroups that were significant, reductions ranged from –5.5 to –7.6; for the non-white and male subgroups, reductions were –3.8 and –5.1, respectively. For the ESS, all subgroups exhibited significant improvements with ON-SXB 9 g vs placebo except NT2 (LSM difference [95% CI]: –2.72 [–6.09, 0.65]); the largest reduction was in low BMI (LSM difference [95% CI]: –6.25 [–8.83, –3.68]). Similar, albeit smaller, differences were found with lower doses.

Conclusions: Post-hoc subgroup analyses demonstrate the robust efficacy of ON-SXB and provide further insight into its effectiveness in different demographic and clinical subgroups.

Acknowledgements: This study was funded by Avadel Pharmaceuticals.

Detecting factors associated with depression and impulsivity in type 1 narcolepsy patients

S. Yue[1], M. Wang[1], S. Wu[1], Z. Feng[1], X. Liu[1], H. Wang[1], B. Li[1], F. Xiao[1], X. Dong[1], F. Han[1]
[1]Peking University People's Hospital, Beijing, China

Introduction: To evaluate the association between depression symptoms or impulsivity scores, clinical features (disease onset-age, disease duration, sleep-related hallucination), sleepiness and polysomnography parameters in type 1 narcolepsy patients.

Materials and Methods: 83 adolescent narcolepsy type 1 (NT1) patients were involved in the analysis about depresion symptoms and 158 NT1 patients were involved in the analysis about impulsivity scores. Patients completed questionnaires evaluating impulsivity symptoms (Barratt impulse scale -11, BIS-11), depression symptoms (Center for Epidemiologic Studies Depression Scale for Children, CES-DC or Self-Rating Depression Scale, SDS) and sleepiness (Epworth Sleepiness Scale, ESS). Parameters from polysomnography and multiple sleep latency test were also collected. Linear regression analysis was performed to detect the factors associated with total and subscales depression symptoms or impulsivity scores. Then generalized additive models and smooth curve fitting was performed to explore the non-linear relationship between chronological age and impulsivity scores.

Results: Patients with depression symptoms (62.7%) have later disease onset-age. Depression symptoms were associated with sleep-related hallucination (OR = 2.75). Six independent variables were associated with sub-dimension depression symptoms, including sleep latency, sleep efficiency, sleep-related hallucination, Epworth sleepiness scale, disease duration and disease onset-age. Factors associated with higher total impulsivity score were higher ESS, older onset and adolescents. Factors associated with higher attentional impulsivity score were higher ESS, older onset and adolescents. Factors associated with higher motor impulsivity score were higher ESS, younger onset and depression symptoms. Factors associated with higher non-planning impulsivity score were adolescents, older onset and depression symptoms. A non-linear relationship between age and impulsivity scores (total impulsivity score, attentional impulsivity score and non-planning impulsivity score) was detected in NT1 patients.

Conclusions: Sleep-related hallucination is associated with total depression symptoms in adolescent narcolepsy. Patients with depression symptoms have later disease onset-age than those without depression symptoms. As for sub-dimension depression symptoms, both the sleep-related hallucination and subjective sleepiness are associated with depressed affect and somatic symptoms. Severe subjective sleepiness and longer disease duration may relate to interpersonal problems. Lower sleep efficiency is associated with lack of positive affect and this may be a potential intervention for adolescent narcolepsy depression symptoms in the future. Not only excessive daytime sleepiness, but also onset-age, depression symptoms and chronological age was associated with impulsivity in NT1 patients. Higher ESS, older onset-age and adolescents may have higher total impulsivity score. Comorbid depression symptoms can increase the motor impulsivity score, but decrease the non-planning impulsivity score. Older onset-age can increase both the attentional and non-planning impulsivity score, whereas younger onset-age can increase the motor impulsivity score. A non-linear relationship between age and impulsivity score indicated brain and mental development alterations in narcolepsy patients.

Development and validation of the narcolepsy severity scale in school aged children

C. Li[1], K. Spruyt[2], C. Zhang[3], L. Xie[4], F. Han[3]
[1]Capital Medical University, Beijing, China, [2]Université de Paris, Paris, France, [3]Peking University People's Hospital, Beijing, China, [4]The Second Affiliated Hospital of Nanchang University, Nanchang, China

Introduction: Narcolepsy type 1 (NT1) can occur at any age, but half of Chinese narcolepsy had onset age between 8 to 18 years old. Pediatric narcoleptics present a distinct set of challenges in regard to the recognition and diagnosis as well as the adverse impact on the patients, parents or caregivers, and the society. It is necessary to assess the long-term outcome of NT1, therefore, to adjust the clinical decision making to achieve better prognosis. Appropriate long-term management also requires meaningful and regular assessment of treatment effects on symptom severity from the patient's perspective. However, there are few tools assessing the severity of symptoms in Chinese children with NT1. Thus, this study aims to develop and psychometrically test the pediatric narcolepsy severity scale (PNSS) for NT1.

Materials and Methods: Item pool was formed based on literature review, clinical judgement of the expert panel and input of the narcoleptic patients and their parents. Psychometric properties were evaluated after applying the PNSS in a sample of 200 patients (8-18 years age) with narcolepsy. Analyses included item analysis, validity analysis and reliability analysis.

Results: PNSS consisted four factors with a total of 17 items. Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) revealed four distinct and theoretically coherent factors, explaining 63.4% of the total variance. The fitting results of the CFA model were $c2/df = 2.235$, GFI = 0.876, AGFI = 0.822, RMSEA = 0.079, TLI = 0.908, CFI = 0.927. PNSS score is correlated with Pediatric Daytime Sleepiness Scale (r = 0.512, P < 0.01) and Epworth Sleepiness Scale for Children and Adolescents (r = 0.355, P < 0.01). Cronbach's α coefficient for PNSS and four dimensions were from 0.732 to 0.915. The split-half reliability was 0.882 (P < 0.01).

Conclusions: PNSS is a valid measure of symptom severity for pediatric patients with NT1. It may serve as a valuable and easily accessible outcome measure for using in narcolepsy trials, the clinic with improved responsiveness and long term follow-up.

Diagnosis and symptoms of narcolepsy from the patient perspective: results from in-depth qualitative interviews

M.J. Doane[1], M. O'Connor[2], M. Lauher-Charest[2], L. Tesler Waldman[2], B. Rege[1], W.P. Williams, III[1]
[1]Alkermes, Inc., Waltham, United States, [2]QualityMetric Incorporated, LLC, Johnston, United States

Introduction: Narcolepsy is a chronic neurological disorder characterized by excessive daytime sleepiness (EDS), among other symptoms. Previous studies that have identified symptoms of narcolepsy (types 1 [NT1] and 2 [NT2]) have largely relied on quantitative methods (e.g., surveys), which provide limited insight into the patient experience. This study used qualitative, in-depth interviews to better understand the patient experience of this rare condition.

Materials and Methods: Participants were recruited using convenience and snowball sampling. Sixty-minute individual interviews were conducted by a trained qualitative researcher via online video conferencing software. Interviewers used a concept elicitation approach with a semi-structured interview guide to elicit descriptions of the patient experience (e.g., symptoms, journey to diagnosis). Interview transcripts were coded and thematically analyzed using inductive and deductive approaches.

Results: Twenty-two adults with narcolepsy (NT1=12; NT2=10) participated in this study (average age: NT1=35; NT2=44). Most identified as female (NT1=83%; NT2=70%) and white (NT1=75%; NT2=60%). Average time since diagnosis was 7 years for NT1 and 11 years for NT2. Approximately half of participants were employed (NT1=58%; NT2=50%).

Participants described their journey from symptom onset to diagnosis. Initial symptoms typically included EDS (NT1=83%; NT2=80%)—sometimes involving sleep attacks (NT1=35%; NT2=50%)—as well as fatigue (NT1=42%; NT2=30%), oversleeping (NT1=33%; NT2=20%), and cataplexy (NT1=42%). Participants sought a diagnosis from various healthcare professionals, including sleep specialists, neurologists, pulmonologists, psychiatrists, and primary care physicians. Many participants reported receiving a formal narcolepsy diagnosis at least 10 years or more after symptom onset (NT1=50%; NT2=60%). During that time, patients reported many misdiagnoses, including depression, sleep apnea, and attention-deficit/hyperactivity disorder.

The most frequently reported symptoms included EDS (NT1=100%; NT2=90%), cognitive impairment (NT1=92%; NT2=100%), and fatigue (NT1=75%; NT2=90%). Additionally, all participants with NT1 reported cataplexy. Participants also rated these symptoms as among the most bothersome. Participants described EDS as a gradual buildup of sleepiness that made it difficult to stay awake during the day. Cognitive impairments were described as feeling "slow" or "foggy," resulting in negative impacts to memory, focus/attention, and processing. Participants described fatigue as a feeling of low or depleted energy, feeling "exhausted," "dragging," and "drained." Almost all NT1 participants (92%) described experiencing cataplexy within a specific body part (e.g., legs, hands, head, neck, or face). Fewer (33%) described full-body cataplexy, which often resulted in them collapsing to the ground. Cataplexy was commonly triggered by laughter (50%), anger (42%), stress (42%), and surprise (25%). Participants also reported experiencing sleep attacks (NT1=83%; NT2=80%), unrefreshing sleep (NT1=58%; NT2=40%), sleep paralysis (NT1=42%; NT2=40%), and fragmented sleep (NT1=50%; NT2=20%).

Conclusions: Results from this study provide rich descriptions of the symptoms of narcolepsy and the often long and complicated journey these individuals experience while seeking a diagnosis. By using qualitative methods and centering the patient voice, this study fills a gap in the literature, providing additional context and insights into the patient experience of narcolepsy that enhance findings from existing quantitative studies.

Diagnosis or identity? Exploring psychological comorbidity among borderline narcolepsy-idiopathic hypersomnia patients

C. Clark[1], A. Roy[1]
[1]Ohio Sleep Medicine Institute, Dublin, United States

Introduction: Narcolepsy type 2 (NT2) and idiopathic hypersomnia (IH) are disorders of hypersomnolence with many shared features that often obscure accurate diagnosis. Current guidelines per the International Classification of Sleep Disorders 3rd Edition (ICSD3) maintain strict cutoffs on sleep tests for an ICSD3-supported narcolepsy diagnosis. This leaves borderline patients with a hazier and less understood diagnosis of IH. ICSD3-supported narcolepsy patients have access to clearer cut counseling and management, insurance-approved medications, and for some, a sense of identity and community. We offer that this clearer and better understood diagnosis could be associated with easier adjustment periods and better mental health outcomes. Clinicians at Ohio Sleep Medicine Institute (OSMI) use a modified diagnostic approach to holistically diagnose type 2 narcolepsy in some patients who would otherwise be classified as IH per ICSD3 criteria (hereafter termed OSMI-supported NT2s, or OSMI-NT2s). This project assesses key mental health parameters among the existing type 2 ICSD3 narcolepsy patients (ICSD3-NT2), our novel OSMI-NT2 group, and ICSD3-IH patients.
Materials and Methods: After generating a list of all sleep-disordered patients at OSMI, we included 492 patients with documented narcolepsy or IH diagnoses and sleep tests performed within the last 15 years. Following retrospective chart review, each patient was classified as ICSD3-NT2 (n=184), OSMI-NT2 (n=254), or ICSD3-IH (n=54), and critical endpoint data including mental health diagnoses and use of antidepressant medication were collected. Data analysis in SPSS involved chi square analyses.
Results: Upon analysis, the rates of depression and anxiety between the three groups showed no significant differences (Depression: ICSD3-NT2: 39%, OSMI-NT2: 43.3%, ICSD3-IH: 40.7%. p=0.677; Anxiety: ICSD3-NT2: 37.5%, OSMI-NT2: 45%, ICSD3-IH: 33.3%, p=0.131). However, ICSD3-NT2 exhibited significantly lower rates of antidepressant use (6.9%) compared to OSMI-NT2 (20.9%) (p=0.04).
Conclusions: While research characterizing this spectrum of hypersomnolence is still in its infancy, this project sheds light on psychological comorbidities within this patient population. While the gross diagnostic prevalence of psychological comorbidities does not differ between groups, OSMI-NT2 patients exhibit higher rates of antidepressant use compared to their ICSD3-supported counterparts. This could suggest that the non-recognition of narcolepsy from the ICSD3 and associated hardships in receiving treatment or identity validation has a negative impact on mental health. It may also suggest that the neurologic etiology of OSMI-NT2 may have additional pathophysiologic complexity that predisposes this patient group to worse mental health challenges. These findings warrant additional investigation into mental health along the narcolepsy-IH spectrum and whether refining existing diagnostic frameworks could improve mental health outcomes for sleep-disordered patients.

Disrupted Nighttime Sleep and Sleep-Dependent Memory Consolidation in Pediatric Narcolepsy Type 1

K. Maski[1,2], G. Heckler[3], J. Worhach[4], T. Scammell[5], C. Behn Diniz[6], D. Mylonas[7], K. Szilagyi[2], R. Stickgold[8]
[1]Harvard Medical School, Neurology, Boston, United States, [2]Boston Children's Hospital, Boston, United States, [3]Harvard Medical School/Boston Children's Hospital, Neurology, Boston, United States, [4]Boston Children's Hospital, Neurology, Boston, United States, [5]Harvard Medical School/Beth Israel Deaconess Medical Center, Neurology, Boston, United States, [6]Colorado School of Mines/University of Colorado Anschutz, Denver, United States, [7]Massachusetts General Hospital, Boston, United States, [8]Harvard Medical School/Beth Israel Deaconess Medical Center, Boston, United States

Introduction: Disrupted nighttime sleep (DNS) is common in narcolepsy type 1 (NT1), yet its impact on cognitive function is unknown. Given known associations between sleep-dependent memory consolidation and N2 sleep spindles, we hypothesized that NT1 impairs memory consolidation, due to fragmented N2 sleep and altered N2 sleep spindles in the NT1 group.

Materials and methods: In this case-control study, we trained n=25 NT1 participants [mean age 15.8 years (3.2)] and n=28 healthy controls (HCs) patients [13.6 years (3.7)] to criterion on a spatial declarative memory task before a nocturnal in-lab polysomnogram and then gave them a cued recall test upon awakening in the morning. NT1 participants could take SSRI/SNRI medication for cataplexy but were weaned off wake-promoting medications and excluded if on an oxybate. We extracted wake and sleep stage bout numbers from sleep and N2 spindle characteristics from the polysomnogram and conducted mixed model analysis of sleep-dependent memory consolidation to identify group differences.

Results: Adjusting for age, NT1 participants had more N1%, lower N3%, higher Wake/N1 Index, as well as more bouts per hour of Wake, N1, N2, REM than controls (p's <0.04). Compared to HCs, NT1 subjects had similar N2 spindle density, amplitude, and sigma power, but shorter mean duration of N2 spindles [HC: 0.87 sec (0.6), NT1: 0.81 sec (0.6), p=0.005]. There was a moderate inverse correlation between number of N2 bouts and sleep spindle duration across both groups (r=-0.42, p<0.002). More NT1 participants failed to meet performance criterion on the initial learning task and required an easier memory task vs. HCs (p=0.02) despite being older than HC. With results normalized to the 15 card task, NT1 participants showed reduced memory performance vs. HCs post-sleep after adjusting for age and gender [mean memory consolidation HC: -3.1% (18.7), NT1: -15.8 (25.3), main effect group x condition F=5.3, p=0.03]. We did not find a correlation between sleep-dependent memory consolidation and N2 bout number. Across groups, shorter N2 spindle duration (r=0.33, p=0.02) and increased N1% (r=-.47, p<0.001) was associated with worse sleep-dependent memory consolidation. Within the NT1 group, only N1% inversely correlated with sleep-dependent memory consolidation (r=-0.46, p=0.02).

Conclusions: Disrupted nighttime sleep produces poorer N2 sleep consolidation and shorter sleep spindles in NT1. NT1 participants have worse sleep-dependent memory consolidation compared to controls and these results are associated with increased N1%. Future sleep therapeutic studies are needed to determine if sleep-dependent memory consolidation can be improved by reducing N1% and lengthening sleep spindle duration in order to address daytime cognitive concerns of NT1 patients.

Dose titration of once-nightly sodium oxybate: analysis of interim data from RESTORE

A. Roy[1], B. Abaluck[2], T. Stern[3], C.A. Kushida[4], J. Dubow[5], J. Gudeman[5]
[1]Ohio Sleep Medicine Institute, Dublin, United States, [2]Private Practice, Malvern, United States, [3]Advanced Respiratory and Sleep Medicine, PLLC, Huntersville, United States, [4]Stanford University School of Medicine, Stanford, United States, [5]Avadel Pharmaceuticals, Chesterfield, United States

Introduction: Once-at-bedtime sodium oxybate (LUMRYZ™, sodium oxybate for extended-release oral suspension, CIII [FT218; once-nightly sodium oxybate (ON-SXB)]) is approved by FDA for treatment of cataplexy or excessive daytime sleepiness (EDS) in adults with narcolepsy. The efficacy and safety of ON-SXB at doses 6, 7.5, and 9 g in patients with narcolepsy type 1 (NT1) or type 2 (NT2) were confirmed in the phase 3 REST-ON clinical trial (NCT02720744). RESTORE is an ongoing, open-label extension/switch study to assess long-term safety and tolerability of ON-SXB (NCT04451668).

Materials and methods: Individuals aged ≥16 years with NT1/NT2 are enrolled in Group A (participants who completed the REST-ON trial with no current oxybate use), Group B (participants who switched from twice-nightly immediate-release oxybates), or Group C (participants who are oxybate-naive). Initial ON-SXB dose is 4.5 g/night for Groups A/C and is the nearest equivalent or closest single dose to their previous nightly dose for Group B. Investigators may alter the nightly dose by 1.5 g/week (maximum, 9 g/night) based on effectiveness and tolerability.

Results: A total of 184 participants were enrolled (180, ≥1-dose) as of March 6, 2023. Most participants are white (n=150 [83.3%]) and female (n=123 [68.3%]), and mean age is 35 years. Most participants in Groups A/C (n=42/50 [84.0%]) increased from the initial dose of 4.5 g and had a median of 3 (range, 0–7) dose adjustments during initial titration; 43% are stable at 7.5 g. The most common initial doses in Group B were 7.5 g (51/130 [39.2%]) and 9 g (47/130 [36.2%]). Most in Group B reaching a stable dose maintained their initial dose (72/117 [61.5%]); 41 increased (35.0%) and 4 decreased (3.4%) their initial ON-SXB dose. In Group B, 90.6% (n=106) had adjustments within 1 titration step (±1.5 g per night each week). The median number of adjustments in Group B was 1 (range, 0–4). Of the participants enrolled, 46.7% (86/184) have discontinued from the study (withdrawal of consent, 21.2% (39/184); adverse events [AEs], 6.5% [12/187]). Most common treatment-related AEs (>5%; safety population [n=180]) are nausea (13.3%), somnolence (7.8%), headache (6.7%), enuresis (6.7%), dizziness (5.6%), and somnambulism (5.0%).

Conclusions: This review of data from the ongoing RESTORE study indicates that most study participants, whether switching from first-generation, immediate-release oxybates or not currently taking oxybates, successfully had their ON-SXB dose titrated to a therapeutic and tolerable dose. A majority of the participants switching from first-generation, twice-nightly immediate-release oxybates had a stable ON-SXB dose equal to their starting dose. ON-SXB was well-tolerated; 6.5% of participants discontinued owing to an AE. The second-generation oxybate, ON-SXB, is a once-at-bedtime treatment for adults with narcolepsy that is available in 4 dose strengths that allow for titration to therapeutic doses.

Effects of oxybate on sleep, sleep architecture, and disrupted nighttime sleep

T. Roth[1], Y. Dauvilliers[2,3], R.K. Bogan[4,5], G. Plazzi[6,7], J. Black[8,9]
[1]Henry Ford Hospital, Detroit, United States, [2]Sleep and Wake Disorders Centre, Department of Neurology, Gui de Chauliac Hospital, Montpellier, France, [3]University of Montpellier, INSERM Institute Neuroscience Montpellier (INM), Montpellier, France, [4]Medical University of South Carolina, Charleston, United States, [5]Bogan Sleep Consultants, LLC, Colombia, United States, [6]University of Modena and Reggio-Emilia, Department of Biomedical, Metabolic and Neural Sciences, Modena, Italy, [7]IRCCS Istituto delle Scienze Neurologiche di Bologna, Bologna, Italy, [8]Stanford University Center for Sleep Sciences and Medicine, Palo Alto, United States, [9]Jazz Pharmaceuticals, Palo Alto, United States

Introduction: Sleep disturbances are the third-most common narcolepsy symptoms (behind excessive daytime sleepiness [EDS] and cataplexy [type 1 only]) and have important adverse health consequences. These encompass and impact self-reported sleep quality, sleep architecture, and disrupted nighttime sleep (DNS). DNS is characterized clinically by complaints of disturbed nighttime sleep, associated with frequent sleep stage shifts and by awakenings/arousals on polysomnography (PSG) resulting in fragmented sleep. Sodium oxybate (SXB; Xyrem®), dosed twice nightly, is approved to treat EDS and cataplexy in patients with narcolepsy. Once-nightly sodium oxybate (ON-SXB; Lumryz™) and low-sodium oxybate (Xywav®) have now been approved for the same indication. Both SXB and ON-SXB improve DNS. Therefore, a review of oxybate's impact on sleep quality, sleep architecture, and DNS in patients with narcolepsy is timely.

Materials and Methods: PubMed was searched for articles published on oxybate, narcolepsy, and DNS. Key data are presented.

Results: Three placebo-controlled trials assessing sleep quality, sleep architecture, and PSG-defined DNS in adults with narcolepsy were identified: study 1 (SXB, ≥16 years), study 2 (SXB, ≥18 years), and study 3 (ON-SXB, ≥16 years). An open-label study (study 4) and pediatric placebo-controlled study (study 5) of SXB were also identified. Patients in study 1 showed significant improvements in patient-reported sleep quality (range 0=Excellent to 3=Poor; 9 g, least squares mean [LSM=−0.5]), increases in N3 sleep (9 g, median=52.5 min), and decreases in REM (9 g, median=−22.0 min). There were significant reductions from baseline in number of shifts/hour to N1/wake from N2/3/REM (9 g, LSM=−4.4), from N2/3 (9 g, LSM=−3.1), and from REM (9 g, LSM=−7.6). Patients in study 2 demonstrated significantly improved sleep quality (Pittsburgh Sleep Quality Index, question 6) relative to placebo (LSM=−0.5), increases in N3 (9 g, median=43.5 min), and decreases in REM (9 g, median=−38.5 min). There were significant reductions from baseline in shifts to N1/wake from N2/3/REM (9 g, LSM=−16.5). Patients in study 3 showed significantly improved sleep quality (visual analog scale, range 0–100) (9 g, LSM=19.5), increases in N3 (9 g, LSM=39.5 min), and decreases in REM (9 g, LSM=−22.8 min) and N1 (9 g, LSM=−13.2 min). There were significant decreases from baseline in arousals (9 g, LSM=−39.4) and shifts from N1/2/3/REM to wake and N2/3/REM to N1 (9 g, LSM =−19.6). In study 4, patients demonstrated significantly increased N3 in the second half of the night (baseline, mean=0.6 min; 9 g, mean=12.6 min) and decreased awakenings (baseline, mean=50.2; 9 g, mean=37.8).

Pediatric patients (SXB-naive at study entry) in study 5 showed decreases in N1% (median=−4.6) and REM% (median=−6.0) and increases in N3% (median=12.6); arousals also decreased from screening (median=−43.0).

Conclusions: A review of clinical data shows that oxybate, independent of once- or twice-nightly dosing, is effective in improving sleep, measures of sleep architecture and DNS in patients with narcolepsy.

Efficacy and safety of pitolisant in children above 6 years with narcolepsy with and without cataplexy

Y. Dauvilliers[1], M. Lecendreux[2], G.-J. Lammers[3], P. Franco[4], M. Poluetkov[5], C. Caussé[6], I. Lecomte[6], J.-M. Lecomte[6], J.-C. Schwartz[6], P. Lehert[7], G. Plazzi[8]
[1]Hôpital Gui-de-Chauliac, CHU Université de Montpellier, INSERM U 1061, Centre National de Référence Narcolepsie, Unité du Sommeil, Service de Neurologie, Montpellier, France, [2]Hospital Robert Debré, Pediatric Sleep Center, National Reference Centre for Orphan Diseases, Narcolepsy, Idiopathic Hypersomnia, and Kleine-Levin Syndrome, INSERM CIC 1426, Paris, France, [3]Sleep-Wake Center Stichting Epilepsie Centra Nederland, Heemstede, Netherlands, [4]Hôpital Femme-Mère-Enfant, Unité de Sommeil Pédiatrique and Centre National de Référence Narcolepsie, INSERM U 628, Lyon, France, [5]I M Sechenov First Moscow State Medical University, Moscow, Russian Federation, [6]Bioprojet, Paris, France, [7]Faculty of Medicine, University of Melbourne, Parkville, VIC, Melbourne, Australia, [8]IRCCS Istituto delle Scienze Neurologiche, Bologna, Italy

Introduction: Narcolepsy is a rare neurological disorder frequently occurring from childhood and persisting through adulthood. Pitolisant, a selective histamine H3-receptor antagonist/inverse agonist, obtained an EMA/FDA approval for the treatment of Excessive Daytime Sleepiness (EDS) and cataplexy in adult narcolepsy patients. We assessed the pitolisant efficacy and safety on EDS and cataplexy in children 6-17 years old with narcolepsy with or without cataplexy.

Materials and methods: This is a double-blind, multicenter, randomized, placebo-controlled study including children with narcolepsy (ICSD-3) with a Pediatric Daytime Sleepiness Scale (PDSS) score ≥ 15 who were randomly assigned to pitolisant or placebo (2:1) once-a-day for 4-week flexible dosing (5-40 mg pitolisant) followed by 4-week stable dosing. The primary endpoint was the EDS and the cataplexy improvement as measured by the Ullanlinna Narcolepsy Scale (UNS). The UNS is an 11-item scale used to measure intensity and frequency of symptoms of narcolepsy. 4 items address cataplexy and 7 items measure the propensity to fall asleep in various situations. Score varies from 0 to 44. Main secondary endpoints were changes in PDSS, UNS catapexy subscore (UNSctp), cataplexy episodes per week (WRC), maintenance of wakefulness test (MWT) and safety.

Results: Among 115 selected patients, 110 were randomised, 72 to pitolisant and 38 to placebo. The UNS score reduced from 24.63(7.8) to 18.23(8.14) in Pitolisant and from 23.68(9.08) to 21.77(9.25) in placebo group: the efficacy of Pitolisant was significantly higher than placebo (difference:-3.69 (95%CI (-6.6 to -0.99)), P=0.0073). PDSS reduced from 20.16(3.64) to 14.57(5.37) with Pitolisant vs 20.00(3.49) to 17.96(5.6) with placebo (significantly better with pitolisant, P=0.0015). The UNSctp also decreased with Pitolisant (-2.88) significantly better than placebo (-1.12) (P=0.029). The reduction of WRC was higher in Pitolisant from 8.63 to 5.39 versus 13.44 to 10.73 with placebo (P=0.054) but not significantly different. The MWT was significantly increased in Pitolisant from 10.14 min to 11.47 min versus placebo 10.61 to 10.19 (Hazard Ratio HR 0.748 [0.616, 0.903],P=0.004). The most frequent adverse events for Pitolisant were headache (19.2%; 8.1% for placebo) and insomnia (6.8%;2.7% for placebo).

Conclusions: In Narcolepsy children above 6 years old, Pitolisant 5 to 40 mg/day demonstrates significant efficacy in reducing Excessive Daytime Sleepiness and cataplexy and is well tolerated.

Endocrine and metabolic aspects of narcolepsy type 1 in children

A. Szakacs[1]
[1]County Hospital Halland, Pediatrics, Halmstad, Sweden

Introduction: The aim of the study was to investigate whether the onset of narcolepsy type 1 (NT1) in children and adolescents affects BMI, specific metabolic risk factors, the onset of puberty, longitudinal growth or other endocrine functions.

Materials and Methods: A population-based study, comprising 34 patients, was performed with a clinical evaluation, an assessment of puberty and growth, actigraphy and blood samples at fasting, from patients and controls, to evaluate pituitary function, growth factors, thyroid gland, gonads, insulin sensitivity, appetite regulation and blood lipids.

Results: In the post-H1N1 vaccination (PHV) narcolepsy group, the median BMI SDS was higher 6-12 months after the onset of narcolepsy ($p < 0.01$), but it was no different 10 years after the onset of narcolepsy ($p = 0.91$), compared with 12-24 months before the onset of narcolepsy. There was a correlation between an increase in BMI and a decrease in total energy expenditure ($R = -0.74$). In the nPHV group, weight and BMI changes were smaller and no significant changes were recorded. Early puberty was more common in patients with puberty onset after narcolepsy onset ($n = 16/19$) compared with patients with puberty onset before narcolepsy onset ($n = 3/11$, $p = 0.02$). There was no significant change in height SDS during the studied period. Although they were within normal ranges, both median HDL and median TSH levels were significantly lower in NT1 patients, compared with controls.

Conclusions: We found a high prevalence of large BMI gain in the period immediately after the onset of narcolepsy, which had almost normalized at the long-term follow-up. The onset of narcolepsy led to early puberty in both sexes. Linear growth was not affected. We did not find any strong indicators of metabolic disturbances.

Endocrine and metabolic aspects of narcolepsy type 1 in children

A. Szakacs[1]
[1]County Hospital Halland, Pediatrics, Halmstad, Sweden

Introduction: The aim of the study was to investigate whether the onset of narcolepsy type 1 (NT1) in children and adolescents affects BMI, specific metabolic risk factors, the onset of puberty, longitudinal growth or other endocrine functions.

Materials and Methods: A population-based study, comprising 34 patients, was performed with a clinical evaluation, an assessment of puberty and growth, actigraphy and blood samples at fasting, from patients and controls, to evaluate pituitary function, growth factors, thyroid gland, gonads, insulin sensitivity, appetite regulation and blood lipids.

Results: In the post-H1N1 vaccination (PHV) narcolepsy group, the median BMI SDS was higher 6-12 months after the onset of narcolepsy ($p < 0.01$), but it was no different 10 years after the onset of narcolepsy ($p = 0.91$), compared with 12-24 months before the onset of narcolepsy. There was a correlation between an increase in BMI and a decrease in total energy expenditure ($R = -0.74$). In the nPHV group, weight and BMI changes were smaller and no significant changes were recorded. Early puberty was more common in patients with puberty onset after narcolepsy onset (n = 16/19) compared with patients with puberty onset before narcolepsy onset (n = 3/11, $p = 0.02$). There was no significant change in height SDS during the studied period. Although they were within normal ranges, both median HDL and median TSH levels were significantly lower in NT1 patients, compared with controls.

Conclusions: We found a high prevalence of large BMI gain in the period immediately after the onset of narcolepsy, which had almost normalized at the long-term follow-up. The onset of narcolepsy led to early puberty in both sexes. Linear growth was not affected. We did not find any strong indicators of metabolic disturbances.

Ethinicity-dependent association of HLA DRB1~DQB1 haplotype in Brazilian narcolepsy patients and review of the literature

C. M.C.S. Bahia[1], V. M. Oliveira[2], L.C. Porto[2], D. A. Secco[2], R. Vianna[2], C.O. Brandão[3], J. Zhang[4], B. F. Dias[4], E. Mignot[4], S. V. Alves Leon[5]
[1]Rio de Janeiro State University/ Pedro Ernesto University Hospital, Neurology, Rio de Janeiro, Brazil, [2]Rio de Janeiro State University/ Policlinica Piquet Carneiro, HLA lab, Rio de Janeiro, Brazil, [3]Neurolife, Rio de Janeiro, Brazil, [4]Standford University, Sleep Medicine, Palo Alto, United States, [5]Rio de Janeiro Federal University, Neurology, Rio de Janeiro, Brazil

Introduction: Molecular techniques make it possible to evaluate the HLA genes and their association with narcolepsy. More than 90% of patients with narcolepsy type 1 (NT1) carried the HLA-DRB1*15:01~DQA1*01:02~DQB1*06:02 haplotype in studies conducted with Chinese, Korean, Japanese, and European populations. However, a different scenario was observed among African American populations, where narcolepsy was associated with other DRB1 and DQB1 haplotypes, such as DRB1*15:03~DQB1*06:02 and DRB1*11:01~DQB1*06:02. Although HLA-DRB1*15:01 is the only genetically recognized risk factor for another autoimmune disease (multiple sclerosis), in some populations such as Brazil and Norway, an allelic association with HLA-DQB1*06:02 was found independent of HLA-DRB1*15:01, and a significant association was found in Afro-descendants with DRB1*15:03. In this context, this data investigated the possibility to find distinct haplotypes associated with increased risk for narcolepsy in a mixed Brazilian population.
Materials and methods: The DNA of 37 patients diagnosed with narcolepsy was extracted from a peripheral blood sample using the Biopur Kit, Mobius©. Narcolepsy diagnosis was made using polysomnography, multiple sleep latencies test, and hypocretin dosage by radioimmunoassay. Class I and II HLA alleles were analyzed with Holotype HLA Assay Omixon©. DRB1~DQB1 haplotype odds ratio (OR) and risk ratio (RR) of the 37 patients were determined in comparison with the control population, considering matching criteria of self-reported color/race and gender, based on 185 samples from the National Register of Bone marrow donors bank (REDOME). The comparison was made using the Chi-square test, with a significant level of 0.05.
Results: The HLA-DRB1*15:03~DQB1*06:02 and HLA-DRB1*15:01~DQB1*06:02 haplotypes obtained the highest OR/RR for assessing the risk of developing narcolepsy, with values of 6.2857/1.7255 and 2.7077/1.2387, respectively, at a significance level of $p < 0.05$. Among the individuals with DRB1*15:03~DQB1*06:02 (n=9), four self-identified as mixed race, three as black, and two as black. Non-white individuals(n=7) stated that they have Native American or African ancestry, either exclusively or not. Only one of the patients who displayed the HLA-DRB1*15:01~DQB1*06:02 haplotype (n=11) declared having African ancestry only. Among these 37 patients, sixteen had low CSF hypocretin; all were DQB1*06:02 positive except one patient. Nine had DRB1*15:03~DQB1*06:02, six had DRB1*15:01~DQB1*06:02, one had the two alleles DRB1*15:03 and DRB1*15:01. As for the fifteen patients with normal hypocretin, only two were DRB1*15:01~DQB1*06:02, and none was DRB1*15:03~DQB1*06:02. The remaining six patients did not have hypocretin results.
Conclusion: Brazil is a highly diverse country with genetic contributions from different world populations. These preliminary data show a significant contribution of African ancestry to the susceptibility to narcolepsy in Brazilians, since the haplotype with the highest OR was the one that is most prominent in populations of African descent (HLA-DRB1*15:03~DQB1*06:02). Furthermore, we also found that the haplotype most commonly described in the literature as being associated with narcolepsy (HLA-DRB1*15:01~DQB1*06:02) had the second highest OR in our study population. This haplotype is commonly seen in patients from European and Asian countries, which indicates the impact of miscegenation on the genetic profile of Brazilian patients. Despite having analyzed only 37 patients, our study agrees with other works that evaluate the ethnicity-dependent association of HLA in autoimmune diseases.

Evaluation of a novel, orally available orexin 2 receptor agonist, on wakefulness and cataplexy in a mouse model of Type 1 narcolepsy

J. Brooks[1], Y. Sun[2], T. Kilduff[2], L. Tan[1], B. Raymer[1]
[1]Alkermes, Inc., Research and Development, Waltham, United States, [2]SRI International, Sleep Neurobiology Laboratory, Center for Neuroscience, Menlo Park, United States

Introduction: Narcolepsy is a neurological disorder characterized, in part, by excessive daytime sleepiness, sleep fragmentation and, in Type 1 Narcolepsy (NT1), bouts of cataplexy. The etiology of narcolepsy is thought to be a loss of hypothalamic orexin/hypocretin-producing neurons and an associated decrease in orexin/hypocretin peptide signaling. Indeed, selective and/or conditional orexin/hypocretin cell loss leads to the emergence of enduring narcolepsy-like behavioral phenotypes in preclinical animal models. Restoration of orexin/hypocretin signaling, particularly through the orexin 2 receptor, is thought to be a desired feature of novel treatment strategies for narcolepsy and related disorders. In the present preclinical proof-of-concept study, the therapeutic effects of a novel, potent and selective orexin 2 receptor agonist were evaluated in *orexin-tTA; TetO DTA* mice, a conditional and selective orexin/hypocretin-producing neuron ablation model with fidelity to NT1 in humans.

Materials and Methods: *Orexin-DTA* mice were implanted with telemetry devices for the simultaneous monitoring of electroencephalography (EEG), electromyography (EMG), subcutaneous body temperature (T_{sc}), and gross activity (LMA). After 6 weeks of degeneration, acute oral dosing of RDC-264177 (ALKS 2680; 0.1, 1, 10 mg/kg males; 0.3, 1, 3 mg/kg females) was evaluated in two cross-over design studies for effects on sleep/wake parameters and cataplexy compared to vehicle. Male (9±1 week old) and female (14±1 week old) mice were tested in separate studies. To simultaneously evaluate wake-promotion and cataplexy suppression, video recordings were collected in conjunction with EEG/EMG recordings on all dosing days. RDC-264177 was administered at the start of the rodent circadian active phase (ZT12) and data were manually scored and analyzed for 6 hours post-dose by 1- or 2-way ANOVA.

Results: RDC-264177 demonstrated wake-promoting and cataplexy-suppressing effects in male and female *orexin-DTA* mice. RDC-264177 dose-dependently increased wake bout duration and decreased the number of wake bouts, resulting in increased total wake time for several hours post-dose. Effects on wakefulness corresponded with dose-dependent increased latencies to non-REM and REM sleep. Quantitative EEG analysis revealed RDC-264177 dose-dependently increased EEG power in wake- and vigilance-related frequency bands (alpha and gamma), suggesting a possible improvement in alertness during wake that will require further validation. Additionally, RDC-264177 dose-dependently reduced the number of cataplexy arrests, with full suppression observed at the highest dose tested. A modest increase in T_{sc} and activity counts were observed at the higher doses tested. The observed change in temperature correlate with increased behavioral activity and falls within the natural mouse circadian variation of 1-3°C with body temperature being highest during the active period and lowest during the inactive period.

Conclusions: Activation of orexin 2 receptors via oral administration of RDC-264177 significantly improved narcolepsy-like symptomatology in *orexin-DTA* mice that included both decreased cataplexy and increased waking during the active phase. These preclinical data provide strong support for further investigation of RDC-264177 as a therapeutic intervention for the treatment of narcolepsy.

Healthcare burden of narcolepsy in the United Kingdom: a cohort study from the CPRD and HES databases

S. Crawford[1], Á. Azpeitia[2], S. Ghosh[1], J. O'Reilly[3], B. Podmore[2], N. Qizilbash[4,5]
[1]Takeda Development Center Americas, Inc., Cambridge, United States, [2]OXON Epidemiology, Madrid, Spain, [3]University Hospital Aintree, Liverpool, United Kingdom, [4]OXON Epidemiology, London, United Kingdom, [5]London School of Hygiene & Topical Medicine, London, United Kingdom

Introduction: Narcolepsy, a rare, chronic, neurological disorder of central hypersomnolence characterized by excessive daytime sleepiness and REM-dissociative symptoms, is reported to affect ~47/100,00 individuals across Europe; however, data on the impact of narcolepsy on patient burden and healthcare resource utilization (HCRU) are scarce. This retrospective comparative cohort study sought to understand the burden of narcolepsy in terms of patient characterization, clinical management, and HCRU in the United Kingdom (UK) using data from the Clinical Practice Research Datalink (CPRD) and Hospital Episode Statistics (HES) Admitted Patient Care and Attendances and Emergency (A&E) databases.

Materials and Methods: The CPRD-Gold database includes anonymized primary care records for more than 5 million people per year. HES databases contain records for 98–99% of inpatient, outpatient and acute hospital activity in England. Data on primary care visits and prescriptions, hospital admissions, accidents, and injuries were collected from the CPRD and HES databases for the period January 1, 2014 to December 31, 2019. Narcolepsy cases were defined as individuals with ≥1 diagnosis code and a narcolepsy-related prescription code. To evaluate HCRU and healthcare costs, narcolepsy cases were compared with controls with no record of narcolepsy diagnosis matched by age, sex, practice, and year of diagnosis (1:5 ratio). Assessments included the presence of comorbidities, medication history, treatment patterns, HCRU (e.g., outpatient visits, hospitalizations) and treatment costs.

Results: In total, 244 patients with narcolepsy and 1,219 matched controls were assessed. Comorbidities and other sleep disorders were more frequent in narcolepsy patients (224 [91.8%] and 146 [59.8%], respectively) than controls (772 [63.3%] and 122 [10.0%]). For narcolepsy patients, modafinil was the most frequently prescribed medication relevant to sleepiness symptoms at baseline; modafinil's prescribing rate increased in the second year after baseline then decreased thereafter. Pitolisant, solriamfetol, reboxetine or selegiline were not prescribed and only 4 patients received sodium oxybate (1.6% patients) during the study period. Patients with narcolepsy visited primary care physicians, medical specialists ~2 times as often as controls (incidence rate ratio [IRR]: 1.91 [95% CI 1.88–1.93] and 1.85 [1.60–2.13], respectively), psychiatrists ~3 times as often (2.62 [1.40–4.90]), and neurologists more than four times as often (4.27 [2.38–7.68]). Accidents were more frequent in patients with narcolepsy compared with controls (IRR 2.14 [95% CI 1.54–2.98]) and they had twice the number of hospital and emergency admissions than controls (IRR 2.61 [95% CI 2.20–3.09) and 2.06 [1.72–2.47], respectively). Total direct costs per patient per year (excluding treatment) were higher for narcolepsy patients (Outpatient: £1,355.26; Inpatient: £1,879.68) compared to controls (Outpatient: £709.78; Inpatient: £723.42).

Conclusions: These findings demonstrate a greater burden for patients with narcolepsy compared with non-narcolepsy matched controls in the UK. Relative to controls, patients with narcolepsy visited primary care physicians, medical and psychiatric specialists and neurologists at rates 2- to 4-fold higher, had higher rates of accidents and inpatient/emergency admissions, and higher healthcare costs.

Heart rate change in spontaneous microarousals during sleep uncovers an increased sympathetic activity in narcolepsy type 1 patients

P. Correia[1], M. Ferreira[1], J. Moita[1], I. Luzeiro[1,2], A. Brás[1,2]
[1]Centro Hospitalar e Universitário de Coimbra, Centro de Medicina do Sono, Coimbra, Portugal,
[2]Centro Hospitalar e Universitário de Coimbra, Serviço de Neurologia, Coimbra, Portugal

Introduction: Narcolepsy type 1 (NT1) is a rare disorder mainly characterized by excessive daytime sleepiness and episodes of cataplexy. Narcolepsy is caused by the loss of hypothalamic orexin neurons. A disturbance of the autonomic nervous system in narcolepsy type 1 has been recently suggested, affecting the sympathetic and parasympathetic interplay. We aim to describe the duration and heart rate (HR) change associated to spontaneous microarousals across all sleep stages in NT1 patients.

Materials and Methods: Ten NT1 patients and 10 age-matched controls were examined. Polysomnography data and randomly selected spontaneous microarousals were analyzed and compared between groups. Three to seven spontaneous microarousals were selected in each sleep stage preceded by at least 30 seconds of stable sleep. The HR response was calculated based on the difference between the maximal and average HR during microarousal and average basal HR 10 seconds before the microarousal.

Results: The average of total sleep time, sleep efficiency, sleep onset and REM latencies, percentage of N2, N3 and REM sleep were inferior in NT1 patients. The percentage of N1 stage, periodic leg movements and apnea-hypopnea indices were superior in NT1 patients.

A total of 428 spontaneous microarousals were analyzed, including 214 in NT1 patients (58 in N1 sleep, 73 in N2 sleep, 35 in N3 sleep and 48 in REM sleep) and 214 in controls (64 in N1 sleep, 67 in N2 sleep, 31 in N3 sleep and 52 in REM sleep).

The duration of spontaneous microarousals were significantly higher in NT1 patients for N1 sleep (7.6±3.2 vs. 5.8±1.6), N2 sleep (7.0±2.2 vs. 5.8±1.9) and N3 sleep (7.1±2.6 vs. 5.4±1.6) ($p < 0.001$). Comparing with controls, the difference between the average HR during and before microarousals was significantly higher in NT1 patients across all sleep stages (N1 sleep 3.8±5 vs. 0.5±4.3, N2 sleep 4±4.5 vs. 0.5±3.9, N3 sleep 5.3±6.4 vs. 2.3±4.3 and REM sleep 3.9±6.1 vs. 1±3.3) ($p < 0.05$). Considering the difference of maximal HR during and the average basal HR before microarousals, a significant HR response was verified in microarousals occurring in N2 (11.5±6.9 vs. 8.9±5.4) and REM (13.4±8.4 vs. 9.2±6.7) stages for NT1 patients ($p < 0.05$).

Conclusions: The higher HR change in spontaneous microarousals during sleep points toward an enhanced sympathetic activity in the context of a possible autonomic dysfunction could predict higher cardiovascular risk in NT1 patients.

Identification of the genetic risk factors for narcolepsy in Brazilian patient's cohort paired with health controls of National Register of Bone Marrow Donors (REDOME): preliminary results

C. Martins Correa da Silva Bahia[1], S. V. Alves-Leon[2], V. M. Oliveira[3], D. A. Secco[3], R. Vianna[3], C.O. Brandão[4], B. F. Dias[5], J. Zhang[5], E. Mignot[5], L.C. Porto[3]
[1]Rio de Janeiro State University/ Pedro Ernesto University Hospital, Neurology, Rio de Janeiro, Brazil, [2]Rio de Janeiro Federal University, Neurology, Rio de Janeiro, Brazil, [3]Rio de Janeiro State University/ Policlinica Piquet Carneiro, HLA lab, Rio de Janeiro, Brazil, [4]Neurolife, Rio de Janeiro, Brazil, [5]Standford University, Sleep Medicine, Palo Alto, United States

Introduction: Brazil, with a population of approximately 203 million people, is renowned for its rich blend of ethnic backgrounds, resulting in a diverse genetic landscape, with a majority of individuals identifying as brown (45.3%) and white (42.8%). The REDOME database stands as the third-largest bone marrow donor registry globally, boasting over 5 million Brazilian donors, thereby serving as a valuable resource for genetic comparisons. Despite this genetic diversity, studies on narcolepsy genetics, particularly in Afro-descendants and Latinos, are limited. While the *HLA-DQB1*06:02* allele is recognized as the primary genetic risk factor for narcolepsy type 1 (NT1) and to a lesser extent for narcolepsy type 2 (NT2), it is by no means the sole genetic factor associated with the condition. In this study, we present the initial findings of the first Brazilian research endeavor that integrates high-resolution HLA sequencing, hypocretin quantification, neurophysiological assessments, and comparisons with controls sourced from the REDOME database.

Materials and Methods: The DNA of 37 patients diagnosed with narcolepsy was extracted from peripheral blood using the Biopur Kit, Mobius©. The diagnosis of narcolepsy was established through polysomnography and multiple sleep latency tests. Categorization into narcolepsy type 1 or type 2 (NT2) was contingent on cerebrospinal fluid hypocretin-1 measurements conducted via radioimmunoassay. Class I and II HLA alleles were ascertained using Holotype HLA Assay Omixon©, and the results were compared to those observed in individuals residing in the same state, adhering to matching criteria based on self-reported color/race and gender. A total of 185 samples (case 1: controls 5) from the REDOME database were used for this purpose. Risk assessments were executed by comparing the frequency of alleles or haplotypes in narcolepsy cases versus controls, employing Chi-Square or Fisher's exact tests, with p-values corrected using the Bonferroni method. Four groups were analyzed: NT1, NT2, NT1-matched controls, and NT2-matched controls, and odds ratios (OR) with 95% confidence intervals were reported, with statistical significance set at $p < 0.05$.

Results: The comparison of all narcoleptic patients (n=37) with controls (n=185) revealed disparities in the prevalence of *HLA-DQB1*06:02* (OR=4.4, 2.11-9.20, $p < 0.001$), DRB1*15:03 (OR 5.63, 2.1-15.06, $p < 0.001$), and *DRB1*15:01* (OR=2.59, 1.14-5.86, p=0.024), signifying an increased risk. When comparing NT1 (n=16) against NT1 controls (n=80), heightened risk was observed solely for *DQB1*06:02 (*OR 49.29, 8.01-1112.66, $p < 0.001$) and *DRB1*15:03* (OR=15.06, 4.17-59.25, p=0.001). Similar findings emerged when comparing NT1 with NT2 (n=15) in terms of *DQB1*06:02* ($p < 0.001$) and *DRB1*15:03* (p=0.023). Notably, fourteen out of sixteen NT1 patients exhibited the *DQB1*06:02~DRB1*15* haplotype, while the remaining two possessed rare non-narcolepsy haplotypes, specifically DQB1*06:02 non-DR15 and non-*DQB1*06:02*.

Conclusion: Despite the limited number of cases, NT1 patients displayed genetic distinctions from NT2 and controls. The primary risk factors identified were also HLA-DQB1*06:02 and *DRB1*15:03*, with DRB1*15:01 not demonstrating a significant association. These findings suggest a predominance of African ethnicity among NT1 patients in Brazil, given the higher prevalence of *HLA-DRB1*15:03* among African descendants. No definitive risk factor was identified for NT2. Larger scale studies are needed to validate these findings.

Impact of the first Hypersomnia Research Center in a public health service of Rio de Janeiro, Brazil - a participatory medicine model

C. Martins Correa da Silva Bahia[1], V. Mendes de Oliveira[2], D. Angst Secco[2], R. Vianna[2], L.C. Porto[2], F. Vianna[3], A.C. Souza Braga[4], J. Flygare[5], C.O. Brandão[6], P. Vallegas[1], L.F. Ferreira-Souza[7], R. da Silva-Rodrigues[7], D. Sá-Caputo[7], L. Gusmão[7], M. Bernardo-Filho[7], M. Fritsch[8], M. Meira e Cruz[9], E. Mignot[10], B. de Freitas Dias[10], J. Zhang[10], S. Vieira Alves Leon[11]
[1]Rio de Janeiro State University/Pedro Ernesto University Hospital, Neurology, Rio de Janeiro, Brazil, [2]Rio de Janeiro State University/Policlinica Piquet Carneiro, HLA Lab, Rio de Janeiro, Brazil, [3]UNIRIO/Gafrée Guinle University Hospital, Sleep Sector, Rio de Janeiro, Brazil, [4]ABRANHI, Rio de Janeiro, Brazil, [5]Project Sleep, Los Angeles, United States, [6]Neurolife, Rio de Janeiro, Brazil, [7]Rio de Janeiro State University/Policlinica Piquet Carneiro, LAVIMPI, Rio de Janeiro, Brazil, [8]Rio de Janeiro State University/Pedro Ernesto University Hospital, Cardiology, Rio de Janeiro, Brazil, [9]Universidade de Lisboa/School of Medicine, Sleep Unit, Centro Cardiovascular, Lisboa, Portugal, [10]Standford University, Sleep Medicine, Palo Alto, United States, [11]Rio de Janeiro Federal University, Neurology, Rio de Janeiro, Brazil

Introduction: Narcolepsy and Idiopathic hypersomnia (IH) are rare central nervous system disorders causing excessive daytime sleepiness (EDS). Patients are frequently misdiagnosed, leading to delayed referral to the specialized center and causing significant biopsychosocial consequences. Since January 2022, the Hypersomnias Research Center in Neurology Department of the Pedro Ernesto University Hospital (HUPE) /Rio de Janeiro State University (UERJ) has been recruiting patients with EDS under 60 years for detailed clinical evaluation. This includes polysomnography (PSG), multiple sleep latency test (MSLT), high-resolution HLA sequencing, hypocretin measurement, and investigation for secondary sleepiness causes. This Center has been conducting the research on Genetics and Narcolepsy granted by FAPERJ with international collaboration and other branches. It follows the participatory medicine model, with the active collaboration of the Brazilian Association of Patients with Narcolepsy and IH (ABRANHI), which can refer a suspected individual directly to the center.

Materials and Methodos: We describe the work of the Hypersomnia Research Center of HUPE-UERJ. Patients´s view was obtained by questionnaries.

Results: Precision Medicine: Among 125 patients evaluated with EDS from January/22 to August/23, 95% completed the investigation with either PSG(n=68) or PSG with MSLT(n=51) when primary hypersomnia (PH) was strongly suspected. Forty-one patients (80%) with suspected PH met the criteria for narcolepsy, while ten patients met the criteria for IH, according to ICSD-3. Hypocretin measurement was performed in 37 patients, and HLA sequencing in 44 patients. ABRANHI referred 73% of them. Patients came from ABRANHI had an expressive assertiveness of 90% for PH diagnosis. Population Features: 80,3% are women, 58,8% are black and mixed race, aged 35 years (average). The diagnostic delay was 17,21 years (average). Obstructive sleep apnea was the most prevalent differential diagnosis. Impact of proper diagnostic: patients expressed relief rather than negative emotions. The benefits mentioned with the correct diagnosis included the return to the job market, curriculum adaptation in their academic journey, and access to the rights of people with disabilities. All patients recognized the importance of a Hypersomnias Research Center in the public healthcare system in shortening time for diagnostic due to free offer of costly exams and expert consultants that contrasts the unfamiliarity with the disease by medical community.

Beyond hospital care, periodic meetings with ABRANHI members helped identify challenges, and physicians actively participated in collaborative activities to reduce barriers to access and treatment. These actions included public awareness campaigns, training primary healthcare professionals, involvement in public assemblies to discuss medication access and diagnostic tests, providing technical consultancy for patient well-being projects, and organizing events for the university community centered on the knowledge of the patient and their families.

Conclusions: Public health networks should establish reference centers for PH. The timely diagnosis significantly impacts proper treatment and enables the production of reports and documents that will help patients to be included academically, professionally, and socially. Flow through patient associations is crucial for expediting patient referrals to specialized centers, and the Participatory Medicine Model proves valuable in guiding necessary actions and discuss public polices with health managers.

Improvement in sleep latency with once-nightly sodium oxybate: analysis from the Phase 3 REST-ON clinical trial

M.J. Thorpy[1], C.M. Shapiro[2], C.A. Kushida[3], M.M. Ohayon[3], J. Dubow[4], J. Gudeman[4]
[1]Albert Einstein College of Medicine, New York, United States, [2]University of Toronto, Toronto, Canada, [3]Stanford University School of Medicine, Stanford, United States, [4]Avadel Pharmaceuticals, Chesterfield, United States

Introduction: Efficacy and safety of a once-at-bedtime oxybate (LUMRYZ™, sodium oxybate for extended-release oral suspension, CIII [FT218; once-nightly sodium oxybate (ON-SXB)]) in treating narcolepsy symptoms were assessed in the phase 3 REST-ON clinical trial (NCT02720744). At all doses tested (6, 7.5, and 9 g), ON-SXB was associated with significant improvement vs placebo on the 3 coprimary endpoints mean sleep latency on the Maintenance of Wakefulness Test (MWT), Clinical Global Impression of Improvement rating, and mean number of weekly cataplexy episodes (all, $P<0.001$) and the treatment was well tolerated (most common adverse drug reactions: dizziness, nausea, vomiting, headache, and enuresis). This post hoc analysis assessed the effect of ON-SXB treatment on mean sleep latency in individuals with narcolepsy from REST-ON.
Materials and Methods: Participants (≥16 years) with narcolepsy type 1/2 were randomized 1:1 to double-blind ON-SXB or placebo. Doses were 4.5 g week 1, 6 g weeks 2–3, 7.5 g weeks 4–8, and 9 g weeks 9–13. Mean sleep latency on the MWT was measured in 5 trials up to 30 minutes each at baseline and weeks 3, 8, and 13. Percentage of participants with improvement of ≥5, ≥10, ≥15, and ≥20 minutes from baseline and with mean sleep latency=30 minutes were assessed. Two-sided P values were calculated using Fisher exact test.
Results: The modified intent-to-treat population included 190 participants (ON-SXB, n=97; placebo, n=93). At baseline, mean (SD) sleep latency was as follows: ON-SXB, 5.0 (3.1) minutes; placebo, 4.7 (2.6) minutes. More participants receiving ON-SXB vs placebo had mean MWT=30 minutes at weeks 3 (6 g; 5.7% vs 0%; $P<0.05$), 8 (7.5 g; 10.5% vs 1.3%; $P<0.05$), and 13 (9 g; 13.2% vs 5.1%; $P=0.14$). A significantly greater percentage of participants receiving ON-SXB vs placebo had improved mean sleep latency ≥5 to ≥20 minutes over baseline at all doses (6 g: ≥5 min, 57.5% vs 25.0%; ≥10 min, 35.6% vs 9.1%; ≥15 min, 18.4% vs 3.4%; ≥20 min, 10.3% vs 1.1% [all $P<0.01$]; 7.5 g: ≥5 min, 63.2% vs 28.2%; ≥10 min, 43.4% vs 11.5%; ≥15 min, 31.6% vs 3.8%; ≥20 min, 15.8% vs 1.3% [all $P<0.001$]; 9 g: ≥5 min, 66.2% vs 37.2% [$P<0.001$]; ≥10 min, 50.0% vs 19.2% [$P<0.001$]; ≥15 min, 32.4% vs 10.3% [$P<0.01$]; ≥20 min, 17.6% vs 6.4% [$P<0.05$]).
Conclusions: Clinically significant improvements in excessive daytime sleepiness (EDS) occurred with 6-, 7.5-, and 9-g doses of ON-SXB. At the 2 highest doses, >10% of participants remained awake for the entire MWT. ON-SXB is an efficacious treatment for EDS in individuals ≥16 years of age with narcolepsy. ON-SXB is a once-at-bedtime treatment option for adults with narcolepsy; findings from this post hoc analysis may facilitate counseling patients and setting treatment expectations.

Individualized dosing strategies for oxybate: insights from the real-world TENOR study

W. Macfadden[1], C. Bae[2], D.S. Fuller[1], <u>S. Candler</u>[1], T.J. Measey[1], A.M. Husain[3], P.C. Zee[4]
[1]Jazz Pharmaceuticals, Philadelphia, United States, [2]Penn Medicine, University of Pennsylvania, Philadelphia, United States, [3]Duke University Medical Center, Durham, United States, [4]Feinberg School of Medicine, Northwestern University, Chicago, United States

Introduction: Low-sodium oxybate (LXB; Xywav®) contains the same active moiety as high-sodium oxybates (sodium oxybate [SXB; Xyrem®] and fixed-dose, high-sodium oxybate [Lumryz™]), but with 92% less sodium, and is approved by the US Food and Drug Administration (FDA) for treating cataplexy or excessive daytime sleepiness in patients ≥7 years of age with narcolepsy. LXB's lower chronic sodium exposure is recognized by the US FDA in the narcolepsy population as clinically meaningful compared to high-sodium oxybate products. LXB can be administered twice nightly as equal or unequal doses to allow for treatment individualization. Real-world data regarding treatment individualization and dosing strategies in patients transitioning to LXB from SXB are limited.

Materials and Methods: Transition Experience of persons with Narcolepsy taking Oxybate in the Real-world (TENOR; NCT04803786) was a patient-centric, prospective, observational, virtual-format study of US adults with narcolepsy (type 1 or type 2) transitioning to LXB from SXB. Longitudinal data were collected during transition and for 21 weeks post-transition via daily and weekly diaries and questionnaires completed by participants. Insights regarding physician-directed individualized dosing strategies, including reasons for unequal dosing, are reported.

Results: Overall, the mean (SD) age of the 85 participants in TENOR (narcolepsy type 1, n=45; narcolepsy type 2, n=40) was 40.3 (13.0) years; most were female (73%) and White (87%). Seventeen participants (20.0%) reported taking unequal dosing (narcolepsy type 1, n=7; narcolepsy type 2, n=10) at any point in the study. Among those taking SXB twice nightly at baseline (n=82), 9 (11%) and 1 (1%) took higher first and second doses, respectively. Immediately following the transition to LXB, 7 (9%) and 2 (2%) participants took higher first and second doses, respectively. At end of study (week 21), 8 (12%) participants were on an unequal dosing regimen, and all took a higher first dose. Among those taking unequal doses of SXB or LXB who reported timing between doses, all (100%) took the second dose ≥2.5 hours after the first dose. The most common total nightly doses for SXB and LXB were 7.5 and 9.0 g, respectively. Overall, the most common reasons cited for unequal dosing of SXB and LXB were to avoid feeling groggy in the morning (44% and 33%, respectively), to help fall asleep (25% and 13%, respectively), and to improve sleep quality (13% and 29%, respectively). Other reasons cited for unequal dosing included to reduce side effects, such as nausea, insomnia, and anxiety.

Conclusions: Data from this real-world study demonstrate dosing strategies for oxybate individualization, including reasons for considering unequal twice-nightly dosing. The most common reasons reported for unequal dosing were to avoid morning grogginess and to help fall asleep. These real-world insights may help inform clinical decision around individualizing dosing strategy in patients with narcolepsy.

Influenza HA antibody titers in recent onset type-1 narcolepsy

H. Yan[1], L. Lin[1], J. Zhang[1], E. Mignot[1]
[1]Stanford University, Department of Psychiatry and Behavioral Science, Palo Alto, United States

Introduction: Epidemiological studies have shown associations between pandemic H1N1 2009 Influenza-A infection and vaccination (only using Pandemrix®) and the onset of narcolepsy, an autoimmune disease associated with HLA-DQB1*0602. We tested whether recent onset type 1 narcolepsy patients have increased flu antibodies titers comparing with matched HLA-DQB1*0602 positive controls.

Materials and Methods: Sera of 82 recent onset type-1 narcolepsy patients (12 [1-25] months) and 84 healthy controls matched by sex, age, and year and season of sample collection were used. Sera were tested for Influenza-A and B antibodies using hemagglutinin inhibition (HAI) assays against the dominant strains known to circulate at time of collection. HAI assays against H1N1 pdm09 were also tested independently in all subjects. Titers were log2 transformed, with zero being <1/10 dilution, 1 as 1/20, 2 as 1/40 etc., so that every dilution represents an increment of 1 unit. Further analysis using multiple variable linear regression and logistic regression were done to analyze association between confounding factors and disease status and HA antibody titers.

Results: H1N1pdm09 HA titers were increased in 25/63 (39.7%) subjects collected after 2009. Increasing titers (doubling rate) of H1N1pdm09 [OR=1.2962(1.0513, 1.5984), p=0.015], all H1N1 [OR=1.13(1.03-1.24), p=0.023] and B/Victoria [1.37 (1.16-1.61), p=0.001] were associated with narcolepsy, whereas no association was found with H3N2 and B/Yamagata. Logistic regression shows after controlling sex, age and season of sample collection, narcolepsy is associated with H1N1pdm09 [4.68(1.5281, 14.3392), p=0.007] and B/Victoria strains [5.5306 (2.6039, 11.8224), p=0.001].

Conclusions: Both H1N1 and B/Victoria, but not other strains, may trigger narcolepsy onset. This result is in line with a recent epidemiological study in Europe that reported a strong increase in narcolepsy onset in 2010 (following 2009 H1N1 pandemic) and a secondary peak in 2013 following a season with a dominant B/Victoria infection.

Insights from real-world and interventional studies of patients transitioning from sodium oxybate to low-sodium oxybate

W. Macfadden[1], A.M. Husain[2], P.C. Zee[3], D.S. Fuller[1], S. Candler[1], C. Bae[4]
[1]Jazz Pharmaceuticals, Philadelphia, United States, [2]Duke University Medical Center, Durham, United States, [3]Feinberg School of Medicine, Northwestern University, Chicago, United States, [4]Penn Medicine, University of Pennsylvania, Philadelphia, United States

Introduction: Low-sodium oxybate (LXB; Xywav®) contains the same active moiety as high-sodium oxybates (sodium oxybate [SXB; Xyrem®] and fixed-dose, high-sodium oxybate [Lumryz™]), but with 92% less sodium, and is approved by the US Food and Drug Administration (FDA) for treating cataplexy or excessive daytime sleepiness in patients ≥7 years of age with narcolepsy. LXB's lower chronic sodium exposure is recognized by the FDA in the narcolepsy population as clinically meaningful compared to high-sodium oxybate products. One real-world and 1 interventional study have examined the experience of adults with narcolepsy (type 1 or type 2) transitioning to LXB from SXB (Transition Experience of persons with Narcolepsy taking Oxybate in the Real-world [TENOR], NCT04803786; and Substitution of Equal Grams of Uninterrupted Xyrem® to Xywav® [SEGUE]; NCT04794491).

Materials and Methods: TENOR was a 21-week prospective, observational, virtual-format study; SEGUE was an 8-week multicenter, interventional, site-based study. TENOR participants were transitioning to LXB from SXB within the previous/upcoming 7 days; in SEGUE, after 2 weeks on a stable SXB dose/regimen (baseline period), participants switched to the same dose/regimen of LXB and were titrated if needed (intervention period; 6 weeks). Efficacy assessments included the Patient Global Impression of Change (PGIc), a forced preference questionnaire (FPQ), an ease of switching medication scale (EOSMS), and the Epworth Sleepiness Scale (ESS).

Results: In TENOR, mean (SD) age of the 85 participants (narcolepsy type 1, n=45; narcolepsy type 2, n=40) was 40.3 (13.0) years; most were female (73%) and White (87%). Similarly, of the 62 participants in the safety set in SEGUE, a majority were female (60%) and White (87%); mean (SD) age was 44.3 (15.2) years. Almost all took SXB (96% and 93% in TENOR and SEGUE, respectively) twice nightly prior to transition and LXB (98% and 93%, respectively) twice nightly after transition. Mean (SD) doses of SXB (7.7 [1.5] g [TENOR] and 8.0 [1.4] g [SEGUE]) and LXB (7.7 [1.5] g [TENOR] and 8.0 [1.4] g [SEGUE]) were similar. In both studies, most participants (84% and 93%, respectively) reported that switching from SXB to LXB was "easy," or "extremely easy, not difficult at all" on the EOSMS, and most (81% and 79%, respectively) preferred LXB to SXB on the FPQ. Most participants reported improvement or no change (very much/much/minimal: 34% and 45%, respectively; no change: 46% and 48%, respectively) in narcolepsy symptoms on the PGIc. Participants who favored LXB most frequently cited its lower sodium content being healthier (95% and 77%, respectively) for their preference. Mean (SD) change from baseline on the ESS was −2.0 (3.8) and −0.7 (2.3), in TENOR and SEGUE respectively.

Conclusions: Despite differences in study design and duration, across both studies most participants reported that switching to LXB from SXB was easy with minimal modifications to dose/regimen. Most participants preferred LXB to SXB, primarily due to its lower sodium content. Effectiveness of oxybate treatment was maintained following transition to LXB.

Long-term ambulatory monitoring and identification of digital biomarkers in narcolepsy

O. Gnarra[1,2], J. van der Meer[1], J.D. Warncke[1], L.G. Fregolente[1], E. Wenz[1], U. Nwachukwu[1], R. Khatami[1,3], S. von Manitius[4], S. Miano[5], J. Acker[6], M. Strub[7], R. Riener[2,8], C.L. Bassetti[1], M.H. Schmidt[1,9]

[1]Insel University Hospital of Bern, Sleep-Wake Epilepsy Center, NeuroTec, Department of Neurology, Bern, Switzerland, [2]Institute of Robotics and Intelligent Systems, ETH Zurich, Sensory-Motor System Lab, Department of Health Sciences and Technology, Zurich, Switzerland, [3]Clinic Barmelweid, Center for Sleep Medicine and Sleep Research, Barmelweid, Switzerland, [4]Department of Neurology, Kantonsspital St. Gallen St, Gallen, Switzerland, [5]Sleep and Epilepsy Center, Neurocenter of the Southern Switzerland, Regional Hospital (EOC) of Lugano, Lugano, Switzerland, [6]ZurzachCare, Clinic for Sleep Medicine, Zurzach, Switzerland, [7]Zentrum für Schlafmedizin Basel, Basel, Switzerland, [8]Spinal Cord Injury Center, University Hospital Balgrist, Zurich, Switzerland, [9]Ohio Sleep Medicine Institute, Dublin, United States

Introduction: The Swiss Primary Hypersomnolence and Narcolepsy Cohort Study (SPHYNCS) is a multicenter research study to identify novel biomarkers for narcolepsy and central disorders of hypersomnolence (CDH). While narcolepsy type 1 (NT1) is well characterized, precise diagnostic biomarkers for other CDH disorders remain elusive. Current ambulatory monitoring in clinical practice is limited to 1-2 weeks of actigraphy. In the SPHYNCS study, we aimed to assess the feasibility of long-term ambulatory monitoring using Fitbit smartwatches and identify digital biomarkers associated with narcolepsy and its borderland.

Materials and methods: Compliance metrics were established to evaluate the usability of the Fitbit smartwatch in a cohort of patients with CDH. Compliance rates were calculated based on daily and minute-resolution data, differentiating between weekdays, weekends, and day and night periods. Physical activity, heart rate, and sleep features were extracted and correlated. Averages were computed at two-week intervals, and t-tests were performed to compare results between NT1 patients and healthy controls (HC). Additionally, Pearson's correlation coefficient (r) was investigated between activity measured by the Fitbit Inspire 2 and the medical-grade actigraphy device MotionWatch 8. The accuracy of sleep stage classification by the Fitbit algorithm was assessed against gold-standard polysomnography (PSG) Somnomedics.

Results: 118 participants, including patients with CDH and HC, received Fitbit smartwatches, exhibiting an overall compliance rate of 80% over one year. No significant differences were observed in compliance rates between weekdays and weekends or day and night. In terms of sleep quality, we found significant differences between NT1 patients and HC, with NT1 patients displaying increased wake-after-sleep onset (p=0.007), awakening index (p=0.025), and standard deviation of time in bed over the two-week interval (p=0.044). We also found differences between NT1 and HC when comparing multiple activity features; NT1 patients exhibited significantly lower peak heart rate (p=0.008), heart rate standard deviation (p=0.039), high-intensity activity (p=0.009), number of steps (p=0.049), REM latency (p=0.019), sleep latency (p=0.001), and rise-time latency (p=0.002) compared to HC. The activity-heart rate correlation was significantly lower in NT1 patients than in HC (p=0.028). A strong correlation was observed between activity measured by Fitbit and medical actigraphy (r=0.81). Compared to the PSG, the sleep stage classification algorithm from Fitbit showed an accuracy of 0.76.

Conclusions: Our findings demonstrate the feasibility of long-term home monitoring and identifying digital biomarkers in CDH. This technology can potentially enhance the diagnostic process and management of patients with narcolepsy and its borderland disorders. Moreover, our work on utilizing smartwatches for long-term everyday life monitoring in patients with CDH carries implications beyond sleep medicine. This approach holds promise for identifying and tracking disease progression, monitoring therapy compliance, and discovering novel diagnostic digital biomarkers. Ultimately, it paves the way for personalized and precision medicine, with potential applications in improving clinical decision-making and patient outcomes.

Long-term safety and efficacy of extended-release once-nightly sodium oxybate for narcolepsy

B.C. Corser[1], A.M. Morse[2], T. Stern[3], A.O. Ajayi[4], C.A. Kushida[5], J. Gudeman[6]
[1]Sleep Management Institute, Cincinnati, United States, [2]Geisinger Commonwealth School of Medicine, Geisinger Medical Center, Janet Weis Children's Hospital, Danville, United States, [3]Advanced Respiratory and Sleep Medicine, PLLC, Huntersville, United States, [4]Florida Pediatric Research Institute, Winter Park, United States, [5]Stanford University School of Medicine, Stanford, United States, [6]Avadel Pharmaceuticals, Chesterfield, United States

Introduction: Once-at-bedtime extended-release sodium oxybate (once-nightly SXB [ON-SXB]; FT218) was FDA approved May 1, 2023. In the phase 3 REST-ON trial, ON-SXB met primary/secondary efficacy endpoints for excessive daytime sleepiness (EDS), cataplexy, overall condition, and measures of disrupted nighttime sleep (DNS) in adults with narcolepsy ($P<0.001$ vs placebo); safety profile was consistent with 1st generation, twice-nightly, immediate-release SXB. Ongoing RESTORE (NCT04451668) is designed to assess long-term safety/tolerability of ON-SXB; efficacy in oxybate-naive participants and REST-ON completers not currently taking oxybate is also assessed.

Materials and methods: Open-label RESTORE has an initial dose titration period ≤2 mo and a stable-dosing period ≤24 mo. Participants (≥16 y with narcolepsy type 1/2) completed REST-ON, were oxybate-naive, or switched from stable (≥1 mo) 1st generation oxybate. If not taking oxybate at entry, initial ON-SXB dose is 4.5 g/night; investigators adjust doses ±1.5 g/night weekly as needed (dose range, 4.5–9 g/night). Adverse drug reactions (ADRs; ie, adverse events [AEs] related to ON-SXB) were collected. ON-SXB efficacy was assessed using Epworth Sleepiness Scale (ESS), daily diary (weekly cataplexy episodes, nighttime awakenings), and Clinical and Patient Global Impression of Improvement (CGI-I; PGI-I). Interim analysis of data (baseline to last efficacy assessment) was completed in May 2023 following FDA approval of ON-SXB.

Results: REST-ON/oxybate-naive participants (N=50) had mean age 32.7 (range, 16–72) y; 60.0% were female and 80.0% were white. Median ON-SXB exposure was 348.5 (range, 11–902) d; 7 participants discontinued owing to an AE. Most common ADRs (≥4 participants): nausea (24.0%), somnolence (10.0%), dizziness (10.0%), paresthesia (8.0%), and tremor (8.0%). In the modified intent-to-treat (mITT) population (n=47), least squares mean (LSM) change in ESS score was −8.1 (95% CI, −10.5 to −5.8; $P<0.0001$); 75.9% had ESS scores shift from ≥10 to <10. Cataplexy episodes were significantly reduced (mITT, n=31; LSM, −8.0 [95% CI, −11.8 to −4.3]; $P=0.0004$; median, −50.6%). Nighttime awakenings were significantly reduced (LSM, −7.6; 95% CI, −9.8 to −5.4; $P<0.0001$). Severity of narcolepsy was improved for most (CGI-I, 86.7%; PGI-I, 82.2%).

Conclusions: Oxybate is a standard-of-care treatment for EDS and cataplexy in people with narcolepsy. First-generation oxybate therapies are taken at bedtime and 2.5–4 hours later. Bifurcating nightly sleep imposes undue burden on patients whose narcolepsy symptoms may include poor sleep quality and DNS. FDA recognized clinical superiority of ON-SXB based on the major contribution to patient care that the once nightly dosing regimen provides. Open-label RESTORE approximates real-world use of ON-SXB for adults with narcolepsy and shows robust long-term tolerability of ON-SXB and clinically significant improvement in symptoms.

Long-term safety of once-nightly sodium oxybate for narcolepsy: RESTORE study interim analysis of data

T. Stern[1], A. Roy[2], C.M. Shapiro[3], J. Harsh[4], <u>A.O. Ajayi</u>[5], S. Ibrahim[6], J. Dubow[7], J. Gudeman[7]
[1]Advanced Respiratory and Sleep Medicine, PLLC, Huntersville, United States, [2]Ohio Sleep Medicine Institute, Dublin, United States, [3]University of Toronto, Toronto, Canada, [4]Colorado Sleep Institute, Boulder, United States, [5]Florida Pediatric Research Institute, Winter Park, United States, [6]University Hospitals Cleveland Medical Center, Cleveland, United States, [7]Avadel Pharmaceuticals, Chesterfield, United States

Introduction: The pivotal phase 3 REST-ON trial (NCT02720744) evaluated the efficacy and safety of a once-at-bedtime oxybate (LUMRYZ™ sodium oxybate for extended-release oral suspension, CIII [FT218; once-nightly sodium oxybate (ON-SXB)]) for treatment of adults with narcolepsy. In REST-ON, ON-SXB met its 3 coprimary endpoints: improvement in mean sleep latency on the Maintenance of Wakefulness test, Clinical Global Impression-Improvement rating (% much/very much improved), and number of weekly cataplexy attacks at all doses tested ($P<0.001$ vs placebo). The safety profile of ON-SXB was consistent with that of immediate-release (IR) SXB. The ongoing RESTORE trial (NCT04451668) is an open-label/switch study evaluating the safety and tolerability of ON-SXB.
Materials and Methods: Participants aged ≥16 years with narcolepsy type 1 or 2 who completed the REST-ON trial, were on stable-dose (≥1 month) IR oxybate, or were oxybate-naive were eligible for RESTORE. Initial doses were 4.5 g/night or equivalent/closest to the previous total IR oxybate dose/night for those switching; incremental adjustments (1.5 g/week; maximum dose, 9 g/night) were allowed. Safety data for participants receiving ≥1 dose of ON-SXB as of 06 March 2023 are reported here.
Results: This analysis includes interim data from 180 participants (REST-ON participants, n=15 [8.3%]; oxybate-naive, n=35 [19.4%]; switch, n=130 [72.2%]). Most participants are white (n=150 [83.3%]) and female (n=122 [67.8%]); mean age is 35 years (range, 16–84). Most participants who reported an adverse event (AE; n=133 [73.9%]) had AEs that were mild (38.9%) or moderate (27.2%) in severity. Fourteen participants experienced a severe AE, 12 participants experienced an AE leading to discontinuation, and 7 participants reported experiencing a serious AE (none occurred in >1 participant). Adverse drug reactions (ADRs; ie, AEs related/possibly related to study drug) were reported by 93 (51.7%) participants. ADRs occurring in ≥3% of participants were nausea (13.3%), somnolence (7.8%), enuresis (6.7%), headache (6.7%), dizziness (5.6%), somnambulism (5.0%), anxiety (3.9%), vomiting (3.9%), paresthesia (3.3%), and tremor (3.3%).
Conclusions: Interim data from the RESTORE study suggest that the safety profile of ON-SXB is consistent with that of SXB. ON-SXB is generally well tolerated, and no new safety signals have been observed thus far in RESTORE. ON-SXB offers adults with narcolepsy a once-at-bedtime oxybate treatment option.

Magnitude of improvement in excessive daytime sleepiness with the once-at-bedtime oxybate for narcolepsy

C.A. Kushida[1], M.J. Thorpy[2], A.M. Morse[3], J. Harsh[4], L.E. Ortiz[5], T. Roth[6], Y. Dauvilliers[7], J. Dubow[8], J. Gudeman[8]
[1]Stanford University School of Medicine, Stanford, United States, [2]Albert Einstein College of Medicine, New York, United States, [3]Geisinger Commonwealth School of Medicine, Geisinger Medical Center, Janet Weis Children's Hospital, Danville, United States, [4]Colorado Sleep Institute, Boulder, United States, [5]Johns Hopkins All Children's Hospital, St. Petersburg, United States, [6]Sleep Disorders and Research Center, Henry Ford Health System, Detroit, United States, [7]Sleep-Wake Disorders Center, Department of Neurology, Gui-de-Chauliac Hospital, Institute for Neurosciences of Montpellier INM, INSERM, University of Montpellier, Montpellier, France, [8]Avadel Pharmaceuticals, Chesterfield, United States

Introduction: The safety and efficacy of once-nightly sodium oxybate (ON-SXB; FT218; LUMRYZ™) was investigated in the phase 3 REST-ON trial. Study results demonstrated statistically significant improvements for the coprimary endpoints of change from baseline in mean sleep latency on the Maintenance of Wakefulness test, Clinical Global Impression-Improvement (CGI-I) rating, and weekly cataplexy attacks for ON-SXB 6 g (week 3), 7.5 g (week 8), and 9 g (week 13) vs placebo (all *P*<0.001). Participants also had statistically significant improvements in excessive daytime sleepiness (EDS) measured using the Epworth Sleepiness Scale (ESS; secondary endpoint) at all doses beginning at week 2 (post hoc analysis, ON-SXB 6 g vs placebo at week 2). The objective of this analysis was to assess the magnitude of improvement in the patient-reported outcome of EDS following treatment with ON-SXB.

Materials and Methods: In this multicenter, double-blind, placebo-controlled REST-ON clinical trial (NCT02720744), participants aged ≥16 years with narcolepsy type 1 (NT1) or 2 (NT2) were randomly assigned 1:1 to ON-SXB or placebo. Doses were 4.5 g week 1; 6 g weeks 2−3; 7.5 g weeks 4−8; and 9 g weeks 9−13. This post hoc analysis examined median (Q1-Q3; interquartile range [IQR]) ESS scores to assess magnitude of improvement in EDS at the end of each dosing period.

Results: The mean age of participants was 31.2 years, 68% were female, 75.5% were white, and 76.4% had NT1. The modified intent-to-treat population included 190 participants (ON-SXB, n=97; placebo, n=93). Baseline median (IQR) ESS scores were 17 (14−19) for ON-SXB and 18 (15−21) for placebo. After 1 week of treatment, median (IQR) ESS scores were 16 (12−18) for ON-SXB 4.5 g vs 17 (13−20) for placebo. At week 3 (ON-SXB 6 g), median (IQR) ESS scores were 14 (10−18) vs 17 (14−20) for placebo. With the 7.5-g dose of ON-SXB at week 8, median (IQR) ESS scores were 12 (8−16) vs 15.5 (12−20) for placebo. At the end of the study (week 13), median (IQR) ESS scores for ON-SXB 9.0 g were 9.5 (6.0−15.0) vs 15 (11−19) for placebo. ON-SXB was well tolerated; the most common adverse drug reactions were dizziness, nausea, vomiting, headache, and enuresis (consistent with the known safety profile of sodium oxybate).

Conclusions: Treatment with ON-SXB resulted in statistically significant and clinically meaningful improvement in EDS with doses >6 g in that at the end of the study, median ESS scores were within the range considered normal (≤10). ON-SXB should be considered an effective intervention in treatment of EDS for patients with NT1 or NT2 with a once-at-bedtime dose.

Management of the tolerance to modafinil in narcolepsy patients by means of pitolisant-supported bridging during drug holidays

Y. Winter[1], C. Lang[2], U. Kallweit[3], D. Apel[1], E. Ellwardt[4], S. Groppa[5]
[1]Mainz Comprehensive Epilepsy and Sleep Medicine Center, Department of Neurology, Johannes Gutenberg-University, Mainz, Germany, [2]University Hospital Ulm, Department of Neurology, Ulm, Germany, [3]Institute of Immunology, University Witten/Herdecke, Clinical Sleep and Neuroimmunology, Witten, Germany, [4]Helios-HSK Wiesbaden, Department of Neurology, Wiesbaden, Germany, [5]University of Mainz, Department of Neurology, Mainz, Germany

Introduction: Modafinil is a widely-used treatment for excessive daytime sleepiness (EDS) in narcolepsy. In its long-term use, modafinil can lead to the development of tolerance with a loss of efficacy. In this case, patients have to continuously increase the dose of modafinil. Data on the pharmacological strategies to deal with the development of tolerance to modafinil are lacking. We investigated the efficacy and safety of pitolisant-supported bridging during drug holidays in patients with narcolepsy, who developed tolerance to modafinil.

Materials and Methods: We included patients with narcolepsy (type 1 and 2) on monotherapy with modafinil who developed symptoms of tolerance to this treatment. The following alternating therapy regimen was established to manage the tolerance to modafinil: Monday to Friday patients continued to take modafinil whereas Saturday and Sunday they were taking pitolisant to "bridge" the EDS symptoms. The assessment of narcolepsy symptoms was performed at baseline and after three months by using the Epworth Sleepiness Scale (ESS) and the Ullanlinna Narcolepsy Scale (UNS). Health-related quality of life (HrQol) was evaluated by EuroQol5D. All adverse events, were documented in the diaries of the patients.

Results: 41 patients aged 30.9 ± 5.6 years participated in this study. After three months of the established alternating therapy regimen, the symptoms of tolerance to modafinil decreased and the dose of modafinil could be reduced by 41% ($p < 0.01$). We observed an improvement in ESS values (baseline: 18.2 ± 4.2, follow-up: 12.6 ± 4.0, $p < 0.0001$) and in UNS (baseline: 25.8 ± 7.9, follow up: 18.9 ± 5.9, $p < 0.0001$). The HrQol measures improved by 12-13% ($p<0.01$). The adverse events of modafinil therapy, such as arterial hypertension and insomnia, ameliorated.

Conclusions: Our data provide the evidence that narcolepsy patients who develop tolerance to modafinil could benefit from pitolisant-supported bridging during drug holidays. This alternating therapy regimen proved to be safe, reduced the EDS symptoms and helped to decrease the dose of modafinil. Further randomized controlled studies are required for the evaluation of the different therapeutical strategies in the management of the tolerance to modafinil.

Mapping narcolepsy and idiopathic hypersomnia across Brazil: the Brazilian Rare Diseases Network (RARAS) and Brazilian Association of Patients with Narcolepsy and Idiopathic Hypersomnia (ABRANHI) census: a call for official notification

C. M. C. S. Bahia[1], R. Boy[2], A.C. S. Braga[3], R. Leite[2], B. Pinheiro[2], V. Mendes[4], R. Vianna[4], D. A. Secco[4], L.C. Porto[4], S. V. Alves-Leob[5], C.O. Brandão[6], E. Mignot[7], B. Dias[7], J. Zhang[7], T. Felix[8]
[1]Rio de Janeiro State University/ Pedro Ernesto University Hospital, Neurology, Rio de Janeiro, Brazil, [2]Rio de Janeiro State University/ Pedro Ernesto University Hospital, Medical Genetics, Rio de Janeiro, Brazil, [3]ABRANHI, Rio de Janeiro, Brazil, [4]Rio de Janeiro State University/ Policlinica Piquet Carneiro, HLA Lab, Rio de Janeiro, Brazil, [5]Rio de Janeiro Federal University, Neurology, Rio de Janeiro, Brazil, [6]Neurolife, Rio de Janeiro, Brazil, [7]Standford University, Sleep Medicine, Palo Alto, United States, [8]UFRGS/ Hospital das Clínicas de Porto Alegre, Porto Alegre, Brazil

Introduction: RARAS is a research project granted by CNPq and the Ministry of Health to survey the frequency, clinical features, diagnostic, therapeutic resources, and costs related to individuals with rare diseases (RD) of genetic and non-genetic origin. It is a multicenter project, currently being carried out in 40 centers spread across all regions of Brazil, with the coordination of Hospital das Clínicas de Porto Alegre of the Federal University of Rio Grande do Sul. Pedro Ernesto University Hospital of Rio de Janeiro State University (HUPE-UERJ) is one of the participating centers.

Materials and methods: Data on patients with Narcolepsy and Idiopathic Hypersomnia (IH) treated at the first outpatient clinic specialized in primary hypersomnia of the state of Rio de Janeiro, inaugurated in January 2022, are being included in this register by the Medical Genetics team of HUPE-UERJ. ABRANHI has also mapped patients across Brazil who have spontaneously sought the association via the internet, identifying themselves with the symptoms of the disease. They were included in the census after an interview and observation that they were suspected or confirmed narcolepsy or IH by a doctor. In this work, we show the results of the RARAS database from September 2020 to December 2022. RARAS uses the term "Narcolepsy with Cataplexy," a nomenclature based on ICD-10. For this reason, primary hypersomnia patients (type 1 and 2 narcoleptic and IH individuals) were grouped under this term, which, although inappropriate, serves as a first mapping given the similarity of these conditions. These data were compared with the census made by ABRANHI.

Results: Of 12.497 patients on the RARAS database, only 12 (0,1%) were " Narcolepsy with Cataplexy." Of them, 11 (91,6%) were included by HUPE-UERJ. Among the 366 rare disease´individuals included by HUPE-UERJ, narcoleptic patients corresponded to 3%. After that, HUPE-UERJ made more 39 primary hypersomnia diagnoses (29 with narcolepsy and 10 with IH), which will be included soon in the RARAS database. The mapping carried out by ABRANHI showed 198 patients. Of these, 176 started medical follow-up and are already being treated as primary hypersomnia, while 22 are still waiting for a consult or tests to clarify the diagnosis. Region "Sudeste", the richest in Brazil, concentrates the majority of cases reported.

Conclusions: RARAS project is an unprecedented initiative that has been helping to build a standardized database with information on RD in Brazil. This will be important for directing resources and optimizing access, enabling public policies for this population. Narcolepsy data is still scarce. A comparison with data obtained by ABRANHI shows a discrepancy between official statistics and reality. This is due to underreporting and underdiagnosis of the disease throughout Brazil. The existence of the recently inaugurated Hypersomnia Research Center at HUPE-UERJ, which works in partnership with ABRANHI in a participatory medicine model associated with continuous supply to the RARAS database, has been an important source of data, helping rescue Narcolepsy and IH from the current invisibility for health managers. We encourage other Brazilian centers to contribute to this statistic.

Microglial activation in narcolepsy type 1

L. Barateau[1], A. Krache[2], S. Chenini[1], M. Lecendreux[3], D. Mariano-Goulart[4], I. Jaussent[5], S. Béziat[5], P. Payoux[2], Y. Dauvilliers[1]

[1]Institute for Neurosciences of Montpellier, University of Montpellier, INSERM, Sleep Disorders Center, National Reference Centre for Narcolepsy, Montpellier, France, [2]ToNIC, Toulouse NeuroImaging Center, UMR 1214, INSERM, Université Paul-Sabatier, Toulouse, France, [3]Pediatric Sleep Centre, Hospital Robert-Debré, Paris, France, [4]Department of Nuclear Medicine, University Hospital of Montpellier, Montpellier, France, [5]Institute for Neurosciences of Montpellier, Montpellier, France

Introduction: To determine whether patients with type 1 narcolepsy (NT1) have microglial activation assessed by [18F]DPA-714 PET compared to controls, and to study the links between microglial activation in the hypothalamus and other brain regions, duration of evolution of the disease, and cerebrospinal fluid orexin levels.

Materials and Methods: 41 NT1 patients with recent evolution of the disease and 35 controls (non-sleepy and healthy subjects) from two different populations underwent [18F]DPA-714 PET evaluations, a radiolabeled ligand specific to the 18kDa Translocator Protein (TSPO). The genotyping of the TSPO transporter polymorphism determined the subject's receptor affinity: low/mixed/high. Images were processed on PMOD, using Standard Uptake Value (SUV) on hypothalamus, frontal, thalamic, cerebellar, and whole brain regions. SUV ratios (SUVr) were obtained by normalizing the cortical SUV with the mean uptake in a reference region.

Results: The mean duration since first cataplexy in NT1 was 26 ± 21 months (50% with less than 2 years of evolution). Three patients and one control with low TSPO affinity, and two other controls with technical imaging issues were excluded. In the NT1 group, 25 patients were high TSPO binders, 13 were mixed, and in the control group, 16 were high binders and 16 were mixed. No difference in SUVr of [18F]DPA-714 were found in hypothalamus, frontal, thalamic, and whole brain between patients and controls after adjusting for TSPO affinity.

Conclusions: Our findings indicate the absence of *in vivo* microglial activation in NT1 compared to controls, casting doubt on the involvement of neuroinflammation as a mechanism in the destruction of orexin neurons and thereby challenging this widely held hypothesis.

Acknowledgements: We thank all study participants: patients and their families, and the French Association of Narcoleptic patients (ANC).

Modeling distributional characteristic of sleep fragmentation in narcolepsy and obstructive sleep apnea

V. Zipunnikov[1], P. Guha[1], A. Cai[2], B. Tracey[2], M. Vilela[2], K. Maski[3], E. Mignot[4], L. Barateau[5,6,7], Y. Dauvilliers[5,6,7], D. Volfson[2]
[1]Johns Hopkins University, Department of Biostatistics, Baltimore, United States, [2]Takeda Development Center Americas, Inc., Cambridge, United States, [3]Boston Children's Hospital, Department of Neurology, Boston, United States, [4]Stanford Center for Sleep Sciences and Medicine, Redwood City, United States, [5]Sleep-Wake Disorders Center, Department of Neurology, Gui-de-Chauliac Hospital, CHU Montpellier, Montpellier, France, [6]National Reference Network for Narcolepsy, Montpellier, France, [7]Institute for Neurosciences of Montpellier (INM), INSERM, University of Montpellier, Montpellier, France

Introduction: Sleep fragmentation is observed in multiple sleep disorders including Narcolepsy and Obstructive Sleep Apnea (OSA). In narcolepsy type 1 (NT1), sleep fragmentation shows frequent transitions, resulting in changes of duration and frequency of contiguous sleep and wake stage bouts. Such characteristics were shown to be unique to NT1 compared to other central hypersomnolence disorders using survival curves and Cox proportional hazard regression to model bout durations cross-sectionally (Maski, et al., 2021). Here, we generalize this approach and develop *subject-level distributions of bout durations* that can be used in longitudinal modeling to assess sleep fragmentation in any sleep disorder. We illustrate the proposed approach and its added clinical utility in cohorts of patients with NT1 and OSA compared to patients with other sleep disorders.

Materials and methods: The Montpellier study included 137 adult patients with NT1 and 76 adult controls from a French National Reference Center for Narcolepsy. The Stanford Technology Analytics and Genomics in Sleep Study (STAGES; Zhang, et al., 2018) included 1254 study participants who had undergone sleep testing for any sleep disorder; 413 with moderate to severe OSA (AHI >14/hr) vs 841 with AHI ≤14/hr. Total time spent in each sleep stage (N1, N2, N3, REM) and Wake were used in logistic scalar regression. Three distributional representations of bout durations utilizing total-time-on-test, quantile, and hazard functions were used in scalar-on-distribution logistic regression models. The models were applied to discriminate NT1 and clinical controls in the Montpellier study, and to discriminate between the normal vs sleep apnea AHI group in the STAGES study. Performance was quantified via 5-fold cross-validated Area Under the Curve (cvAUC) with 100 random repetitions.

Results: In the Montpellier study, performance to discriminate between NT1 and control groups increased from a cvAUC of 0.57 based on total time in N2 to 0.66 when based on distribution of N2 bout durations. Similarly, performance cvAUC increased from 0.67 based on total time in Wake to 0.78 when based on distribution of wake bout durations. In the STAGES study, performance to discriminate between sleep apnea and normal AHI cohorts increased from cvAUC 0.58 based on total time in Wake to 0.64 when based on distribution of Wake bout durations, and from 0.58 based on total time in N2 to 0.64 when based on distribution of N2 bout durations.

Conclusions: The use of distributional information may serve as a novel marker of sleep fragmentation by more accurately characterizing N2 sleep and wake consolidation. In our two studies, inclusion of distributional information significantly improved discriminatory power in identifying sleep patterns in NT1 and moderate/severe OSA from other sleep disorders. This work may facilitate further development of more sensitive clinical endpoints based on sleep fragmentation and modeling these endpoints in longitudinal clinical trials.

Multiscale modeling of nocturnal polysomnography for improved detection of narcolepsy type 1

A. Neergaard Zahid[1], M. Olsen[2], R. Retnam[3], L. Lin[4], H. Yan[4], C. Zhao[5], B. Tracey[3], D.L. Buhl[6], D. Volfson[7], E. Mignot[8]
[1]Stanford-Takeda Post-Doctoral Program, Stanford University, (at the time of the study, shared first author), Palo Alto, United States, [2]Takeda Development Center Americas, Inc., (shared first author), Cambridge, United States, [3]Takeda Development Center Americas, Inc., Cambridge, United States, [4]Stanford Center for Sleep Sciences and Medicine, Palo Alto, United States, [5]German Research Center for Environmental Health, Institute of Neurogenomics, Neuherberg, Germany, [6]Takeda Development Center Americas, Inc., (at the time of the study), Cambridge, United States, [7]Takeda Development Center Americas, Inc., (shared last author), Cambridge, United States, [8]Stanford Center for Sleep Sciences and Medicine, (shared last author), Palo Alto, United States

Introduction: Narcolepsy type 1 (NT1) is a central disorder of hypersomnolence caused by loss of orexin/hypocretin peptides that can have a delayed diagnosis of up to 15 years. Current diagnostic criteria require demonstrating low cerebrospinal fluid Orexin-A/hypocretin-1 or either >2 sleep onset REM periods (SOREMPs) on a multiple sleep latency test (MSLT) or >1 SOREMP on a full-night polysomnography (PSG) and >1 SOREMP on MSLT the following day. Sleep stages are scored in 30sec intervals, mandated by guidelines for historical reasons, but this may restrict in-depth analysis of underlying neurophysiological dynamics existing at higher or lower resolutions. Here, we investigate variable-resolution sleep staging as a high-performing diagnostic tool under the hypothesis that informative characteristics of sleep operate at different characteristic time-scales smaller or larger than 30sec, and that these characteristics can be used to enhance identification of NT1.

Materials and methods: We trained a custom U-Sleep implementation for variable-resolution sleep staging using central electroencephalogram (EEG), left/right electrooculogram (EOG) and chin electromyogram (EMG) from ~19,000 PSG recordings obtained through the National Sleep Research Resource and Stanford Sleep Clinic. Sleep stages were evaluated for a discrete set of resolutions ranging from 0.25 to 7200sec. For each resolution, hypnodensity, hypnogram, and multi-step probabilistic transition matrix features were extracted from 1360 subjects across 7 countries. A Gaussian process model trained on 892 PSGs classified NT1 (n=410) and clinical controls (n=482) in a repeated 5-fold cross-validation setup and was tested in a hold-out sample of 486 PSGs, ensuring balanced representation by diagnosis without age matching. Prediction probabilities were calculated using a resolution ensemble, weighted by prediction uncertainty and accuracy. A multi-information model incorporating HLA DQB1*06:02 typing was produced, optimizing the threshold for diagnosis within each HLA typing. HLA- and HLA+ typing groups contain 99.1% and 19.1% controls, respectively. Performance is reported using mean±SD [95% CI] for area under the receiver operator curve (AUC) and sensitivity/specificity metrics computed on the hold-out sample.

Results: The best performance was achieved at medium frequencies (15sec resolution) with an AUC of 0.991±0.004 [0.983-0.997]. Lower performance was observed for higher and lower resolutions, with the lowest AUC of 0.967±0.008 [0.951-0.981] at 7200sec resolution. Combining predictions from individual resolutions improved performance, resulting in an ensemble AUC of 0.992±0.003 [0.985-0.997], with sensitivity/specificity of 0.962±0.013 [0.935-0.983]/0.957±0.013 [0.930-0.982] (9 false negatives [FN], 10 false positives [FP]). Stratification by HLA typing further increased performance, yielding a sensitivity/specificity of 0.966±0.012 [0.942-0.987]/0.974±0.010 [0.952-0.992] (FN=8, FP=6). Perfect separation with a sensitivity/specificity of 1.000±0.000 was achieved in HLA- subjects, and a sensitivity/specificity of 0.961±0.013 [0.934-0.983]/0.892±0.044 [0.797-0.979] was achieved for HLA+ subjects

Conclusions: NT1 exhibits discriminating features at several characteristic timescales that can be exploited by predictive models. Further stratification by HLA status augments predictive performance by increasing sensitivity and specificity. Future iterations of the model will investigate additional genetic markers beyond HLA DQB1*06:02 status derived from genome-wide association studies.

NARCAPA: Benefits of physical activity in children with narcolepsy

L. Brunel[1,2], E. Brossaud[1,2], J. Lioret[1,2], A. Jaffiol[3], L. Vanderghote[4], L. Cuisinier[4], L. Peter-Derex[1,3], F. Ricordeau[3], M. Thieux[1,2], A. Guyon[1,2], P. Franco[1,2]
[1]Lyon Neuroscience Research Center (CRNL), University Lyon 1, Lyon, France, [2]Pediatric Sleep Unit and National Reference Center for Narcolepsy, Mother-Children's Hospital, Hospices Civils de Lyon, Bron, France, [3]Center for Sleep Medicine and Respiratory Disease, Croix-Rousse Hospital, Hospices Civils de Lyon, Lyon, France, [4]Mother-Children's Hospital, Hospices Civils de Lyon, Bron, France

Introduction: Narcolepsy cataplexy (NC) is associated with many symptoms including excessive daytime sleepiness (EDS), cataplexy, disturbed nighttime sleep…, and comorbidities like obesity, attention deficit hyperactivity disorder, and depression. Pharmacological treatments are only partially effective. Therefore, behavioral treatments are recommended to help manage symptoms and comorbidities: among other advice, sleep specialists suggest physical activity (PA). This study aimed (i) to evaluate the association between PA habits and NC symptoms and comorbidities in children, and (ii) to test the effects of a PA intervention in a pediatric NC population on NC symptoms and comorbidities.

Materials and Methods: Thirty-one NC patients aged 8 – 18 years (90% HLA positive; 96% cataplexy; median age 15.5 years) were included in the "NARCAPA" study. They benefited from an adapted PA (APA) program proposed in several units of the Mother-Children's Hospital of the Hospices Civils de Lyon, France ("e-Hop" project).

An interview with an APA specialist allowed to collect self-reported information (leisure physical activities and screen time) and to personalize a four-week PA intervention. NC symptoms and comorbidities were assessed before and after the APA intervention through questionnaires (Epworth, Narcolepsy Severity Scale, Insomnia Severity Index, Children's Depression Inventory, Conners, *Vécu et Santé Perçue*) during a medical examination. PA was objectively measured by actigraphy (ActiGraph wGT3X-BT) at waist throughout the whole study for a subgroup of 21 patients.

Before the intervention, we compared PA levels of our sample to a reference population in the same age range and to international recommendations. We then searched for associations between PA and clinical data prior to the intervention using Spearman correlations. We evaluated the effects of our intervention on PA and clinical data using regression models and paired Wilcoxon tests. Finally, we compared clinical profiles of responsive vs non-responsive patients using unpaired Wilcoxon tests.

Results: Our observations of symptoms and comorbidities were in line with previous reports in pediatric NC: 36% obesity, 21% insomnia, 28% depression and 10% hyperactivity. Daily duration of moderate-to-vigorous PA revealed that most patients (64%) had higher PA levels compared to normative data, and PA levels met the World Health Organization (WHO) pediatric recommendations for 50%. Objective and subjective data revealed higher activity on school days compared to days off. Patients engaged in leisure-time PA showed a higher quality of life score at the VSP (*Vécu et Santé Perçue*). Objectively measured PA levels increased during the intervention ($p < 0.001$) but was not related to any significant changes in the symptoms and comorbidities. Individual evolution of PA was positive for 48% of the sample. Among them, the proportion of patients whose PA level met the WHO recommendations increased from 30% before to 80% during the intervention.

Conclusions: Despite their EDS, young NC patients can be physically active. For less active patients, PA level is susceptible to increase *via* an APA program. Future interventions should rely on longer programs to aim for long-term and significant improvements of NC symptoms and comorbidities.

Path to diagnosis and impact of narcolepsy on quality of life: a survey of people living with narcolepsy

L.E. Ortiz[1], A.M. Morse[2], L. Krahn[3], M. Lavender[4], M. Horsnell[5], D. Cronin[6], B. Schneider[6], J. Gudeman[7]

[1]Johns Hopkins All Children's Hospital, St. Petersburg, United States, [2]Geisinger Commonwealth School of Medicine, Geisinger Medical Center, Janet Weis Children's Hospital, Danville, United States, [3]Mayo Clinic, Phoenix, United States, [4]Comprehensive Sleep Medicine Associates, Houston, United States, [5]Patient Author, Project Sleep's Rising Voices of Narcolepsy, Los Angeles, United States, [6]MyHealthTeam, San Francisco, United States, [7]Avadel Pharmaceuticals, Chesterfield, United States

Introduction: Research was undertaken to better understand the path to a narcolepsy diagnosis, common symptoms, and the impact of narcolepsy on work, social interactions, and mental health.

Materials and methods: In February 2022, an email invitation to an online, 27-question survey was sent to US members of MyNarcolepsyTeam, a social network of >10,100 members.

Results: In total, 110 members completed the survey. 38% of respondents started to experience symptoms before reaching 16 years of age. Most commonly experienced symptoms included excessive daytime sleepiness (EDS; 93%) and fatigue (84%). In total, 72% were also experiencing some form of sleep disturbance and 67% were already suffering from cognitive/memory challenges. 68% who were eventually diagnosed with narcolepsy type 1 (NT1) had cataplexy attacks. For 31%, getting to a narcolepsy diagnosis took ≥10 years. In fact, 64% were initially under- or misdiagnosed with something other than narcolepsy, including depression (73%), sleep apnea (36%), or attention-deficit/hyperactivity disorder (16%). 74% of patients with NT1 have continued to experience cataplexy, with 46% having some form of a cataplexy episode a few times per week. Cataplexy episodes were triggered by a wide range of emotional situations, including over-tiredness (70%), anger (48%), being startled (46%), laughter (46%), fear (44%), excitement (38%), or crying (33%). 76% of respondents indicated that the impact of narcolepsy on daily life is extremely or very severe. The far-reaching impact on quality of life was evident in that most respondents reported that narcolepsy interfered with work (82%), social life (86%), everyday chores (85%), and exercise (85%) and has limited career options (76%). The emotional toll of narcolepsy manifested in feeling isolated (83%), depressed (81%), anxious (80%), or embarrassed (75%).

Conclusions: Patients routinely experienced a misdiagnosis or a "missed" diagnosis based on common symptoms experienced. Being able to quickly identify narcolepsy as the root cause for symptoms of EDS, fatigue, and sleep disturbances can lead to getting the patient on the best treatment path as early as possible. Understanding the physical, emotional, and quality-of-life impact of narcolepsy can help clinicians provide a more holistic approach to treating their patients.

Patient preferences and nocturnal experiences with oxybate therapy for narcolepsy: RESTORE study interim analysis

A. Roy[1], J. Harsh[2], A.O. Ajayi[3], T. Stern[4], J. Dubow[5], J. Gudeman[5]
[1]Ohio Sleep Medicine Institute, Dublin, United States, [2]Colorado Sleep Institute, Boulder, United States, [3]Florida Pediatric Research Institute, Winter Park, United States, [4]Advanced Respiratory and Sleep Medicine, PLLC, Huntersville, United States, [5]Avadel Pharmaceuticals, Chesterfield, United States

Introduction: Sodium oxybate (SXB) is a standard-of-care treatment for adults with narcolepsy. First-generation, immediate-release (IR) oxybate formulations require patients to awaken for a second dose 2.5–4 hours after the first bedtime dose. Once-nightly SXB (ON-SXB; FT218; LUMRYZ™), an extended-release formulation of SXB, replaces this middle-of-the-night dosing with a once-at-bedtime regimen. RESTORE (NCT04451668) is an open-label/switch study evaluating the safety/tolerability of ON-SXB and patient preferences for ON-SXB or IR oxybate.
Materials and Methods: RESTORE includes participants aged ≥16 years with narcolepsy type 1 or 2 who completed the phase 3 REST-ON trial, were on stable-dose (≥1 month) IR oxybate, or were oxybate-naive. Initial doses for participants switching from IR oxybate are equivalent/closest to the previous total dose/night; incremental adjustments (1.5 g/week; maximum, 9 g/night) are allowed. A nocturnal adverse event (AE) questionnaire about switch participants' IR oxybate experience in the previous 3 months was completed at baseline. Switch participants completed the preference questionnaire after 3 months of ON-SXB treatment.
Results: Data available from preference questionnaires (n=98) and nocturnal AE questionnaires (n=130) were analyzed at the interim data cutoff (06 March 2023). Most common treatment-related AEs thus far were nausea, somnolence, enuresis, headache, dizziness, and somnambulism. The once-nightly dosing regimen was preferred by 93.9% (92/98) of participants. In the previous 3 months, the second nightly IR oxybate dose was unintentionally missed by 84 (65.1%) switch participants and/or was intentionally missed by 26 (20.1%); 80.0% (72/90) who intentionally and/or unintentionally missed the second dose felt worse the next day. Participants who took their second nightly IR oxybate dose >4 h after the first dose (n=51 [39.5%]) reported being somewhat, quite a bit, or extremely groggy/unsteady the next morning (26/51 [51.0%]). Inconvenience of the second dose was reported by 71.3%. Other issues related to the second dose were anxiety (30.2%) and the need to be woken by someone else (23.3%). In the past 3 months, 120 participants (93.0%) arose from bed after waking to take the second dose; 9 of these participants reported having fallen, with 5 reporting injuries.
Conclusions: These interim RESTORE data show that 94% of patients switching from twice-nightly IR oxybate have stated a preference for the ON-SXB dosing regimen. Among participants who switched from twice-nightly IR oxybate, a high proportion had difficulty with either taking the second oxybate dose at all or taking it at the right time, which led to feeling worse than usual and/or groggy the next day. ON-SXB, the only once-at-bedtime oxybate, provides a major advancement in patient care and may ease treatment burdens associated with the second nightly IR oxybate dose.

Preliminary results from a Phase 1 study of ALKS 2680, an orexin-2 receptor agonist, in healthy participants and patients with narcolepsy or idiopathic hypersomnia

B. Yee[1,2], J. Chapman[1], R. Grunstein[1,2], C. Argent[3], A. D'Rozario[1], C. Hopkinson[4], J. Ramos[4], I. Landry[4], S. Yagoda[4], B. Rege[4]
[1]Woolcock Institute of Medical Research, Sydney, Australia, [2]Royal Prince Alfred Hospital, Camperdown, Australia, [3]Scientia Clinical Research, Ltd., Randwick, Australia, [4]Alkermes, Inc., Waltham, United States

Introduction: Narcolepsy is a sleep disorder associated with a loss of orexin-producing neurons and an associated decrease in orexin peptide signaling. ALKS 2680 is a potent, brain-penetrant, oral, small molecule and highly selective orexin 2 receptor agonist being developed for the treatment of narcolepsy and other disorders characterized by excessive daytime sleepiness. ALKS 2680 has been shown to promote wakefulness in wild-type rats and in a narcolepsy mouse model. We report preliminary results from the first-in-human study of ALKS 2680.

Materials and methods: This randomized, double-blind, phase 1 study is being conducted at two sites in Australia to assess the safety, tolerability, pharmacokinetics, and pharmacodynamics of ALKS 2680. Consenting healthy participants received single or multiple doses of ALKS 2680 or matching placebo. The single-dose escalation (n=48) included 6 active dose levels; multiple-dose escalation (n=32) has thus far included 4 active dose levels administered once daily for 10 days. Safety assessments included adverse events (AEs), vital signs, clinical laboratory testing of blood and urine, and ECG. Plasma and urine samples were collected for pharmacokinetic analysis. Patients with narcolepsy type 1 (NT1) and type 2 (NT2) or with idiopathic hypersomnia (IH; up to 8 patients for each indication) are also being studied, receiving single doses of ALKS 2680 or matching placebo in a 4-way crossover design that includes 3 active dose levels. In addition to safety assessments, pharmacodynamic assessment in these patients will include the Maintenance of Wakefulness Test, Karolinska Sleepiness Scale, and quantitative electroencephalography (qEEG). Sleep and cataplexy episodes were tracked through patient diaries.

Results: In healthy participants, ALKS 2680 was orally absorbed and showed biphasic distribution/elimination, with a terminal half-life suitable for maintaining daytime wakefulness with once-daily administration. Plasma drug exposure increased proportionally with dose. Preliminary analysis of qEEG data suggests central activity consistent with the mechanism of action. There were no safety signals identified in vital signs, safety laboratory tests, or ECGs at any dose level. There were no serious or severe adverse events. Adverse events observed in more than 1 participant and deemed related to study drug included, in single-dose escalation: dizziness, pollakiuria, nausea and blurred vision; in multiple-dose escalation: insomnia, dizziness, pollakiuria, and visual disturbance (described as blurred or distorted vision, increased light sensitivity). Most of these events were mild, observed at the higher doses, transient, and resolved without medical intervention or treatment interruption. One participant in MAD discontinued study drug after the first dose due to non-serious, non-severe adverse events that resolved without treatment.

Conclusions: The orexin 2 receptor agonist ALKS 2680 is orally bioavailable and, based on preliminary data from healthy participants in a phase 1 study, appears to be centrally active and generally well tolerated with a pharmacokinetic profile suitable for once-daily administration to promote daytime wakefulness in the treatment of narcolepsy and other disorders characterized by excessive daytime sleepiness. The effects of ALKS 2680 in patients with NT1, NT2, and IH will be evaluated, and data from the first cohort of 4 NT1 patients will be presented.

Safety, tolerability, pharmacodynamics, and pharmacokinetics of oral TAK-861 in an acute sleep phase delay paradigm in healthy male subjects

M. Naylor[1], R. Neuwirth[1], A. Abraham[1], T. Olsson[1]
[1]Takeda Development Center Americas, Inc., Lexington, United States

Introduction: Narcolepsy, a rare, chronic neurological disorder of central hypersomnolence, is characterized most prominently by excessive daytime sleepiness (EDS) and can be associated with loss or absence of orexin neuropeptides. Orexin-selective agonists that target the orexin-type 2 receptor (OX2R) have been shown to increase wakefulness in healthy individuals and in patients with narcolepsy. This study assessed the safety, tolerability, pharmacodynamics, and pharmacokinetics of TAK-861, an orally available, highly selective OX2R agonist, in healthy adult males kept awake overnight.

Materials and Methods: This was a phase 1, randomized, double-blind, placebo-controlled, 3-period cross-over study in healthy sleep deprived adult males aged 18-40 years. Subjects were randomized to receive TAK-861 high-dose (HD; 30 mg followed by 10 mg), TAK-861 low-dose (LD; 15 mg followed by 5 mg), and placebo (P). Unequal TAK-861 doses were administered 4 hours apart at 11pm and 3am. Subjects were required to stay awake during each treatment period from before dosing on Day 1 until completion of the assessments ~10 hours after the first dose. A minimum of 7 days between treatment periods was required to ensure appropriate washout of study drug and normalization of sleep-wake cycles. Safety was assessed throughout the study. Pharmacokinetic and pharmacodynamic parameters were assessed up to ~10 hours after the first dose in each treatment period. Sleepiness was assessed with the maintenance of wakefulness test (MWT; at predose and 2, 4, 6 and 8 hours post-first dose) and Karolinska sleepiness scale (KSS; at predose and after each MWT session).

Results: Eleven subjects were randomized to one of three treatment sequences: LD-P-HD (n=4), HD-LD-P (n=4) or P-HD-LD (n=3). Ten (90.9%) completed all planned doses; one subject in the HD-LD-P group withdrew consent from the study after the first treatment period. Overall, 6 (54.5%) subjects reported 10 treatment-emergent adverse events (TEAEs) during the study, all with TAK-861; 9 were considered by investigators to be mild in severity and 1 (increased blood creatine phosphokinase, unrelated to study drug [TAK-861 LD]) was moderate. No deaths, serious TEAEs, TEAEs leading to discontinuation, or severe TEAEs were reported. The most common TEAE was micturition urgency, reported by 3 (27.3%) subjects on TAK-861 HD. For both TAK-861 HD and LD regimens, mean plasma concentrations peaked 3-5.5 hours after the first dose and steadily declined thereafter. Systemic drug exposures increased approximately proportionally with dose. Both HD and LD TAK-861 regimens significantly improved measures of sleepiness. LS mean (95%CI) differences from placebo in MWT mean sleep latency were 17.8 (12.2, 23.5) minutes and 19.1 (13.6, 24.6) minutes for TAK-861 LD and HD, respectively (p<0.0001 for both), and LS mean (95%CI) differences from placebo in change in KSS score were -2.65 (-4.58, -0.72; p=0.0088) and -4.40 (-6.29, -2.52; p<0.0001) for TAK-861 LD and HD, respectively. Most subjects reached the maximum MWT sleep latency of 40min with TAK-861.

Conclusions: HD and LD TAK-861 demonstrated significant and dose-dependent improvements in measures of wakefulness compared with placebo, with no serious or severe adverse events.

Sodium oxybate treatment patterns in narcolepsy patients: a propensity score–matched cohort study subanalysis

L. Krahn[1], M.C. Lipford[2], G. Pal Singh[3], S. Asfahan[3], J.L. Moore[2], M. Tippmann-Peikert[2], P. Kumar-M[3], W. Ip[4], S. Awasthi[4], J. Gudeman[5]
[1]Mayo Clinic, Phoenix, United States, [2]Mayo Clinic, Rochester, United States, [3]Nference Labs, Bengaluru, India, [4]Nference, Cambridge, United States, [5]Avadel Pharmaceuticals, Chesterfield, United States

Introduction: Sodium oxybate (SXB) is strongly recommended for treatment of narcolepsy. Treatment adherence may be suboptimal with immediate-release oxybates as patients are required to awaken for a second dose 2.5–4 hours after the bedtime dose to cover a full night of sleep. Understanding the reasons patients discontinue treatment with twice-nightly SXB using real-world data is important for helping optimize narcolepsy management. This study characterized SXB treatment patterns and discontinuation in narcolepsy patients.

Materials and methods: An electronic health record (EHR)-based search identified first-time Mayo Clinic patients from 1975–2020 with ≥1 narcolepsy-specific *ICD-9/-10* code and ≥1 diagnostic mention of narcolepsy in clinical notes (identified using a natural-language-processing [NLP] algorithm). NLP was used to identify SXB non-use events (ie, reasons for SXB therapy not being continued or taken as directed) with manual chart reviews performed to characterize reasons for discontinuation, switching, or missing the second dose and effects of missing the second dose.

Results: Among the 351 patients with narcolepsy prescribed SXB (mean age at first diagnosis code observed at Mayo Clinic, 32 y [IQR: 23.2–46.1]; 65.5% female; 92.3% white), 113 (32.2%) had clinical notes indicating discontinuation of SXB, with 71 (20.2%) including reasons for discontinuation. The most common reasons for discontinuation (n≥5) included lack of efficacy (n=11), side effects (n=10), gastrointestinal side effects (n=10), lack of access (insurance/cost, n=10), neurological side effects (n=9), psychiatric side effects (n=8), and resolution/absence of cataplexy (n=5). Mentions of switching from SXB to other drugs (n=12 patients) included switching to stimulants (mixed amphetamine salts, n=3; dextroamphetamine, n=2; methylphenidate, n=1), sedative hypnotics (zolpidem, n=2), antidepressants (mirtazapine, n=1), and wake-promoting agents (solriamfetol, n=1). Of the 38 patients (10.8%) with mentions of missing the second nightly SXB dose, reasons were recorded for 24 (63.2%), including inability to wake up (n=14), forgetting the second dose (n=3), and having to wake up early the following day (n=3). Consequences of missing the second dose were recorded for a small subset (increased cataplexy, n=4; lower daytime alertness, n=3; awakens earlier, n=1; tiredness, n=1).

Conclusions: Limited data are available regarding real-world use of SXB. This novel study used a combination of NLP algorithm and manual chart review to identify difficulties patients have with the second, middle-of-the night immediate-release oxybate dose and patient-experienced consequences of not adhering to the prescribed dosing regimen. Of the therapeutic alternatives prescribed following SXB discontinuation, few were recommended in European guidelines or guidelines from the American Academy of Sleep Medicine for pharmacological treatment of EDS and/or cataplexy indicating potential opportunities for optimizing pharmacotherapeutic management of patients with narcolepsy.

Surface-based morphometry and neurodevelopment in type 1 narcolepsy patients

M. Wang[1], S. Yue[1], S. Wu[1], Z. Feng[1], X. Liu[1], B. Li[1], H. Wang[1], F. Xiao[1], X. Dong[1], F. Han[1]
[1]Peking University People's Hospital, Beijing, China

Introduction: Morphological changes in the cortex of narcolepsy patients were investigated by surface-based morphometry analysis in this study.

Materials and Methods: Fifty-one type 1 narcolepsy patients and sixty demographically group-matched healthy controls provided resting-state functional and high-resolution 3T anatomical magnetic resonance imaging scans. Vertex-level cortical thickness, gyrification and voxel-wise functional connectivity were calculated.

Results: Adolescent narcolepsy patients showed decreased cortical thickness (CT) in bilateral superior frontal gyrus, left precuneus, right middle and right superior frontal gyrus. Adolescent narcolepsy demonstrated increased local gyrification index (LGI) in left occipital lobe, left precuneus and right fusiform but decreased LGI in left postcentral gyrus. Whilst, adult narcolepsy exhibited increased gyrification in left temporal lobe and right frontal cortex. Regional findings of increased LGI overlapped with their areas showing reduced CT in left precuneus in narcolepsy adolescents. In narcolepsy adolescents, ESS was negatively correlated with CT in left precuneus. While a positive correlation was found between left superior frontal CT and sleep latency. In narcolepsy adults, sleep latency was negatively correlated with LGI in left lateral occipital. Narcolepsy adolescents with short sleep latency showed increased gyrification in right postcentral gyrus compared to those who had long sleep latency. Narcolepsy adolescents with hallucination showed widely decreased gyrification in bilateral frontal and occipital lobes compared with others without hallucination. Compared with healthy controls, narcolepsy adolescents demonstrated reduced lingual gyrus-supplementary motor area (SMA) connectivity within left hemisphere and reduced fusiform-precentral gyrus connectivity within right hemisphere. The left lingual-SMA connectivity negatively correlated with left lingual gyrification and the right fusiform-precentral gyrus connectivity negatively correlated with right fusiform gyrification in narcolepsy adolescents. In the adult subjects, compared with healthy controls, narcolepsy adults showed reduced left inferior temporal-precentral gyrus connectivity, while such connectivity pattern was negatively associated with left inferior temporal gyrification in narcolepsy adults. Significant decrease in gyrification was observed in adolescence onset-age cases compared with adult onset-age cases in a wide range of regions, including: bilateral postcentral gyrus and left precuneus, paracentral lobule, middle frontal gyrus and right cuneus, superior parietal gyrus, inferior temporal gyrus. All the participants were divided into four groups according to diagnosis (narcolepsy versus control) and chronological age (adolescents versus adults). A significant diagnosis-by-age interaction on gyrification changes with aging was observed in left superior-parietal gyrus, left cuneus lobe, left rostral anterior-cingulate gyrus and right medial-orbitofrontal gyrus. Narcolepsy augmented age-related gyrification reductions in adolescents within these four regions, whereas narcolepsy attenuated age-related gyrification reductions in adults within these four regions

Conclusions: The present study contributes to the existing literatures by demonstrating decreased cortical thickness in adolescent narcolepsy and increased gyrification in narcolepsy compared with healthy controls. Furthermore, findings showed that the increased gyrification was associated with reduced long-range functional connectivity. Altered right postcentral gyrification was associated with objective sleepiness and disrupted frontal and occipital gyrification was involved in hallucination in adolescent narcolepsy. The impact of narcolepsy on brain development could remain from adolescence to adulthood and it was especially exacerbated in adolescence, which may partially relate to their cognitive and behavioral problems.

Symptoms of dysautonomia and REM sleep behavior disorder in patients with narcolepsy

G. de Martin Truzzi[1], M.F. Naufel[1], R.M.d.C. Cremaschi[2], S. Tufik[1], F. Morgadinho Santos Coelho[1]
[1]Universidade Federal de São Paulo, Departamento de Psicobiologia, São Paulo, Brazil,
[2]Universidade Federal de São Paulo, Departamento de Neurologia, São Paulo, Brazil

Introduction: Patients with narcolepsy may experience excessive daytime sleepiness, cataplexy, sleep paralysis, hypnagogic and hypnopompic hallucinations, and sleep fragmentation. In addition to sleep-related symptoms, the disease is related to other findings, such as symptoms related to dysautonomia and REM sleep behavior disorder (RBD). In this study, we evaluated the presence of such additional findings in patients with narcolepsy.

Materials and methods: A study was carried out with patients diagnosed with narcolepsy. Changes in the autonomic nervous system and RBD were investigated through the application of questionnaires (Composite Autonomic Symptom Score-31 and REM Sleep Behavior Disorder Screening Questionnaire, respectively).

Results and conclusions: 29 participants previously diagnosed with narcolepsy were included in the study. The results obtained through the questionnaire that evaluated the burden of autonomic nervous system symptoms were high among patients both with and without hypocretin-1 deficiency, with no significant differences between them (dysautonomia questionnaire total result - hypocretin-1 deficient group: 26.6±16.46 versus normal hypocretin-1 group: 16.46±11.46; p=0.39). The REM Sleep Behavior Disorder Screening Questionnaire also showed high scores in both groups, with no significant differences between them (group with hypocretin-1 deficiency: 8.39±2.69 versus group with normal levels of hypocretin-1: 7.27±4.65; p=0.41). There was a relationship between the score obtained in the questionnaires that evaluated RBD and dysautonomia (r=0,57, p=0,001), showing that the alterations are prevalent in patients with narcolepsy, and should be recognized and treated in these individuals.

The effects of daylight duration on the multiple sleep latency test (MSLT) results

A. Packard[1], C.E. Barker[2]
[1]Larner College of Medicine, University of Vermont, Neurology, Burlington, United States, [2]University of Vermont Medical Center Sleep Laboratory, Neurology, Brulington, United States

Introduction: Multiple sleep latency test (MSLT), considered the diagnostic hallmark for hypersomnia/narcolepsy, has known concerns related to variability due to habitual sleep time, nighttime arousals, and medications intake, to name a few. Although light exposure is one of the main synchronizers of sleep and wakefulness, the effects of daylight duration on the MSLT results have not been examined before. City of Burlington, Vermont, USA experiences great variations in daylight duration, ranging from 15hrs 33min of daylight (DMAX) on June 21st to 8hrs 50 min of daylight (DMIN) on December 24th. In this study, we have performed retrospective comparative analysis of the MSLT results that were recorded during periods of short vs. periods of long daylight in the past 9 years at the Sleep Center of the University of Vermont Medical Center (UVMC), Burlington, VT, USA.

Materials and methods: UVMC Polysmith database has been mined for MSLT studies of interest completed during the past 9 years. Results of MSLTs carried out during the interval with the longest daylight period [DMAX-30min, DMAX] were analyzed and compared to the results of MSLTs carried during the interval with the shortest daylight period [DMIN, DMIN+30min]. Specifically, for each calendar year, MSLTs obtained during May 22nd-July 22nd, and November 22nd -January 19th were analyzed. Total of 68 studies were identified, of which three were excluded as overnight polysomnogram (PSG) demonstrated significant respiratory or limb movement disturbance felt to be causing daytime hypersomnia complaints. Total of 35 long daylight studies (LDS) and 30 short daylight studies (SDS) were further analyzed. Descriptive summaries were frequencies and percentages for categorical data and medians and quartiles for continuous variables. Groups of LDS and SDS results were compared using the non-parametric Wilcoxson's Rank Sum Tests, student T test, and Chi-Square test.

Results: Average daylight duration was 8hrs 57min ± 14min for SDS, and 15hrs 19min ± 14.7min for LDS. SDS and LDS did not significantly differ in terms of the age, gender and race of patients studied. Similarly, average total sleep time and sleep efficiency of the PSGs preceding MSLTs did not significantly differ for the two groups (451.96 ± 50.7min vs. 445.65 ± 48.5min, and 85.8 ± 7.6% vs. 85 ± 7.5%, respectively). There were no sleep onset REM (SOREM) episodes captured during overnight PSGs in both groups. Mean sleep onset latency (SOL) of the MSLT also did not significantly differ between the SDS and LDS groups (8.89 ± 4.6 min vs. 8.59 ± 5.3 min). However, MSLTs conducted during short daylight period had significantly more SOREM periods (50% vs 20%, chi^2 6.4931, p=.0108). Furthermore , narcolepsy defined stringently as MSLT with ≥2 SOREMS and SOL of ≤5 min was more frequently diagnosed during SDS, while hypersomnia defined stringently as MSLT with <2 SOREMS and MSOL of ≤5 min was more frequently diagnosed during LDS (chi^2 6.2715, p=.0434).

Conclusions: Our study suggests that duration of the daylight affects the MSLT results and has to be taken into account when interpreting MSLT studies, particularly in higher latitude sleep laboratories.

The lived experience of narcolepsy - from symptoms to stigma

A. Schokman[1,2], J. Cheung[1,2], A. Milton[1], D. Naehrig[1], N. Thornton[1], Y.S. Bin[1], K. Kairaitis[1,3], N. Glozier[1]

[1]University of Sydney, Faculty of Medicine and Health, Sydney, Australia, [2]The University of Sydney, Sleep Research Group, Charles Perkins Centre, Sydney, Australia, [3]The University of Sydney at Westmead Hospital, Department of Respiratory and Sleep Medicine, Westmead, Australia

Introduction: Narcolepsy is a rare and debilitating neurological sleep disorder that has an adverse impact on health-related quality of life, long-term disability, and absenteeism and is associated with poor socioeconomic and psychosocial outcomes. Much of the research exploring symptoms, impact and the illness experience comes from the perspective of healthcare professionals and researchers. It is rarely explored qualitatively from the perspective of someone living with narcolepsy. Understanding how persons with narcolepsy conceptualise and communicate their experiences is an important part of facilitating dialogue between healthcare professionals and their patients and ensuring healthcare needs and priorities are addressed.

Materials and methods: 127 self-reported persons with narcolepsy were recruited from an Australian narcolepsy support group. A short demographic survey was completed, with all agreeing to participate in a subsequent 1:1 semi-structured interview. Saturation was reached after 24 interviews (mean age = 33 years (SD 11) with 44% reporting cataplexy). A multidisciplinary team of researchers/clinicians analyzed interview transcripts using thematic analysis.

Results: Participants perceived physical fatigue, sleepiness, and two separate experiences of 'falling asleep/sleep attacks' as distinct symptoms rather than a multidimensional construct (i.e. excessive daytime sleepiness). We also identified two experiences of cataplexy, one triggered by acute emotion (e.g. laughter) and another by a stressor. Importantly, participants employed medical terminology in non-specific and interchangeable ways to describe their experience, which often differed from other participants and medical literature (e.g. describing a sleep attack but calling it a cataplexy attack). We found participants determined their narcolepsy to be 'well-managed' by the level of functional impairment rather than the frequency of any symptom. Almost all participants described frequently experiencing stigma across various life domains, including education, vocation and personal relationships. For the first time, we characterise the stigma experienced as primarily anticipated and internalised- or self-stigma that likely stems from the societal devaluation of sleep and the conflation of sleepiness with laziness.

Conclusions: Our findings suggest the symptom experience of narcolepsy is more heterogeneous than what is described in diagnostic manuals and the literature, where participants attributed their own meaning and experience to commonly used terminology (i.e. sleep attack). The discrepancy in terminology could affect patient-physician communication, with both parties utilising the same terminology to communicate different concepts. Further work is needed to bridge the gap between the healthcare needs of persons with narcolepsy and how they are perceived by healthcare professionals. This includes providing care that focuses on improving functional capacity and impairment rather than just treating symptoms. Having characterised the stigma experienced by PwN as both anticipated stigma and internalized or 'self- 'stigma, our findings present opportunities for future research exploring the impact and possible development of tailored interventions to reduce the substantial psychological comorbidity in persons with narcolepsy.

The safety, tolerability, pharmacodynamics, and pharmacokinetics of oral TAK-994 in sleep deprived healthy male subjects

T. Olsson[1], J. Padmanabhan[1], R. Neuwirth[1], H. Faessel[1], Y. Hang[1], M. Naylor[1]
[1]Takeda Development Center Americas, Inc., Lexington, United States

Introduction: Loss or absence of orexin neurons is associated with Narcolepsy type 1 (NT1), a chronic neurological disorder characterized by a pentad of symptoms, most prominently excessive daytime sleepiness (EDS) and cataplexy. Despite availability of treatment options, a significant unmet need exists as current treatments typically fail to fully resolve patients' symptoms. Addressing the underlying pathophysiology, orexin-selective agonists increase wakefulness and reduce cataplexy in patients with narcolepsy. This study assessed the safety, tolerability, pharmacodynamics, and pharmacokinetics of the selective, orally available orexin type-2 receptor agonist TAK-994 in healthy male subjects kept awake overnight.

Materials and Methods: In this randomized, double-blind, placebo-controlled, 3-period crossover study, healthy adult males aged 18-40 years were randomized to receive oral TAK-994 high-dose (HD; 270 mg followed by 130 mg), TAK-994 low-dose (LD; 130 mg followed by 70 mg), and placebo (P). Unequal TAK-994 doses were administered 4 hours apart at 11pm and 3am. A minimum of 7 days between treatment periods was required to ensure appropriate washout of study drug and normalization of sleep-wake cycles. Safety was assessed throughout the study. Pharmacokinetic and pharmacodynamic measures were assessed up to ~10 hours after the first dose in each treatment period. Sleepiness was assessed with the maintenance of wakefulness test (MWT; at predose and 2, 4, 6 and 8 hours post-first dose) and Karolinska sleepiness scale (KSS; at predose and after each MWT session).

Results: Nineteen subjects were randomized to one of three treatment sequences: LD-P-HD (n=6), HD-LD-P (n=7) and P-HD-LD (n=6); five withdrew consent and did not complete treatment. Treatment emergent adverse events (TEAEs) occurred in 1 (6.3%), 4 (25.0%) and 8 (47.1%) subjects while taking placebo, LD TAK-994 and HD TAK-994, respectively, all considered by investigators to be mild in severity. Urinary-related events were the most frequently reported TEAEs with TAK-994. There were no severe or serious TEAEs, no discontinuations due to TEAEs, and no clinically relevant abnormal laboratory values. For both HD and LD TAK-994 regimens, mean plasma concentrations peaked ~5.5 hours after the first dose and steadily declined over 16 hours. Systemic drug exposures increased approximately proportionally with dose. Both TAK-994 HD and LD regimens significantly increased MWT sleep onset latency (LS mean [95% CI] difference 24.8 [18.8,30.7] and 19.2 [13.2,25.2] min vs placebo; both $p<0.0001$) and significantly decreased KSS score (-4.35 [-5.8,-2.9] and -2.8 [-4.2,-1.3] vs placebo; both $p<0.001$). Most subjects reached the maximum MWT sleep latency of 40 min with TAK-994.

Conclusions: HD and LD TAK-994 demonstrated significant and dose-dependent improvements in objective and subjective measures of wakefulness compared with placebo with no severe or serious adverse events.*

*Clinical development of TAK-994 was discontinued due to associated hepatotoxicity in separate studies.

Toeing the line: exploring diagnostic uncertainty along the type 2 narcolepsy-idiopathic hypersomnia spectrum

C. Clark[1], A. Roy[1]
[1]Ohio Sleep Medicine Institute, Dublin, United States

Introduction: Narcolepsy type 2 (NT2) and idiopathic hypersomnia (IH) are disorders of hypersomnolence with many shared characteristics, making diagnosis often clinically challenging. Current guidelines per the International Classification of Sleep Disorders 3rd Edition (ICSD3) maintain strict cutoffs on sleep tests that preclude many from achieving an ICSD3-supported narcolepsy diagnosis. This leaves many borderline patients with a hazier diagnosis of IH, which can lead to insurance disputes, longer diagnostic workups, and clinical inaction, all of which confer negative health outcomes to patients. Clinicians at Ohio Sleep Medicine Institute (OSMI) use a modified diagnostic approach to holistically grant some patients a diagnosis of type 2 narcolepsy who would otherwise be classified as IH per ICSD3 criteria (hereafter termed OSMI-supported NT2s, or OSMI-NT2s). This project assesses key clinical similarities and differences between this novel group of OSMI-NT2s and the existing groups of ICSD3-supported narcolepsy patients (ICSD3-NT2s) and idiopathic hypersomnia patients (ICSD3-IH).

Materials and methods: After generating a list of all sleep-disordered patients at OSMI, we included 492 patients with documented narcolepsy or IH diagnoses and sleep tests performed within the last 15 years. Following retrospective chart review, each patient was classified as ICSD3-NT2 (n=184), OSMI-NT2 (n=254), or ICSD3-IH (n=54), and critical endpoint data such as sleep test, demographic, and medical history data were collected. Data analysis in R involved one-way analyses of variance, independent two-sample t tests, and chi square analyses.

Results: Upon analysis, the OSMI-NT2 group exhibited a longer mean sleep latency test (MSLT) score than the ICSD3-IH group (7.424 ± 3.89 vs 4.861 ± 2.03, $p<0.001$). The OSMI-NT2 group exhibited significantly higher amounts of sleep onset REM periods (SOREMPs) than ICSD3-IH patients (0.813 ± 0.97 vs 0.074 ± 0.26, $p<0.001$). Analysis of the overnight polysomnogram (PSG) revealed that both ICSD3-NT2 and OSMI-NT2 exhibit significantly lower N3% when compared to ICSD3-IH (9.926% and 9.03% vs 13.78%, $p<0.001$).

Conclusions: While research characterizing this spectrum of hypersomnolence is still in its infancy, this project helps delineate some of the salient features that may organize future diagnostic frameworks. The MSLT and SOREMP disparities confirm that there is a clinically identifiable difference between OSMI-NT2s and ICSD3-IH patients, indicating the presence of a subgroup of patients currently under the ICSD3's "IH" umbrella that could be more accurately be defined as a distinct diagnostic group. Furthermore, the uniquely lower N3% exhibited by OSMI-NT2s compared to the ICSD3-IH lends additional support to the idea that the two groups are clinically distinct and could have differing underlying pathomechanisms of hypersomnolence. The historic diagnostic uncertainty and the unique findings in this study underscore the need for more focused research aimed at delineating this spectrum of disease. With advanced precision and greater diagnostic characterization, patients with disorders of hypersomnolence can receive more personalized treatment and achieve better clinical outcomes.

Treatment of narcolepsy by means of vagus nerve stimulation

Y. Winter[1], K. Sandner[1], C. Bassetti[2], M. Glaser[3], D. Ciolac[4], A. Saryyeva[5], J. Krauss[5], F. Ringel[3], S. Groppa[4]

[1]Mainz Comprehensive Epilepsy and Sleep Medicine Center, Department of Neurology, Johannes Gutenberg-University, Mainz, Germany, [2]Inselspital, University Hospital of Bern, University of Bern, Department of Neurology, Bern, Switzerland, [3]University Medical Center of the Johannes Gutenberg University Mainz, Department of Neurosurgery, Mainz, Germany, [4]University of Mainz, Department of Neurology, Mainz, Germany, [5]Medical School Hannover, MHH, Department of Neurosurgery, Hannover, Germany

Introduction: Neurostimulation was not investigated for the treatment of narcolepsy until now. In the same time, wake-promoting effects of vagus nerve stimulation (VNS) are know from animal experiments and from the clinical practice of VNS in the treatment of epilepsy or depression. The objective of this study was to evaluate the effect of VNS on excessive daily sleepiness and cataplexies in narcolepsy.

Materials and methods: In this open-label comparative study (n=36), we included patients with narcolepsy type 1 or 2 who received VNS for the treatment of concomitant epilepsy or major depressive disorder (in-label indication for VNS treatment) (n=18). Controls (n=18) were the patients without narcolepsy (type 1 or 2), who received VNS for the same in-label indication (depression or epilepsy). The rationale for inclusion of patients without narcolepsy was to investigate if there is a disease-specific improvement of daily sleepiness in narcolepsy on VNS in comparison to a general reduction of sleepiness in neurological diseases. We evaluated excessive daily sleepiness (EDS) by means of the Epworth Sleepiness Scale (ESS) and the number of cataplexies per week before the implantation of VNS and at follow-ups after three and six months.

Results: In comparison to baseline patients with narcolepsy showed a significant improvement of EDS after three months (ESS at baseline 15.9 ± 2.5 versus 11.2 ± 3.3 after three months, $p < 0.05$) and after six months (9.6 ± 2.8, $p < 0.001$). In addition, a trend to reduction of cataplexies was observed (weekly cataplexy rate at the baseline of 3.9 ± 4.5 versus 1.8 ± 2.1 after six months, $p = 0.09$). In patients without narcolepsy, no significant ESS-improvement was observed ($p = 0.09$). There were no differences in side effects between the study groups.

Conclusions: Our data shows that VNS could be considered as a potential non-pharmacological therapeutic option for patients with narcolepsy in cases of a non-response to drug therapy.

Understanding daytime and nighttime treatment needs from the patient's perspective: a survey of people living with narcolepsy

L.E. Ortiz[1], A.M. Morse[2], L. Krahn[3], M. Lavender[4], M. Horsnell[5], D. Cronin[6], B. Schneider[6], J. Gudeman[7]

[1]Johns Hopkins All Children's Hospital, St. Petersburg, United States, [2]Geisinger Commonwealth School of Medicine, Geisinger Medical Center, Janet Weis Children's Hospital, Danville, United States, [3]Mayo Clinic, Phoenix, United States, [4]Comprehensive Sleep Medicine Associates, Houston, United States, [5]Patient Author, Project Sleep's Rising Voices of Narcolepsy, Los Angeles, United States, [6]MyHealthTeam, San Francisco, United States, [7]Avadel Pharmaceuticals, Chesterfield, United States

Introduction: Narcolepsy is typically associated with excessive daytime sleepiness; however, nighttime sleep disruption is also a recognized feature of narcolepsy. Individuals with narcolepsy were surveyed to better understand desired treatment outcomes and how those outcomes map to commonly experienced symptoms, treatment awareness, and medication usage.

Materials and methods: In September 2022, an email invitation to a 47-question online survey was sent to US members of MyNarcolepsyTeam, a social network of >10,100 members.

Results: In total, 109 members completed the survey. The far-reaching negative impact of narcolepsy was evident with 97% indicating that narcolepsy has had a negative impact on daily life. Most troubling symptoms included excessive daytime sleepiness (90%), fatigue (84%), difficulty concentrating (72%) and memory problems (68%). Additionally, 81% experienced some type of nighttime disruption, including poor quality sleep (67%), disrupted sleep (62%), insomnia (40%) or frequent awakenings (40%). Among those with Narcolepsy type 1, cataplexy was also a top concern (64%). Top treatment goals included desire to stop sleeping during the day (99%), improved productivity (96%), increased energy level (95%), improved memory/cognition (90%) and reducing cataplexy (71% among Type 1 patients). Given the high incidence of nighttime disruptions, 85% mentioned desire for improved quality sleep. Despite this desired goal, only 45% indicated their doctor had discussed how narcolepsy impacts nighttime sleeping and only 44% indicated that their doctor discussed treatments to improve nighttime sleep. For comparison, 80% had discussions with their doctor about treatments to relieve daytime symptoms. A number of sodium oxybate naive patients relied on sleep treatments such as melatonin or zolpidem; Only 34% were satisfied with those sleep aids.

Conclusions: People with narcolepsy experience a wide range of both daytime and nighttime symptoms and seek relief from both sets of symptoms. However, the clinician-patient discussion and the treatment regimens are primarily focused on the daytime symptoms. Nighttime symptoms may not be reported unless asked directly. This may result in patients seeking treatment options that may not improve the underlying condition of narcolepsy. Understanding and proactively, actively, and continuously discussing the experiences and needs of individuals with narcolepsy throughout the 24-hour cycle can provide significant opportunities for clinicians to support, educate and treat their patients holistically.

Understanding narcolepsy treatments from the patient's perspective: a survey of people living with narcolepsy

L.E. Ortiz[1], A.M. Morse[2], L. Krahn[3], M. Lavender[4], M. Horsnell[5], D. Cronin[6], B. Schneider[6], J. Gudeman[7]

[1]Johns Hopkins All Children's Hospital, St. Petersburg, United States, [2]Geisinger Commonwealth School of Medicine, Geisinger Medical Center, Janet Weis Children's Hospital, Danville, United States, [3]Mayo Clinic, Phoenix, United States, [4]Comprehensive Sleep Medicine Associates, Houston, United States, [5]Patient Author, Project Sleep's Rising Voices of Narcolepsy, Los Angeles, United States, [6]MyHealthTeam, San Francisco, United States, [7]Avadel Pharmaceuticals, Chesterfield, United States

Introduction: Individuals with narcolepsy were surveyed to better understand desired treatment outcomes and how those outcomes map to commonly experienced symptoms, treatment awareness, and medication usage.

Materials and methods: In February 2022, an email invitation to a 27-question online survey was sent to US members of MyNarcolepsyTeam, a social network of >10,100 members.

Results: In total, 110 members completed the survey. The most frequently mentioned desired treatment goals aligned with the most commonly reported symptoms: being able to stop sleeping during the day (77%); increased energy (62%); improved memory (36%); improved productivity (29%); improved sleep continuity (22%); and for patients with narcolepsy type 1, reducing cataplexy (28%). A common theme was desire for a medication that would treat the underlying cause and not just improve specific symptoms. In one patient's own words: *"I want to see treatments that target the root problem of poor nighttime sleep rather than just being a band-aid for [excessive daytime sleepiness] EDS, like stimulants are."* Only a small percentage of respondents (13%) were not currently taking any type of medication to address narcolepsy symptoms. 64% were currently taking ≥2 medications to address both the daytime and nighttime symptoms. Most commonly mentioned current treatments were dextroamphetamine-amphetamine (30%), modafinil (22%), melatonin (16%), *armodafinil* (15%), venlafaxine (14%), and oxybate (14%). Notably, 33% of patients taking sodium oxybate chose sleeping through the night as a desired outcome. Most common sources for learning about treatments were narcolepsy-specific websites (53%), MyNarcolepsyTeam specifically (45%), the patient's doctor (42%), scientific articles (42%), and advocacy groups (37%).

Conclusions: Patients experience a wide range of both daytime and nighttime symptoms and seek relief from both sets of symptoms including EDS (93%), fatigue (79%), cognitive challenges (74%), as well as sleep disruptions (63%). As a result, the majority need multiple medications. Understanding the experiences and needs of people with narcolepsy provides significant opportunities for clinicians to support, educate, and treat their patients holistically. Additionally, content readily available on the internet, whether it is narcolepsy-specific content or social networks, helps patients proactively discuss options with their clinician.

Understanding the patient experience with sodium oxybate therapy for narcolepsy

M. Horsnell[1], E. Zhang[1], R. Cook[1], L. Dougherty[1], A. Foley Shenk[1], F. Ascencion[2], A.M. Morse[3], L.E. Ortiz[4], E.R. Wassman[1], C. DeFelice[1], M. Picone[1]
[1]TREND Community, Philadelphia, United States, [2]PWN4PWN, Tampa, United States, [3]Geisinger, Janet Weis Children's Hospital, Geisinger Commonwealth School of Health Sciences, Danville, United States, [4]Johns Hopkins Medical Institutions, Johns Hopkins All Children's Hospital, St. Petersburg, United States

Introduction: Narcolepsy is a chronic sleep disorder defined by excessive daytime sleepiness, impaired rapid eye movement sleep, disrupted nighttime sleep with frequent waking, and several molecular biomarkers; it may also be accompanied by cataplexy. Narcolepsy has no cure and affects both men and women. This research used natural language processing (NLP) with social media listening to better understand patient experiences in the narcolepsy community with taking sodium oxybate (SO) therapy.

Materials and Methods: A combination of social media listening and survey methods was employed. A proprietary analytics engine that incorporates NLP analyzed 25,018 posts/comments shared by 15,280 participants during August 2011 to October 2022 in 2 narcolepsy communities: a subreddit, r/Narcolepsy, and a private Facebook group. A clinical entity recognition tagger leveraging a medical ontology was used to build a co-occurrence network and identify relationships between entities. We filtered conversations that mentioned
(1) second dosage (e.g., second dose, 2nd) and
(2) SO (e.g., Xyrem, SO) to build a unique co-occurrence network for all conversations discussing second doses of SO. Patient experiences with SO were then documented by surveying and interviewing community members and analyzing the stories and experiences they shared on social media.

Results: A total of 4,275 of the subreddit users mentioned SO and 398 (9%) used language consistent with having challenges in taking a second SO dose. The co-occurrence network revealed that second SO dose was comentioned with physical (e.g., nausea, headache) and mental health (e.g., anxiety, depression) conditions. A group of 87 users from the private Facebook group were then surveyed (n = 85 patients, n = 2 caregivers). Missing the second dose was reported by 75% of patients (65% at least monthly). The most common reported impacts of missing doses were poor sleep quality, increased daytime sleepiness, work/school absences, and brain fog affecting next-day functioning. Regarding whether they suffered injuries resulting from waking to take a second dose of SO, 32% responded yes (33% of these respondents at least monthly). Delayed dosing (>4 hours after) was another issue reported by 59% (74% at least monthly). Impacts of this delayed dosing led to school/work tardiness and missed responsibilities. Patients reported adverse effects with SO therapy, including mental health issues (especially depression), racing heart, muscle spasms, acid reflux, bedwetting, and eating problems. Seventy-six percent of the respondents strongly agreed or agreed that a single bedtime dose of SO would be safer.

Conclusions: Converging evidence from both the social media and survey results suggests that the need to take the second dose of SO is associated with various sleep-related issues and disruption for people with narcolepsy and their caregivers. Daily functioning, physical and mental health, injuries, and quality of life were affected. These impacts are present both for missed second SO doses and doses taken more than 4 hours after the first dose.

Validity and reliability of the Pediatric Narcolepsy Patient-Reported Outcomes Scale (PN-PROS)

K. Maski[1]
[1]Harvard Medical School/Boston Children's Hospital, Neurology, Boston, United States

Introduction: There are currently no validated, patient-reported outcome measures for pediatric narcolepsy that assess disease burden, determine treatment efficacy, and guide future drug development. To ensure optimal clinical management of pediatric narcolepsy, we developed the Pediatric Narcolepsy Patient-Reported Outcomes Scale (PN-PROS) through literature review, content expert interviews, patient focus groups, and cognitive testing with patients (ages 9-17 years) and their parents. The resulting PN-PROS item bank included 55 items that assess pediatric narcolepsy symptoms and their functional impact. The aim of this study is to provide interim data from our multi-site validation and reliability study of the PN-PROS.
Methods: We performed field testing for validity and reliability of the PN-PROs in pediatric narcolepsy patients (9-17 years) with a comparator group of pediatric obstructive sleep apnea patients. We recruited participants from Boston Children's Hospital, Stanford Medical Center, Toronto Hospital for Sick Children (SickKids), and Geisinger Medical Center, as well as from narcolepsy patient advocacy meetings and websites. Participants completed the PN-PROS, Epworth Sleepiness Scale for Children and Adolescents (ESS-CHAD), Peds QL, and PROMIS Life Satisfaction using the REDCap data capture platform. Participants completed the PN-PROS item bank 1 week later for test-retest reliability.
Results: To date, 83 pediatric patients with narcolepsy (mean age=15(2) years, 52.3% female, 26% non-Caucasian) and 60 pediatric patients with OSA (mean age=13.2(2.6), 46.3% female, 22% non-Caucasian) have completed all study measures. Discriminant Validity: Participants with narcolepsy reported a higher PN-PROS mean total score than participants with OSA [narcolepsy=126.9 (28.6), OSA=95 (31.2), $p<0.001$]; results retain significance controlling for age, race and gender [group main effect: $F=36.6$, $p<0.001$]. Content Validity: For participants with narcolepsy, the PN-PROS total score was significantly correlated with the ESS-CHAD ($r=0.64$, $p<0.001$), Peds QL ($r=-0.84$, $p<0.001$), and PROMIS Life Satisfaction ($r=-0.55$, $p<0.001$). For participants with OSA, the PN-PROS total score was significantly correlated with the ESS-CHAD ($r=0.65$, $p<0.001$), Peds QL ($r=-0.81$, $p<0.001$), and PROMIS Life Satisfaction ($r=-0.36$, $p<0.001$). Reliability: Internal consistent was strong for both participants with narcolepsy (Cronbach alpha=0.94) and OSA (Cronbach alpha=0.93). Test-retest reliability was high for both participants with narcolepsy (interclass coefficient=0.94) and OSA (interclass coefficient=0.93).
Conclusion: Interim results suggest the PN-PROS is a valid and reliable measure for the evaluation of symptom frequency and burden for pediatric patients with narcolepsy. Data collection is ongoing, utilizing additional sites in other regions of the United States to ensure generalizability of our findings.
Support: American Sleep Medicine Foundation

Neurological Disorders Affecting Sleep

Alternating hemiplegia of childhood: an electroclinical study of sleep and hemiplegia

U. Vivekananda[1], J. Poole[2], S. Balestrini[2]
[1]Institute of Neurology, UCL, London, United Kingdom, [2]Institute of Neurology, London, United Kingdom

Introduction: Alternating Hemiplegia of Childhood (AHC) is characterised by paroxysmal hemiplegic episodes and seizures. Remission of hemiplegia upon sleep is a clinical diagnostic feature of AHC. We investigated whether: 1) Hemiplegic events are associated with spectral EEG changes 2) Sleep in AHC is associated with clinical or EEG spectral features that may explain its restorative effect.
Materials and methods: We retrospectively performed EEG spectral analysis in five adults with AHC and twelve age-/gender-matched epilepsy controls. Five-minute epochs of hemiplegic episodes and ten-minute epochs of four sleep stages were selected from video-EEGs. Arousals were counted per hour of sleep.
Results: We found there were 98% more arousals in the AHC group versus controls ($p = 0.0003$). We also found hemispheric differences in pre-ictal and ictal spectral power ($p = 0.034$), during AHC hemiplegic episodes that resolved during post-ictal sleep.
Conclusions: Sleep in AHC is generally disrupted. There are hemispheric differences in spectral power preceding hemiplegic episodes in adults with AHC that resolve with sleep.
Acknowledgements: The authors would like to thank all participants and their families for taking part in this research.

An antipodal correlation between circannual light-dark exposure and severe seizure provocation

M. Ng[1], T. Zhang[2], D. Toutant[3], M. Pavlova[4], P. Bergin[2], M. Quigg[5]
[1]University of Manitoba, Internal Medicine, Winnipeg, Canada, [2]Auckland District Health Board, Auckland, New Zealand, [3]University of Manitoba, Biomedical Engineering, Winnipeg, Canada, [4]Harvard University, Neurology, Boston, United States, [5]University of Virginia, Charlottesville, Neurology, Charlottesville, United States

Introduction: Daily sleep time is influenced by changes in circadian light-dark exposure, which in turn fluctuates over the course of a year as determined by local geographical latitude. Seizures are exquisitely linked to changes in sleep quantity and quality, such as in sleep deprivation. At their most severe, seizures can manifest as life-threatening emergencies in the form of status epilepticus (SE). Comparing SE rates at communities near Earth's northern and southern poles, we hypothesize that SE is provoked circannually following the winter solstice when daylight starts to grow after the darkest day of the year.

Materials and Methods: Secondary analysis of existing datasets to compare rates of SE occurrence over the course of a year. We compared retrospectively acquired data at a northern hemispheric site in the Canadian Arctic region of Kivalliq (latitude 62.8°N) from 2009 to 2020 against those prospectively acquired at a southern hemisphere site in Auckland, New Zealand (latitude 36.9°S) from 2015 to 2016. We conducted polar statistics using Rayleigh's test to assess for significant data departures from circular uniformity.

Results: In the Canadian Arctic region of Kivalliq (n=99), the circannual SE acrophase peaked from February to June (averaged at April), with a mean resultant length (MRL) vector length of 0.17 on monthly analysis (p=0.03), 0.16 on weekly analysis (p=0.04), and 0.16 on daily analysis (p=0.04). In Auckland, New Zealand (n=367), the circannual SE acrophase in Auckland peaked from July to August (averaged at July), with a MRL vector length of 0.14 on monthly analysis (p=0.0008), 0.14 on weekly analysis (p=0.001), and 0.14 on daily analysis (p=0.001).

Conclusions: Despite being situated on polar opposites of the globe with substantial patient, socioeconomic, and cultural heterogeneity, both the Canadian Arctic and the southern hemispheric Greater Auckland area of New Zealand experienced significant circannual SE peaks during the increasing daylight phase after each region's respective winter solstice. Our findings demonstrate that the cumulative effects of increasing light exposure can mediate SE susceptibility.

An investigation into upper airway reflex responses to negative airway pressure in non-obese multiple sclerosis patients with versus without sleep apnea

E. Thomas[1], A. Osman[1], L. Calonzo[1], L.-A. Hall[2,1], M. Slee[2,1], M. Agzarian[3,2,1], D. Eckert[1]
[1]Flinders Health and Medical Research Institute (FHMRI) Sleep Health, Flinders University, Bedford Park, Australia, [2]Southern Adelaide Local Health Network, Bedford Park, Australia, [3]South Australia Medical Imaging, Bedford Park, Australia

Introduction: Estimated prevalence rates of obstructive sleep apnea (OSA) are similar in people with multiple sclerosis (MS) versus the general population. However, many people with MS do not share the typical risk factors for OSA. For example, there is a female predominance in MS many of whom are not obese. Upper airway dilator muscle activity and reflex responses to negative pressure are important to prevent major upper airway narrowing and closure. Recent evidence indicates ~30% of people with MS have an impaired upper airway dilator reflex response to negative pressure. Thus, the primary aim of this study was to compare genioglossus (largest upper-airway dilator muscle) reflex responses in non-obese people with MS, with and without OSA. Secondary aims were to compare upper airway collapsibility and the number of brainstem lesions.

Methods: This was a case-control physiology study in which upper airway collapsibility and genioglossus reflex responses were carefully quantified in non-obese adults with MS and compared in those with versus without OSA. The expanded disability status scale (EDSS) questionnaire and recent MRI were used to assess MS severity. The apnea-hypopnea index (AHI) was estimated via one-week under-mattress home sleep monitoring (Withings). Participants were instrumented with two airway pressure sensors; one at the choanae , the other at the level of the epiglottis. Bipolar fine wires were inserted into the genioglossus to measure electromyographic (EMG) activity. A fitted nasal mask and pneumotachograph were attached to short tubing connected to a custom-designed breathing circuit to deliver brief (~250ms) suction pressure (~-12cmH2O) during early inspiration every 2-10 breaths. Participants were instructed to breath normally while supine and awake. Baseline genioglossus EMG activity was quantified as mean activity 100ms before negative pressure stimulus was applied to the airway. The upper airway collapsibility index (UACI) was measured as the percent difference between choanal and epiglottic airway pressures during negative pressure pulses.

Results: To date, 15 people with MS (6 males), aged 48±13 years, BMI=25±3 kg/m-2 and AHI=13±17 events/h (mean±SD) were studied. 7 people (47%) had OSA (AHI>10 events/h). There were no differences in BMI between OSA and non-OSA participants (25±3 vs. 25±3 kg/m-2). 6 people with MS and OSA (86%) had at least 1 brainstem lesion compared to 4 people without OSA (50%). Genioglossus reflex excitation onset latency (22±2 vs. 24±19ms), peak excitation latency (37±11 vs. 38±23ms) and peak amplitude (258±125 vs. 205±95%) to negative pressure pulses were not systematically different between people with versus without OSA vs. non-OSA. The upper airway was however, more collapsible in people with versus without OSA (49±32 vs. 17±16%, p=0.04).

Conclusions: These preliminary findings support the high prevalence of OSA among non-obese people with MS. There was no systematic difference in upper airway dilator muscle function in people with MS with versus without OSA. However, the upper airway is ~65% more collapsible in people with MS and OSA despite absence of obesity.

Associations between slow wave sleep and Alzheimer's disease plasma biomarkers among Black and White cognitive normal older-adults

M. Balthazar[1], O. Cesar[2], E. Valkanova[3], A.K. Mbah[3], O.M. Bubu[2]
[1]Penn State University, College of Nursing, University Park, United States, [2]NYU Grossman School of Medicine, Department of Psychiatry, Neurology and Population Health, New York, United States, [3]University of South Florida, Department of Biostatistics, College of Public Health, Tampa, United States

Introduction: We determined whether slow wave sleep is associated with plasma levels of Aβ40, Aβ42, Aβ42/Aβ40, Tau, tau/Aβ42 and NfL and whether this relationship differed between Blacks/African-Americans and non-Hispanic Whites.

Materials and Methods: This was a cross-sectional analysis of baseline data from 171 community-dwelling cognitively normal older-adults, participating in ongoing NYU studies on memory, sleep and aging. Non-rapid eye movement sleep (NREM) slow wave sleep (SWS) duration was calculated from 2 nights of in-lab NPSGs. Plasma Aβ40, Aβ42, Tau and NfL were determined using single molecule array (SIMOA).Associations of NREM SWS duration and plasma AD biomarker levels were assessed using adjusted generalized linear models and Pearson correlation analysis after data normalization. Analyses were adjusted for age, sex, BMI, race, and education.

Results: Of the 171 subjects (128 Whites and 43 Blacks), 112 (65.5%) were females, and mean (SD) age was 68.6 (6.6) years, BMI was 27.6 (6.1) kg/m**2, and education was 16.9 (2.1). There were no racial differences in age, sex, and BMI. Compared to whites, blacks had significantly lower years of education (14.2 vs. 17.2, p <.01). Black/African-American subjects had significantly lower plasma Aβ40 (248.3 vs. 262.5 pg/ml) and NfL levels (11.4 vs. 15.2 pg/ml). p<.05 for both. There were no significant racial differences in levels of plasma Aβ42, Aβ42/Aβ40, Tau, Tau/Aβ40 and Tau/Aβ42. NREM SWS duration was not associated with plasma Aβ42, Aβ40 or tau in the overall sample. However, in Whites, SWS negatively correlated with plasma Aβ42 (r=-0.28, p<=0.05). In Black/African-Americans, SWS positively correlated with plasma Aβ42 (r=0.48, p=0.05). In Whites, SWS negatively correlated with plasma Aβ40 (r=-0.087, p=0.72), though not significant. In Black/African-Americans, SWS positively correlated with plasma Aβ40 levels (r=0.32, p=0.04). In Whites, SWS negatively correlated with plasma Tau (r=-0.153, p=0.27), though not significant. In Black/African-Americans, SWS positively correlated with plasma Tau levels (r=0.52, p=0.04). NREM SWS was not associated with plasma tau/Aβ42, plasma tau/Aβ40 or plasma NfL in the overall sample and across racial subgroups.

Conclusions: Race-specific divergent associations between NREM SWS and plasma Aβ42, Aβ40 & Tau may suggest differences in SDOH mechanisms that could influence sleep and AD-risk in older-adults.

Automatic sleep staging and detection of sleep disorders through wearable EEG monitoring devices

E. Heremans[1], A. Devulder[2,3], B. Buyse[4,5], D. Testelmans[4,5], W. Van Paesschen[2,3], M. De Vos[1,6]
[1]KU Leuven, Department of Electrical Engineering, Leuven, Belgium, [2]KU Leuven, Laboratory for Epilepsy Research, Leuven, Belgium, [3]University Hospitals Leuven, Department of Neurology, Leuven, Belgium, [4]KU Leuven, Laboratory of Respiratory Diseases and Thoracic Surgery, Leuven, Belgium, [5]University Hospitals Leuven, Department of Pulmonary Diseases, Leuven, Belgium, [6]KU Leuven, Department of Development and Regeneration, Leuven, Belgium

Introduction: Low-cost wearable electroencephalography (EEG) recording devices enable remote long-term monitoring and large-scale screening of sleep across the population. However, large volumes of EEG data necessitate automated analysis. This pressing need is further exacerbated by the fact that clinicians have difficulties interpreting wearable, non-standard EEG signals. Existing automated sleep staging methods perform well on large polysomnography (PSG) datasets of healthy subjects. However, sleep staging on wearable EEG data from diseased populations is more challenging. In this study, we investigated the use of automated sleep scoring methods on wearable EEG measurements of patients with obstructive sleep apnea (OSA) and Alzheimer's disease (AD). Additionally, we evaluated the potential of wearable sleep monitoring with automated sleep staging to detect these diseases. The long-term goal is to deploy these tools to screen for AD and OSA in the home environment.

Materials and methods: The dataset consisted of 110 age-matched subjects over 60 years old, divided into three subgroups: 40 subjects with OSA (AHI≥15), 35 patients with AD and 35 control subjects (AHI<15). All subjects were recorded with a standard PSG and a behind-the-ear wearable EEG device measuring one cross-head EEG derivation and accelerometry. Sleep stages were manually scored on the PSG data. Then, automated sleep staging was performed using a state-of-the-art deep learning method for sleep staging, called SeqSleepNet (Phan, et al., 2018). SeqSleepNet classifies 30-second segments as Wake, N1, N2, N3 or REM sleep. The algorithm was trained on an independent dataset with cross-head EEG. Its performance was evaluated on the different subgroups. We then used sleep parameters derived from the automatically obtained sleep stages to identify the groups. A total of thirty relevant parameters were calculated. These parameters were used to classify each patient into one of the groups, using a multilayer perceptron classifier.

Results: The mean 5-class accuracy (± standard error) of the sleep staging algorithm using the wearable device data was 60.9±2.3% for the AD group, 64.4±2.5% for the OSA group, and 69.9±2.2% for the control group. Based on these automated sleep stages, the accuracy in classifying patients into the correct group was 72.5±0.6 for the AD group and 63.8±0.9% for the HC group. The accuracy in detecting the patients with AHI≥15 (including the full OSA group and 18 AD patients) was 65.5±0.9. The classification accuracies for the different groups were similar when based on the ground truth sleep stages.

Conclusions: The feasibility of automated sleep staging using a wearable EEG device and a deep learning algorithm was demonstrated in AD patients, OSA patients and control subjects, with accuracies ranging from 60.9% to 69.9%. Furthermore, the sleep stage parameters derived from this approach are promising as markers in the screening for both AD and OSA. This result shows that perfect sleep staging is not needed to obtain useful biomarkers for these disorders.

Biological sex and injury severity impact sleep in the mouse following diffuse traumatic injury

G. Mannino[1,2], T. Green[2], S. Murphy[3], M. Opp[2], R. Rowe[2]
[1]University of Colorado Boulder, Psychology and Neuroscience, Boulder, United States, [2]University of Colorado Boulder, Integrative Physiology, Boulder, United States, [3]Cumberland Biological and Ecological Researchers, Longmont, United States

Introduction: Although women and female animals are historically underrepresented in sleep studies, growing recognition of sex disparities in sleep disturbances exists. Traumatic brain injury (TBI) leads to sleep-wake disturbances, which can contribute to long-term neurological morbidities. Whether biological sex differences in sleep, or sex disparities in post-injury sleep after mild or moderate TBI exist remains unknown. We hypothesized that at baseline, females would sleep less than males, and that TBI would increase sleep in both sexes, independent of injury severity.

Materials and Methods: Mice were acclimated to non-invasive piezoelectric cages and baseline physiological parameters were recorded. After randomization, adult male (n=36) and female (n=30) mice were subjected to sham, mild, or moderate midline fluid percussion injury and uninterrupted sleep was assessed. We analyzed hourly sleep percentage, cumulative minutes slept, and mean bout lengths using hierarchical models with nonlinear time effects.

Results: We found profound sex differences in baseline sleep; females slept significantly less with shorter bout lengths than males (p=0.004). Regardless of injury severity, TBI increased percent sleep (p=0.0001–0.003) and cumulative minutes slept (p<0.0001) in both sexes during the first 2 days post-injury, compared to respective shams. Interestingly, mice subjected to moderate TBI had shorter bouts than mice subjected to mild TBI or shams (p=0.03), indicative of fragmented sleep.

Conclusions: This suggests that injury severity may play a role in the quality, rather than quantity, of post-traumatic sleep. A comprehensive understanding of the relationship between sex, injury severity, and sleep quality provides useful insight for developing personalized pharmacological and rehabilitative TBI treatments.

Cardiac sympathetic modulation is predominated during wake and sleep in patients with Rett syndrome: a possible trigger of cardiovascular risk?

G. Dias Rodrigues[1], R. Cordani[2], M. Veneruso[2], L. Chiarella[2], G. Prato[3], R. Ferri[4], A. Carandina[1], E. Tobaldini[1,5], L. Nobili[2,3], N. Montano[1,5]
[1]University of Milan, Department of Clinical Sciences and Community Health, Milan, Italy, [2]University of Genoa, Department of Neurosciences, Rehabilitation, Ophthalmology, Genetics, and Maternal and Child Health, Genoa, Italy, [3]IRCCS Istituto Giannina Gaslini, Child Neuropsychiatry Unit, Genoa, Italy, [4]Oasi Research Institute - IRCCS, Sleep Research Center, Department of Neurology I.C, Troina, Italy, [5]Fondazione IRCCS Ca' Granda, Ospedale Maggiore Policlinico, Department of Internal Medicine, Milan, Italy

Introduction: The Rett syndrome (RTT) is a rare neurological disorder related to methyl-CpG-binding protein 2 (MECP2) gene mutations. Patients with RTT are susceptible to sudden cardiac deaths attributed, in part, to autonomic dysfunction. Furthermore, subjects with RTT show irregular sleep/wake patterns, difficulty in initiating and maintaining sleep, excessive daytime naps, and problematic night time behaviours. The role of the autonomic nervous system (ANS) in cardiovascular regulation during the sleep stages has been studied in several neurologic disorders. However, to date, it is unclear how the ANS modulates the cardiovascular functions during the wake/sleep stages in patients with RTT. Thus, we aimed to investigate the cardiovascular autonomic modulation during sleep in subjects with RTT compared to an aged-matched healthy control group (HC).
Materials and Methods: A complete overnight polysomnographic (PSG) study was obtained in 11 patients with Rett syndrome (all females, 10 ±4 years old) and 11 HC (all females, 11 ±4 years old; p=0.48). ECG and breathing data were extracted from PSG and divided into wake, non-REM, and REM sleep. The cardiac autonomic control was assessed by symbolic non-linear heart rate variability analysis. The symbolic analysis identified three patterns, 0V%, (sympathetic) and 2UV%, and 2LV%, (vagal). A two-way ANOVA was used, considering within-between factors (wake/sleep stages and groups) with Sidak's post-hoc test. The $p < 0.05$ was considered statistically significant.
Results: Heart rate was higher in RTT than HC group during wake, non-REM, and REM stages ($p < 0.01$). The 0V%, marker of sympathetic modulation, was higher in RTT than HC group during wake, non-REM, and REM stages ($p < 0.01$), while the vagal indexes (2LV and 2UV %) were lower during wake and sleep stages ($p < 0.01$). However, the cardiac sympathetic modulation (0V%) increased similarly from the wake to REM stage in both RTT and HC groups.
Conclusions: The sympatho-vagal balance was shifted towards sympathetic predominance and vagal withdrawal during wake and sleep in subjects with RTT syndrome, although the cardiac autonomic dynamics were preserved during sleep. These results suggest that patients with RETT show an intact neural mechanism of cardiovascular dynamics during sleep, despite a cardiac sympathetic modulation offset to a higher operating point.

Characterizing latent sleep phenotype trajectories over 36 months in children with new-onset seizures

T. Oyegbile-Chidi[1], D. Harvey[1], J. Jones[2], P. Fastenau[3], A. Byars[4], D. Dunn[5], J. Austin[5], B. Hermann[2]
[1]University of California Davis, Sacramento, United States, [2]University of Wisconsin School of Medicine and Public Health, Neurology, Madison, United States, [3]University Hospitals Cleveland Medical Center and Case Western Reserve University School of Medicine, Cleveland, United States, [4]Cincinnati Children's Hospital at the University of Cincinnati, Cinncinati, United States, [5]Indiana University, Indianapolis, United States

Introduction: Accumulating evidence indicates that children with new-onset epilepsies may exhibit co-morbidities including sleep disturbance, cognitive dysfunction and behavioral impairments. These children exhibit a wide range of sleep problems, which infers significant heterogeneity and variability in the extent and persistence of sleep problems in this population. This heterogeneity raises the question of whether there are unique sleep phenotypes associated with epilepsy. Identifying and characterizing these underlying latent cluster profiles and their course over time, along with potential risk categories, can be vital for an accurate understanding, and ultimately for more comprehensive treatment of epilepsy. Here we investigate the presence and progression of sleep phenotypes in youth with new-onset epilepsy over a 3-year period and in addition characterize their associated cognitive and behavioral profiles in order to inform the presence and degree of multimorbidity.

Materials and Methods: 332 subjects (aged 6-16 years) were recruited within 6 weeks of their first recognized seizure. Sleep was evaluated in each child using the Sleep Behavior Questionnaire, assessing five areas of sleep disturbance - bedtime difficulties, parent-child interactions, sleep fragmentation, parasomnia, and daytime drowsiness. Each child also underwent a comprehensive neuropsychological assessment evaluating intelligence, language, immediate & delayed verbal and visual memory, executive function, and speeded fine motor dexterity. In addition, behavioral status was assessed using the Child Behavior Checklist – parental form [CBCL] and teacher form [TRF]. All sleep, cognitive and behavior measures were evaluated at baseline (B), 18 months later (M18), and 36 months later (M36). Latent trajectory analysis identified sleep problem categories within prototypical sleep trajectories over 36 months. Cognitive and behavioral status was examined within each latent sleep status to interrogate the presence and nature of associated neurobehavioral complications. Clinical predictors were also assessed.

Results: Trajectory analysis over the 36-month period identified three sleep phenotypes: a sleep phenotype similar to healthy controls (Typical); a moderately disrupted sleep phenotype (Moderate), primarily encompassing sleep fragmentation and daytime drowsiness; and a severely sleep disrupted phenotype (Severe), primarily encompassing parent-child interaction and bedtime difficulties. The Typical phenotype exhibited the least sleep disturbance overall with the lowest levels of cognitive and behavior problems. The Severe phenotype exhibited the most sleep disturbance overall and showed the highest levels of associated cognitive and behavioral dysfunction. Cognitive and behavioral characterization findings remained significant and stable over 36 months. Clinical predictors showed that patients with a younger age of onset of epilepsy were more likely to fall into the Moderate and Severely disrupted phenotypes.

Conclusions: This study demonstrates the presence of latent sleep trajectory phenotypes over 36 months in youth with new-onset epilepsy that are stable and persistent over time. These distinct phenotypes are also associated with unique cognitive and behavioral patterns—indicating the presence of substantial multimorbidity. Improving and optimizing sleep early in the course of the disorder could potentially improve both the disorder and its associated multimorbidities. Future studies determining if these sleep phenotypic categories are modifiable with early intervention would be beneficial.

Compromised dynamic cerebral autoregulation in patients with frontal lobe epilepsy

D. Wang[1], M. Tang[1], Y. Wang[1], Z. Huang[1], Z. Wang[1]
[1]The First Hospital of Jilin University, Department of Neurology, Sleep Center, Chang Chun, China

Introduction: Frontal lobe epilepsy is the second common focal epilepsy, most of Which occur in complex parts, mostly in night sleep. Frontal lobe epilepsy is often accompanied by autonomic nervous symptoms. When the autonomic nerve changes in frontal lobe epilepsy are serious, it may lead to sudden death of epilepsy due to conduction to the guide lobe. On the other hand, the study of epileptic autonomic nerve is the forefront of international research at present, and some studies have pointed out that the dynamic cerebral blood flow regulation function of epileptic patients is damaged. The aim of this study was to explore the autonomic nerve dysfunction and the dynamic cerebral autoregulation in patients with frontal lobe epilepsy, providing more evidence for the comprehensive treatment of frontal lobe epilepsy.

Materials and methods: Forty patients with FLE were selected from December 2020 to December 2022, and 40 healthy people matched with the personality and age of the case group were selected from the control group, and their dCA function was monitored. The TCD combined with continuous fingertip blood pressure monitoring method was used to continuously and synchronously record the cerebral blood flow velocity and arterial blood pressure of bilateral middle cerebral arteries. The transfer function analysis method was used to obtain the relevant parameters of dynamic cerebral autoregulation: gain and phase difference. The obtained data were statistically analyzed.

Results: Compared with the control group, the left and right phase differences in frontal lobe epilepsy group decreased significantly (P_{left} = 0.002, P_{right} = 0.005), suggesting that the dCA function of frontal lobe epilepsy patients is damaged. In patients with frontal lobe epilepsy with dysautonomia, the autonomic scale score (SCOPA-AUT) was negatively correlated with both left and right phase differences (left: β = -1.621, P = 0.001; right: β = - 2.428, P = 0.002). SCOPA-AUT (Cardiovascular section) were negatively correlated with both left and right phase differences (left: β = - 0.432, P = 0.012; right: β = - 0.543, P = 0.006). The relationship between clinical factors and dCA parameters was analyzed by univariate regression models, and it was found that the number of spike slow waves influenced dCA function (β_{left} = - 0.344, P = 0.029; β_{right} = - 0.413, P = 0.008). After antiepileptic drugs treatment, the left and right phase differences of patients were increased compared with no treatment, and the difference was statistically significant (P = 0.001).

Conclusions: The phase differences of dynamic cerebral blood flow parameters in patients with frontal lobe epilepsy is decreased, it suggested that dCA function is impaired. SCOPA-AUT scale and the number of spike-slow waves were negatively correlated with DCA function in patients with frontal lobe epilepsy; DCA function, SCOPA-AUT and SCOPA-AUT (Cardiovascular section) were improved in patients with frontal lobe epilepsy after treatment with lamotrigine.

Correlating persistent perceptual postural dizziness and sleep

L. Joffily[1], J.F. Araujo[2], N.Z.V. Silva[1], L.G. Teixeira[1], M.S. Morais[1], M.A.S.D. de Lima[3], M. Rocha[1]
[1]UNIRIO, Otolaryngology, Rio de Janeiro, Brazil, [2]UFRN, LabNeuro, Natal, Brazil, [3]UFRJ / HUCFF, Neurology, Rio de Janeiro, Brazil

Introduction: A growing number of publications relate dizziness to sleep disorders. Studies suggest that sleep disorders are more prevalent in patients with Persistent Percetual Postural Dizziness (PPPD), formerly known as psychogenic dizziness, a term currently considered inappropriate. PPPD is a psychological disorder leading to an altered perception of balance. It can be defined as a chronic vestibular disorder that manifests with increasing and decreasing symptoms of dizziness, instability, or non-rotational vertigo, lasting three months or longer and exacerbated by upright posture, active or passive movement of one's body, and exposure to environments with complex or moving visual stimuli. Constituted 15 to 20% of all patients presenting with vestibular symptoms, corresponding to the most common diagnosis among young and middle-aged adults. However, few articles in the literature correlate sleep disorders and PPPD. This study aims to understand the correlation between the two conditions better.

Materials and methods: The study consists of an observational and cross-sectional case-control study of individuals seen at the Otoneurology Outpatient Clinic of the Gaffree and Guinle University Hospital of the Federal University of the State of Rio de Janeiro. 39 volunteers participated in the study, 12 diagnosed with PPPD, 18 with other types of dizziness (Vestibular Migraine, Meniere's Disease and Benign Paroxysmal Positional Vertigo), and 9 healthy volunteers (control group). The following devices were used for sleep monitoring: WatchtPAT for one night and Actigraph for three consecutive weeks. They answered the Pittsburgh Sleep Quality Index (PSQI) to evaluate sleep quality. For the degree of depression and anxiety, the Beck Depression Inventory and the Beck Anxiety Inventory were used. *SPSS Statistics* software, version 28.0 (ANOVA and *post hoc*), was used for data analysis.

Results: Regarding sleep, we found that patients with PPPD had worse sleep quality (PSQI) than the control group (*$p=0,004$). As for the depression score, we found that patients with PPPD had a worse depression score when compared to control group (*$p<0,001$) and even to other types of dizziness (*$p<0,001$). There was also no statistically significant difference in the objective parameters between the Actigraph and the WatchtPAT. Most patients with PPPD have an underlying trait of depression and anxiety, and their perception of body posture and balance is impaired, although vestibular function is normal. It is observed that vestibular function tests and imaging tests of the inner ear are often normal in these patients.

Conclusion: The results of our work show that subjects with vertigo have poor sleep quality and those with PPPD have worse sleep quality. New studies should be carried out in search of mechanisms involved in sleep disturbances in patients with PPPD.

Efficacy of probiotics on the cognitive function, sleep efficiency, and antioxidative biomarkers in patients with Alzheimer's disease dementia: a 12-week randomized, double-blind, parallel-group clinical trial

Y. Sun[1,2], Y.-W. Kuo[3], S.-Y. Tsai[3], J.-H. Lin[3], Y.-C. Hsu[3], J.-F. Chen[3], K.-C. Hsia[3], H.-H. Ho[3], H.-H. Liu[4,5], H.-C. Kua[5]
[1]En Chu Kong Hospital, Neurology, New Taipei City, Taiwan, [2]College of Medicine, National Taiwan University, Neurology, Taipei, Taiwan, [3]Glac Biotech Co., Ltd., Research and Design, Tainan, Taiwan, [4]Molecular and Genomic Medicine, National Health Research Institutes, Miaoli County, Taiwan, [5]En Chu Kong Hospital, Pediatrics, New Taipei City, Taiwan

Introduction: Accumulating evidence shows positive effects of probiotics in modulating the immune system, which may alter neuroinflammatory process implicated in the cognitive decline and sleep disturbance in Alzheimer's disease dementia (ADD). This study aimed to determine whether probiotics are effective for cognitive function, sleep and oxidative stress in patients with mild to moderate ADD.
Materials and methods: In this randomized, double-blind, parallel-group, single-center trial, all participants had clinical diagnosis of ADD with completion of studies on neuroimage, blood tests and mental tests to exclude dementia diseases other than ADD. Only patients with MMSE 10-26 and CDR 0.5-1 were enrolled. These 32 eligible participants were randomly assigned (1:1) to receive standard daily dose of 1×10^{10} CFU or low dose of 5×10^7 CFU of multistrain probiotics capsules (*Bifidobacterium breve* Bv-889, *B. longum* subsp. *infantis* BLI-02, *B. bifidum* VDD088, *B. animalis* subsp. *lactis* CP-9, *Lactobacillus plantarum* PL-02), for 12 weeks. The primary endpoint was the change of ADAS-Cog score. Secondary outcome measures were the change of MMSE, ADL, CDR, sleep parameters including total sleep time, sleep onset latency and sleep efficiency measured by actigraphy, serum antioxidant and inflammatory biomarkers including superoxide dismutase (SOD), glucose-6-phosphate dehydrogenase (G6PD), malondialdehyde (MDA), cytokines, and brain-derived neurotrophic factor. All the measures were performed during the 2 weeks after intervention compared with the 2-week preintervention phase. The study is registered with ClinicalTrials.gov, NCT05145881.
Results: Less cognitive deterioration as less increase of ADAS-Cog score was found in the group with standard dose of probiotics but without statistical significance (standard dose vs low dose, +0.31 vs +0.37, p=0.97). As compared to low dose group, better sleep with increased total sleep time (+9 vs -16, min), less sleep onset latency (+3 vs +9, min) and increased sleep efficiency (-1 vs -2, %) were found in standard dose group but there were still no significant differences. Nevertheless, serum biomarker assay showed significant differences between groups with higher SOD (p=0.04), lower MDA as lower oxidative stress (p= 0.04) and lower IL-1beta (p=0.04) in ADD patients receiving standard dose of probiotics.
Conclusions: This study provides evidence that standard dose of multistrain probiotics significantly increased antioxidant levels, decreased oxidative stress and decreased inflammatory biomarkers in ADD as compared to low dose. The effects of probiotics on cognitive function and sleep disturbance need further larger and long-term studies.

Evaluation of the effects of sleep-related respiratory disorders (primary snoring-severe obstructive sleep apnea syndrome) and epilepsy clinic and their treatments on each other

U. Ozturk[1], A. Seyma Saritas[1], A. Kisabay Ak[1], M. Batum[1], H. Yilmaz[1]
[1]Manisa Celal Bayar University, Department of Neurology Section of Epilepsy and Sleep Disorders, Manisa, Turkey

Introduction: Epilepsy and sleep-related respiratory disorders can be isolated or coexisting, and determining the effects of both clinical presentations on each other is crucial.

Materials and Methods: Intragroup (primary snoring-epilepsy coexistence and severe obstructive sleep apnea syndrome (OSAS)-epilepsy coexistence/pre- and post-treatment) and intergroup comparisons included demographic data, history, and parameters related to epilepsy and OSAS. Changes in the parameters after treatment and the effects of epilepsy and OSAS on each other were evaluated.

Results: Each group included 28 patients. Age, body mass index, age of onset and duration of epilepsy, diseases related to atherosclerotic risk factors, and Epworth Sleepiness scores were significantly higher in the severe OSAS group.

The frequency of seizures improved statistically significantly both in the severe OSAS and primary snoring groups (p<0.001, p=0.004, respectively) after the treatment. While there was a significant difference in the severe OSAS group (p<0.001) in the pre- and post-treatment EEG findings (normal or pathological), there was none in the primary snoring group (p=0.344). Regarding monotherapy/polytherapy, the difference was not statistically significant in the severe OSAS group (p=0.895), yet it was in the primary snoring group (p=0.002).

The snoring complaints of the patients decreased, and the sleep structure improved with the decrease in the doses of antiepileptic drugs and the improvement of the complaints.

Conclusions: Both sleep and epilepsy are active processes of the central nervous system that mutually affect each other. Patients with coexistence of primary snoring-epilepsy and patients with severe OSAS-epilepsy were included in this study. In our study, polysomnography examinations of both primary snoring-epilepsy and severe OSAS-epilepsy groups were evaluated, and a comparison was made for the first time in the literature. Epilepsy and OSAS comorbidity are more common in patients with frequent seizures and in treatment-resistant epilepsy. In patients with epilepsy, a higher OSAS prevalence (43.8%) was reported in the severe refractory epilepsy group (>1 seizure/month), while it was reported in 30.7% patients in the mild group (0-1 seizure/month. It has been shown that after treatment for snoring and apnea, the frequency of seizures decreases, seizures can be better controlled, and antiepilepitleptic doses can be reduced,In our study the frequency of seizures improved statistically significantly both in the severe OSAS and primary snoring groups after the treatment as in the liteature. While there was a significant difference in the severe OSAS group in the pre- and post-treatment EEG findings, there was none in the primary snoring group. Regarding monotherapy/polytherapy, the difference was not statistically significant in the severe OSAS group, yet it was in the primary snoring group. The snoring complaints of the patients decreased, and the sleep structure improved with the decrease in the doses of antiepileptic drugs and the improvement of the complaints. In conclusion; understanding the relationship between epilepsy and sleep disorders, revealing and treating accompanying sleep-related problems; will contribute to the reduction of excessive daytime sleepiness and the control of epileptic seizures. Controlling epileptic seizures; leads to an increase in sleep quality and a significant decrease in apnea and snoring complaints.

Exploring the molecular pathways linking sleep phenotypes and POGZ-associated neurodevelopmental disorders

B.P. Marquezini[1], M. Moysés-Oliveira[1], A. Kloster[1], L. Cunha[1], T.B. Deconto[1], A.C. Mosini[1], P. Guerreiro[1], M. Paschalidis[1], L.N.G. Adami[1], M.L. Andersen[1,2], S. Tufik[1,2]
[1]Sleep Institute, Associação Fundo de Incentivo à Pesquisa, São Paulo, Brazil, [2]Universidade Federal de São Paulo, Departamento de Psicobiologia, São Paulo, Brazil

Introduction: Sleep problems are prevalent in neurodevelopmental disorders and have been associated with effects on cognitive, emotional, and interpersonal functioning. *POGZ* (Pogo transposable element-derived protein with ZNF domain) gene encodes a transcription factor and its variants are strongly associated with autism spectrum disorder. Patients' clinical reports frequently including obesity and sleep problems, including obstructive sleep apnea (OSA). Yet the biological pathways which link sleep traits and the *POGZ*-associated syndrome remain unclear.

Aim: We performed a genotype-phenotype correlation between *POGZ* variants previously described and their sleep implications. We then identified genes associated with sleep traits among the *POGZ* regulatory targets, aiming to dissect the molecular pathways that, when disturbed by *POGZ* loss of function, contribute to the etiology of sleep phenotypes in these patients.

Methods: *POGZ* variants described in patients' reports which included subjective evaluation of sleep and body mass index were collected and screened according to their mutational mechanism. Benefited from recent large-scale genome wide association studies, we manually curated a set of genes associated with sleep traits, including a broad list of sleep disorders and circadian phenotypes. We generated a list of genes directly regulated by *POGZ* by mapping previously described *POGZ* genomic binding sites to gene promoters using Biomart. We contrasted these 2 gene lists to generate an intersection gene list. A gene enrichment study was performed using the third gene list as input. The Benjamini–Hochberg test was used to identify enriched pathways, with a significance threshold of Adjusted *p-value*<0.05. Gene Ontology (GO) and Kyoto Encyclopedia of Genes and Genomes (KEGG) terms were considered in the over-representation analysis.

Results: Sleep disturbances were observed in 52% of patients' reports. Although obesity is a common clinical feature in this syndrome (78% prevalent), being obese was not a risk factor for developing sleep problems in patients with *POGZ* mutations (Fisher exact test, *p-value*=0.3). Loss-of-function variants were the most common mutational mechanism associated with sleep phenotypes. There were 223 overlapping genes between the gene lists associated with sleep phenotypes (1,064 genes total) and the POGZ regulatory targets (4,189 genes total). Significantly enriched pathways among these 223 intersect genes perform in the regulation of circadian rhythm (*p-value*=3.74E-04; OR=13.3), tau protein binding pathway (*p-value* =5.02E-06; OR=16), ATPase regulator activity (*p-value*=8.25E-04; OR=10.6) and RNA binding (*p-value*=9.94E-04; OR=1.99).

Conclusions: Although obesity was not detected as a risk factor for sleep problems in this syndrome, it is known that there is an association between obesity and OSA. This condition was not objectively screened in these patients and could partially mediate the manifestation of sleep problems in patients with *POGZ* mutations. The enrichment of circadian rhythm and tau protein pathways among the intersect gene list reinforces that the loss-of-function of *POGZ* affects processes related to sleep physiology. The overlapping gene set and biological pathways highlighted by this study may serve as a primer for new functional investigations of shared molecular mechanisms between sleep disturbances and rare developmental syndromes related to *POGZ* and its regulatory target.

Frequency of poor sleep quality and its potential variables correlation in Thai epilepsy patients

S. Tiensuntisook[1], T. Awirutworakul[1], A. Boongird[2]
[1]Chakri Naruebodindra Medical Institute, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Psychiatry, Samut Prakan, Thailand, [2]Ramathibodi Hospital,Faculty of Medicine, Mahidol University, Neurology, Bangkok, Thailand

Introduction: Epilepsy is one of the most common neurological disease. Epilepsy and sleep have a bidirectional relationship. Epilepsy can cause poor sleep quality in patients. Concurrently, poor sleep quality may trigger epilepic seizure. Understanding this relationship can provide early intervention for better sleep quality and epilepsy control including screening and preventing possible following comorbidities.

Materials and methods: A cross-sectional study was conducted at Ramathibodi Hospital, Bangkok, Thailand. A Total of 122 patients, diagnosed by a neurologist as those who had epilepsy were recruited at the outpatient neurology clinic of the hospital. In this study, the demographic data of all patients was collected. All participants evaluated their sleep quality, using paper of Thai version of the Pittsburgh sleep quality index questionnaire. The frequency of poor sleep quality was determined. The correlation between potential variables and the presence of poor sleep quality in patients with epilepsy was analyzed using t-test, chi-square and Fisher's Exact Test.

Results: Primary objective: To assess the frequency of poor sleep quality in epilepsy patients. Secondary objective: To identify potential variables correlated with poor sleep quality in epilepsy patients.

The participants were patients aged 18-68 years with the mean age of 46.32 years (SD=15.21). 64 participants (52.45%) were male and 58 participants (47.54%) were female.

From our findings, the frequency of poor sleep quality was 53.27%. Poor sleep quality was found to be statistical significance correlated with temporal lobe epilepsy ($P<0.01$) and age ($P=0.01$). There is no significant correlation between the number of epileptic drugs ($P=0.081$), sex ($P=0.33$) and education level ($P=0.44$) and poor sleep quality in epilepsy patients.

Conclusions: The frequency of poor sleep quality among Thai patients with epilepsy was high especially in temporal lobe epilepsy and older patients. Awareness and Screening for poor sleep quality in patients with epilepsy could help physician to provide early intervention for better sleep quality, epilepsy control and improve patients' quality of life.

Home Sleep EEG biomarkers of neurodegeneration

F. Fagundes Bueno[1], J. Dude[1], J. Boyd[1], K. Hedtkamp[1], Y.-E. Ju[2]
[1]Washington University in Saint Louis - School of Medicine, Neurology, Saint Louis, United States,
[2]Washington University in Saint Louis - School of Medicine, Neurology, Center on Biological Rhythms and Sleep (COBRAS), Hope Center for Neurological Disorders, Department of Anesthesiology, Saint Louis, United States

Introduction: Sleep EEG features, notably spindles and slow waves (SW), are promising candidate electrophysiological biomarkers for neurodegenerative disorders, but in-lab polysomnography (PSG) in older individuals can be challenging. Our objective was to investigate the performance of home sleep-EEG test (HST) against in-lab PSG for the measurement of promising neurodegeneration biomarkers. Secondarily, we assessed if EEG features differed by Alzheimer's Disease (AD) pathology status, as determined by biofluid markers.

Materials and Methods: 65 community-dwelling older adults (70.4+4.3 years) without prior neurological diagnosis completed HST, followed by PSG 4-14 days later. After artifact removal and filtering, custom Python scripts were applied to calculate various EEG features during NREM (N2 and N3), including spindle density, spindle duration, SW density, SW duration, and SW amplitude. Participants were grouped into cognitively-normal (CN; Clinical Dementia Rating (CDR) 0; N=50) and cognitively impaired (CI; CDR 0.5-1; N=15). Bland-Altman plots were used to assess agreement between HST and PSG for each EEG feature. We considered concordance correlation coefficient (CCC) ≥ 0.9 as excellent and 0.7-0.89 as good. Participants underwent lumbar puncture immediately following PSG, and cerebrospinal fluid amyloid-beta-42 and phosphorylated-Tau were assessed via Lumipulse. N=46 had CSF assays available for analysis, and phosphorylated-Tau:amyloid-beta-42 ratio >0.53 was the cutoff used for AD positivity (AD+, N=13) versus no AD (AD-, N=33). Wilcoxon test was used to compare AD+ and AD- groups.

Results: We observed a good agreement between HST and PSG for spindle density (CCC=0.83) and spindle duration (CCC=0.78). Analyses by CN and CI groups showed CCC was excellent for CI group (CCC=0.97 and 0.91) and good for CN group (CCC=0.82 and 0.83). SW density, SW duration, and SW amplitude all had good agreement between HST and PSG for the entire cohort (CCC= 0.87, 0.75, 0.75 respectively) as well as CN and CI groups. The only EEG feature tested that was significantly different between AD+ and AD- groups was the HST SW amplitude (78.7 vs. 82.3 µV, p=0.035). Directionality was the same for PSG SW amplitude but not significantly different (82.7 vs. 84.0 µV, p=0.612).

Conclusions: HST has good-to-excellent agreement with PSG for detection of spindle and SW EEG biomarkers of neurodegeneration in older adults, both cognitively normal and impaired. Secondary analysis showed SW amplitude measured by HST differed between AD+ and AD- groups, suggesting that EEG biomarkers obtained in the home setting may be useful for screening for AD pathology noninvasively, even in the preclinical, pre-symptomatic stages of AD.

Mutational mechanisms related to sleep disturbance in patients with SYNGAP1–associated syndrome

A.C. Mosini[1], M. Moysés-Oliveira[1], T.B. Deconto[1], B. Pereira Marquezini[1], P. Guerreiro[1], L. Cunha[1], A. Kloster[1], M. Paschalidis[1], L.N. Gallego Adami[1], M. L. Andersen[1,2], S. Tufik[1,2]
[1]Sleep Institute, Associação Fundo de Incentivo à Pesquisa, São Paulo, Brazil, [2]Universidade Federal de São Paulo, Departamento de Psicobiologia, São Paulo, Brazil

Introduction: Developmental and epileptic encephalopathies (DEEs) refer to a group of severe epilepsies characterized by seizures (often drug-resistant), as well as developmental delay. Pathogenic variants in the SYNGAP1 gene cause childhood-onset epilepsy, developmental delay, movement disorders, and autism spectrum disorder. SYNGAP1-associated syndrome has greater severity of sleep disturbance, such as problems falling asleep or staying asleep, respiratory problems, disorders of awakening, sleep-wake disturbances, excessive daytime sleepiness, and sleep hyperhidrosis.
Aim: We identified variants in SYNGAP1 described in patients with EEs and NDD that cluster in conserved protein domains and are associated with sleep disturbances, performing a genotype-correlation to pinpoint mutational mechanisms associated with the etiology of sleep problems in this syndrome.
Methods: We systematically reviewed all articles published in the last 10 years that reported SYNGAP1 variants associated with DEEs. We mapped pathogenic or likely pathogenic variants against the most important protein domains coded by this gene (i.e. pleckstrin homology (PH), C2, and Ras-GAP domains). The patients' clinical features were analyzed for possible associations of specific mutational mechanisms with sleep disturbances.
Results: From a total 77 variants identified in SYNGAP1, 18 were missense, and 59 presented mutational mechanisms associated with protein truncation (e.g. frameshift or nonsense). Among those that were mapped to protein domains, 9 were in the PH, 7 in the C2, and 18 in the RAS-GAP. Additionally, 43 of 77 patients had variants outside protein domains. Forty-eight of 77 variants were de novo, and 29 had unknown inheritance. Around 57 EEG abnormalities during sleep or sleep problems were reported. In general, EEG abnormalities showed spike-waves during sleep, increased frequency in generalized spike-waves, focal and generalized discharges. Sleep problems ranged from difficulty initiating and/or maintaining sleep, with many individuals taking sleeping medications. Additionally, there were individuals with restless legs, sleep apnea and parasomnias. Most variants in patients with sleep problems were observed in the Ras-Gap protein domain and presented mutational mechanisms associated with protein truncation.
Conclusions: Precision Medicine aids precise, individualized treatments by recognizing each patient as unique. In *SYNGAP1*-associated syndrome, 62% of reported patients have sleep-related complaints, with disruption of the Ras-Gap domain being often linked to sleep disturbances. The most common sleep-related variant types involve protein truncation, which indicates that the loss of *SYNGAP1* gene function is a relevant mechanism in this association. Identifying mutational mechanisms tied to sleep disturbances in this syndrome may reveal the molecular pathways connecting it to sleep physiology, a first step towards personalized interventions.

Non-invasive neuromodulation with the NESA device to improve sleep, pain, and bladder symptoms in patients with multiple sclerosis

E. Teruel-Hernández[1], R. Medina-Ramírez[1], M. Contreras-Polo[2], B. Machío-Castello[1]
[1]University of Las Palmas de Gran Canaria, Las Palmas, Spain, [2]Clínica Sinapsis Fisioterapia, Palma, Illes Balears, Spain

Introduction: Multiple sclerosis (MS) is an autoimmune demyelinating inflammatory disease of unknown cause and chronic course caused by damage to myelin. Myelin damage results in impairment of the ability of nerves to conduct electrical impulses to and from the brain and this produces a variety of symptoms including spasticity, fatigue, neuropathic pain and/or urinary incontinence. Because they often do not remit and respond poorly to conventional medical treatment, attention has recently turned to novel interventions for bladder, pain, and sleep management. Non-invasive surface neuromodulation applied with the NESA device can help restore electrical balance in the body by regulating the Autonomic Nervous System and is beginning to show promising results in patients with sleep disorders. So, it may be an opportunity for an autonomic approach to sleep, bladder, and pain management. The aim of the study has been to improve sleep quality as well as urinary incontinence control and pain perception in patients treated exclusively with NESA technology.

Materials and Methods: A prospective randomized quasi-experimental study is conducted with 11 patients from a local multiple sclerosis association. They were divided into two treatment groups (Group A: with NESA microcurrent treatment based on program 2 + program 3 (with directional electrode located at L1-L3) and program 5 + program 7 (with directional electrode located at C7). Each program for 15min. Group B: with NESA microcurrent treatment based on program 2 + program 6 + program 5 + program 7 (with directional electrode located at C7). Data on sleep quality, urinary incontinence and pain are measured using various rating scales at three different times during the study.

Results: The analysis of the urinary incontinence and pain variables shows significant and favorable data in the treatment group with programming A with a positive improvement throughout the 3 weeks of treatment, obtaining a more favorable score with programming A. The sleep quality variable shows a significant improvement in both experimental groups, obtaining a more beneficial score in the treatment group with the A programming.

Conclusions: This new technology attempts to neuromodulate the autonomic nervous system which is involved in many endogenous regulations such as sleep, stress, bladder, or chronic pain. This first study using the Nesa non-invasive neuromodulation device in patients with multiple sclerosis reveals its efficacy in improving sleep quality, pain, and urinary incontinence.

Non-REM stage 3 sleep disruption across the spectrum of AD severity: from cognitively unimpaired to dementia

L. Yack[1,2], C.M. Walsh[1], N. Falgàs[3,4], N. Pandher[1], Q. Coppola[1], F. Song[1], A.J. Simon[1,5], M. Tucker[1], R. Saloner[1], K. Casaletto[1], J.H. Kramer[1], M. Gorno Tempini[1], H. Rosen[1], G.D. Rabinovici[1], L.T. Grinberg[1,4], T.C. Neylan[1,2]
[1]University of California San Francisco, San Francisco, United States, [2]San Francisco VA Health Care System, San Francisco, United States, [3]Hospital Clínic de Barcelona, Barcelona, Spain, [4]Global Brain Health Institute, San Francisco, United States, [5]Yale University, New Haven, United States

Introduction: Sleep disruption often occurs in Alzheimer's disease (AD) and sleep/wake nuclei are affected early in AD, however it remains unclear if this disruption precedes objective cognitive impairment and if it worsens at later stages of AD. Previously, our group found that even in cognitively unimpaired individuals, those with subclinical insomnia have cortical thinning in areas associated with Alzheimer's disease. We hypothesized that sleep disruption would be detectable in cognitively unimpaired individuals with positive AD biomarkers and this disruption would correlate with clinical severity.

Materials and Methods: Participants were recruited from the UCSF Memory and Aging Center who were: 1) cognitively unimpaired older adults with a Clinical Dementia Rating scale (CDR)=0 and were either positive (CU AD+) or negative (CU AD-) for AD biomarkers (PET imaging, CSF or plasma markers assessing amyloid and tau); or 2) had a diagnosis of amnestic MCI or dementia due to AD. Participants wore a self-applied EEG device (Sleep Profiler, Advanced Brain Monitoring, Inc.) in their home environment. To evaluate sleep with preclinical AD we assessed sleep measures from 20 nights (9 OA-, 11 OA+) controlling for age and gender. To determine whether sleep disruption is related to AD clinical severity, we performed partial correlations between Sleep Profiler data (35 nights) and CDR sum of boxes (range: 0 to 7) across OA+, MCI and AD.

Results: Compared to CU AD-, CU AD+ spent more time in bed (p<0.05), had marginally poorer sleep efficiency (p=0.08), had more wake after sleep onset (p<0.05), and had diminished NREM delta power (p<0.001) despite greater N3 (hrs: p<0.01, percent: p<0.01). Higher total sleep time (p<0.05), higher time spent in N3 (hrs: p<0.001, percent: p<0.001) and lower delta power (p<0.01) related to worse clinical severity (higher CDR sum of boxes).

Conclusion: Results suggest differential sleep patterns emerge in preclinical AD, including increased wake during the night and disruption of NREM sleep microarchitecture. As AD clinical severity worsens, N3 degradation worsens and becomes detectable at the macroarchitectural level. With disease progression, N3 microarchitecture continues to degrade, with the addition of overall N3 sleep macroarchitecture. N3 is typically associated with memory formation, thus, diminished delta power during N3 precedes detectable cognitive impairments, while loss of N3 itself becomes more pronounced as cognition worsens. Further research is needed to assess this in a larger cohort to determine if sleep measures may be a biomarker for early AD, especially in identifying those that are at risk, potentially suggesting that sleep could be a targetable intervention at these earliest, pre-cognitive impairment stages of AD.

Quality of sleep and profile of sleep disorders among adult patients with epilepsy in Burkina Faso: a cross-sectional multicenter study

A.A. Dabilgou[1], A. Dravé[2], J.M.A.W. Kyelem[1], D. Bonou[1], C. Napon[3], A. Millogo[4], K. Karfo[1], J. Kaboré[1]
[1]University Joseph KI ZERBO / Yalgado Ouédraogo University Hospital, Ouagadougou, Burkina Faso, [2]University of Ouahigouya, Ouahigouya, Burkina Faso, [3]University Joseph KI ZERBO / Bogodogo University Hospital, Ouagadougou, Burkina Faso, [4]University Joseph KI ZERBO / Sanou Sourou University Hospital, Bobo Dioulasso, Burkina Faso

Introduction: Sleep disturbances are a common complaint in epileptic patients. The objective of our study was to determine the prevalence of sleep quality and profile disorders among adult patients with epilepsy aged at least 18 years.

Material and methods: This was a multicenter cross-sectional study conducted from July 05 to October 04, 2021. Selected patients were evaluated by the sleep quality index, the Epworth sleepiness scale, the Severity index of Insomnia; the severity scale of the international Restless Leg Syndrome Study Group and the Berlin questionnaire

Results: Ninety-six patients with a mean age of 32.12 ± 15.26 years were selected. The majority of respondents were male gender (51%) and had generalized epilepsy (71%). Phenobarbital (35.4%), sodium valproate (30.2%) and carbamazepine (29.1%) were the most common antiseizure medications. Adherence to treatment was 80.2%. Poor sleep quality was observed in 32.3%. The main sleep disorders were excessive daytime sleepiness (26%), insomnia (24%), obstructive sleep apnea (24%) and restless legs syndrome (6.3%). Chronic pain (p=0.02), seizure frequency (p=0.016), and carbamazepine (p=0.03) were associated with daytime sleepiness, insomnia, and restless legs syndrome, respectively. The factors associated with apnea were area of residence (p=0.027) and smoking (p=0.024).

Conclusion: Sleep disorders are frequent in adults with epilepsy followed in neurology. Screening for these disorders in these patients is therefore necessary.

Keywords: Sleep quality, sleep disorders, factors associated, multicentric study, Burkina Fasouction:

Race differences in estimates of in-home sleep architecture in diverse populations with and without cognitive impairment

Y. Leng[1], C. Peltz[2], S. Redline[3], S. O'Bryant[4], K. Yaffe[5]
[1]University of California, San Francisco, Department of Psychiatry and Behavioral Sciences, San Francisco, United States, [2]San Francisco VA Medical Center, San Francisco, United States, [3]Brigham and Women's Hospital, Harvard Medical School, Department of Medicine, Division of Sleep and Circadian Disorders, Boston, United States, [4]Institute for Translational Research, University of North Texas Health Science Center at Fort Worth, Fort Worth, United States, [5]University of California, San Francisco and San Francisco VA Medical Center, Departments of Psychiatry and Behavioral Sciences, Neurology, and Epidemiology, San Francisco, United States

Introduction: Sleep disturbances are highly prevalent in patients with cognitive impairment and have been increasingly recognized as an important risk factor for dementia. However, in-lab sleep studies are costly and often impractical at a population level, particularly with diverse populations. There are limited data on measures of sleep continuity and architecture in the home setting among Black, Mexican American (MA) and non-Hispanic White (NHW) adults, with and without cognitive impairment.
Materials and methods: To date, the ongoing Health and Aging Brain Study-Health Disparities (HABS-HD)-Dormir study has enrolled 732 participants using a community-based participatory research approach. In-home sleep testing was assessed using WatchPAT (WatchPAT-200) and the zzzPAT software (5.2.79.7p), which provides estimates of sleep duration, sleep efficiency, and REM and NREM sleep duration using a proprietary algorithm. Dementia, mild cognitive impairment (MCI) or normal cognition (NC) were determined based on a comprehensive clinical evaluation.
Results: On average, participants were aged 66.7±8.4 (50-92) years, including 64.2% women; 34.4% MA, 23.8% Black and 41.8% NHW adults; 22.1% classified as MCI or dementia. After adjustment for age, sex, race, body mass index and comorbidities, participants with MCI or dementia compared to those with NC had shorter adjusted mean sleep duration (6.3 vs. 6.7 hours, p=0.002), lower sleep efficiency (77.2% vs. 82.1%, p<0.001), longer sleep latency (32.3 vs. 25.7 minutes, p=0.006) and longer REM sleep latency (116.5 vs. 95.4 minutes, p=0.002); had lower REM sleep percentage (20.1% vs. 23.1%, p<0.001), and higher NREM sleep percentage (80.0% vs. 76.9%, p<0.001). The association between sleep staging (REM or NREM sleep percentage) and cognitive diagnoses was only significant among Black participants (p for interaction=0.02).
Conclusions: Individuals with MCI/dementia differed from those with NC in key measures of sleep architecture assessed by a home sleep test, suggesting both the utility of in-home assessments to estimate sleep in middle-aged and older diverse samples and the need to understand the race differences underlying associations between sleep architecture and cognition in community-based studies.

Recruitment of inspiratory muscles according to the different stages of sleep in amyotrophic lateral sclerosis is a reliable indicator of the evolution of alveolar hypoventilation

G. Mwenge[1], C. Smetcoren[2]
[1]Cliniques Universitaires Saint-Luc, Pneumology, Brussels, Belgium, [2]Cliniques Universitaires Saint-Luc, Neurology, Brussels, Belgium

Introduction: In patients with ALS, diaphragmatic dysfunction results in inspiratory recruitment of the extra-diaphragmatic muscles during sleep. This activation reflects a certain degree of plasticity in the respiratory control system in order to compensate. However, we observed considerable heterogeneity amongst patients, and within the different stages of sleep.

Objectives: To determine the predictors of inspiratory muscle activation by a retrospective analysis of polysomnographies of ALS patients.

Materials and Methods: From January 2019 to January 2023, we consecutively reviewed all polysomnograms of ALS patients. Electromyography (EMG) electrodes of the sterno-mastoid muscles were always used to identify early diaphragmatic dysfunction. All polysomnograms were manually examined to quantify the SCM muscle phasic activation (SCM +) during each stage of sleep (N1, N2, N3 and REM). Total sleep time (TST), sleep stage duration, apnea/hypopnea index, time spent below 90% oxygen saturation and vital capacity (VC) at time of polysomnography were also collected.

The patients were then divided into 4 groups

Group 1: no phasic activation present on the SCMs

Group 2: activation was present exclusively during REM sleep

Group 3: activation was detected only during SWS

Group 4: activation observed in deep SWS and REM sleep.

Results: The percent VC was significantly different between the groups. The highest percentage was observed in group G2 (72% of the predicted values compared with 55%, 48% and 46% respectively for groups G1, G3 and G4) p value 0.022. In G3 and G4 patients with predominant NREM activation, Rem duration was reduced. A multiple linear regression analysis revealed that the explanatory determinants of the SCM activation were not only the duration of REM sleep but also time below 90% saturation.

Conclusions: ALS patients have activation of the SCM muscles early in the disease. This activation initially occurs only during REM sleep. As the disease progresses, this activation extends to SWS, at the sacrifice of the duration of REM sleep. The lack of activation of the neck muscles may reflect the absence of hypoventilation in patients who have only upper airway weakness.

Relationships between anxiety, academic difficulties, and sleep problems amongst college students with adhd: a questionnaire survey

O. Turcotte[1], C. Dumoulin[2], M. Aubin[1], N. Vézina[3], L. Laberge[1]
[1]Cégep de Jonquière, ÉCOBES - Recherche et Transfert, Jonquière, Canada, [2]Université du Québec à Chicoutimi, Sciences de l'Éducation, Chicoutimi, Canada, [3]Cégep du Vieux Montréal, Psychologie, Montréal, Canada

Introduction: The prevalence of ADHD is higher in the province of Quebec compared to other Canadian provinces and other industrialized countries. Over the past decade, the proportion of college students with ADHD has increased by 70% in Quebec. Also, students with ADHD experience more sleep problems and have lower academic achievement than their peers without this diagnosis. Additionally, sleep problems are known to exacerbate symptoms of ADHD and anxiety. The objective of this study is to clarify the relationships between anxiety, academic difficulties, and sleep problems among students with ADHD attending Quebec colleges.

Materials and Methods: A total of 520 students (mean age ± SD = 22.0 (6.3) years; 71.5% females, 22.9% males, 5.6% others) from Granby, Jonquière, and Vieux Montréal cégeps, who receive support from adapted services as a result of a diagnosis of ADHD, completed an online questionnaire on LimeSurvey. The questionnaire included the Generalized Anxiety Disorder scale (GAD-7), the Pittsburgh Sleep Quality Index (PSQI), the school, self-concept, and social functioning subscales of the Weiss Functional Impairment Rating Scale (WFIRS), the Adult ADHD Self-Report Scale (ASRS), and clinical information. Chi-square tests and independent t-tests were used to assess the relationships between variables. All analyses were performed using R Statistical Software v4.1.3.

Results: The prevalence of severe anxiety (GAD-7 score ≥ 15) and sleep problems (PSQI score ≥ 5) was respectively 29.7% and 85.9%. Furthermore, about one-third of students (32.7%) did not meet the diagnostic criteria for ADHD according to the ASRS, despite reporting a medical diagnosis of ADHD. Moreover, students who also met the criteria for ADHD according to the ASRS reported higher levels of anxiety (GAD-7 score of 12.0 vs. 8.3; $p < 0.001$), sleep problems (PSQI score of 10.1 vs. 7.5; $p < 0.001$), and difficulties in the WFIRS subscales of "school" (1.3 vs. 0.8; $p < 0.001$), "self-concept" (2.1 vs. 1.4; $p < 0.001$), and "social functioning" (1.0 vs. 0.7; $p < 0.001$) compared to students without a diagnosis of ADHD according to the ASRS. In addition, more ADHD students with the ASRS diagnosis used hypnotics (19.7 % vs 11.0 %; $p < 0.05$) and reported another diagnosis of mental health disorder (e.g., depression) (36.7 % vs 26.9 %; $p < 0.05$) compared to those without.

Conclusions: As expected, the majority of students with ADHD have poor sleep quality. The results suggest that students with ADHD who also meet the criteria for ADHD according to the ASRS are at a higher risk of experiencing health problems and academic difficulties, and therefore, they could be prioritized by student support services, namely in terms of school-based sleep interventions. The validity of medical diagnoses, often dating back several years, can also be questioned in light of these findings.

Risk of obstructive sleep apnea in stroke patients in tertiary-level hospitals in Luanda, Angola 2021

F. Samianza[1], C.A. Dias Pedro[2], M. Luemba[1]
[1]Agostinho Neto University of Angola, Neurociense and Mental Health, Luanda, Angola, [2]Sagrada Esperança Hospital of Luanda, Luanda, Angola

Introduction: Obstructive sleep apnea (OSA) is a disease characterized by pauses in breathing during sleep due to repetitive upper airway obstruction. Its prevalence in stroke patients varies between 50% and 70%. OSA is an independent risk factor for stroke. It has been a challenge to make the diagnoses in African countries special in our country, The burden of stroke remains very high in developing countries and OSA can interfere with the recovery, prognosis, and recurrence of stroke in these patients

Objective: Our main goal was to assess the risk of obstructive sleep apnea in stroke patients in tertiary-level hospitals in the province of Luanda, 2021.

Materials and methods: An observational, cross-sectional analytical study was carried out. The sample consisted of 151 patients, selected by the probabilistic method by clusters of multiple stages. The instruments used for data collection were the STOP-Bang questionnaire and the modified Rankin scale. Data were analyzed based on descriptive and analytical statistics using Cramer's V and Spearman's rho tests to assess the association between the degree of functional dependence and the risk of obstructive sleep apnea and an association between the risk of obstructive sleep apnea and brainstem injury.

Results: the representative sex was male (53.0%), and the predominant age group was 48-57 years (30.5%), with a mean age of 53.1±13.3 years, among the patients interviewed, 8.6% had a stroke in the brainstem region. Almost half of the interviewed patients (49.0%) had mild to moderate deficiency on the modified Rankin scale, and 38% were at high risk for obstructive sleep apnea. There was a positive association between the degree of functional dependence and the risk of obstructive sleep apnea (rs = 0.377; p = 0.000), there was no association between the risk of obstructive sleep apnea and brainstem injury (X2 = 3.703 / V = 0.157; p = 0.157).

Conclusions: We observed that stroke patients with a high degree of functional dependence tend to be at high risk for obstructive sleep apnea, There was no association between stroke located in the brainstem region and high risk for obstructive sleep apnea. Keywords: obstructive sleep apnea, stroke, functional dependence, and brainstem stroke.

Scoring sleep in neurodegenerative diseases: a pilot study in the synucleinopathies

A. Montini[1], A. Iranzo[2,3,4], P. Cortelli[1,5], C. Gaig[2,3,4], A. Munoz-Lopetegi[2,3,4], F. Provini[1,5], J. Santamaria[6]
[1]University of Bologna, Department of Biomedical and NeuroMotor Sciences (DIBINEM), Bologna, Italy, [2]Hospital Clínic de Barcelona, Sleep Disorders Center, Neurology Service, Barcelona, Spain, [3]Institut d'Investigacions Biomediques August Pi I Sunyer (IDIBAPS), Clinical Neurophysiology Group, Barcelona, Spain, [4]CIBERNED CB06/05/0018-ISCIII, Barcelona, Spain, [5]IRCCS Istituto delle Scienze Neurologiche di Bologna, Bologna, Italy, [6]Hospital Clínic of Barcelona and Biomedical Research Institute (IDIBAPS), Emeritus Consultant and Researcher, Barcelona, Spain

Introduction: Neurodegenerative diseases often alter sleep architecture, complicating the application of the standard sleep scoring rules. There are no recommendations to overcome this problem. Our aim was to develop a scoring method that incorporates the stages previously applied in dementia with Lewy Bodies (DLB), anti-IgLON5 disease, and fatal insomnia, and to test it in patients with alpha-synucleinopathies.

Materials and methods: Video-polysomnographies (VPSG) of nine patients (DLB:3, Parkinson's disease (PD):3, and multiple system atrophy (MSA):3) selected for their difficulty in applying standard rules were scored independently by two authors, using additional Sleep/Wake stages. These included abnormal Wake, Subwake, Undifferentiated NREM sleep (UNREM), Poorly structured N2 (P-S N2) and abnormal REM sleep including *REM without atonia (RWA), REM without low-amplitude, mixed-frequency EEG activity (RWL) and REM without rapid eye movements (RWR).*

Results: Patients (4 females) had a median age of 74 (range 63 to 85). Six patients (all with PD or DLB) had abnormal EEG awake and Subwake stage. UNREM sleep was present in all patients, typically at sleep onset, and was the most common sleep stage in five patients. P-S N2 was recorded only in the three patients with MSA. Periods of normal and abnormal NREM coexisted in three patients. RWA was the predominant REM subtype, RWR occurred mainly in patients with MSA and RWL in those with DLB. Six patients had brief REM episodes into NREM sleep which we termed "Encapsulated RBD".

Conclusions: Our scoring system allows an accurate description of the complex sleep-wake changes in patients with alpha-synucleinopathies.

Screening for sleep apnea and other sleep disorders in patients with multiple sclerosis in Chillan, Chile, 2023

P. Ortega Peña[1,2], J. Inostroza Espinoza[2], E. Luengo Troncoso[2], E. López Arcos[1,2]
[1]Herminda Martin Hospital, Chillan, Chile, [2]Universidad Católica de la Santísima Concepción, Chillan, Chile

The prevalence of sleep disorders in MultipleSclerosis (MS) population ranges from 47 to 62%. However, sleep disorders often go unrecognized and untreated in this population.

Objective: To evaluate the presence of sleep disturbances in patients with MS, characterizing their clinical presentation.

Methodology: Descriptive cross-sectional study using the STOP-BANG questionnaire, the Epworth scale, the Pittsburgh Sleep Quality Index (PSQI) and ambulatory polygraphy.

Results: There are currently 68 people with a diagnosis of MS under control at the Chillán hospital. During the first semester of 2023, 27 people participated in this study. Of those surveyed, 19 were women and 8 men, the average age was 41.4 years old(22-59 years). The average BMI was 27.1(17.8-34.6).

The average number of years since diagnosis was 7.1 years (0.5-14 years). 26 individuals have relapsing-remitting MS and one has secondarily progressive MS. Regarding treatment, 5 patients are receiving ocrelizumab, 10 with Interferon beta 1a, 3 with glatiramer acetate, 5 with fingolimod, 2 with natalizumab and 2 without disease-modifying therapies (DMTs).

The average rating of the fatigue severity scale was 5.4.(2.7-7)

According to the result obtained in the STOP-BANG, 6 participants have high risk of sleep apnea. These patients underwent polygraphy at home, in which an apnea-hypopnea index close to 15 was evidenced in 2 of them.

In the Epworth sleepiness survey, 10 patients obtained a score greater than 11 points, 4 of them also obtained high risk in the STOP-BANG.

According to the PSQI, 10 patients would not present sleep disturbances, 8 mild, 7 moderate, and 2 severe disturbances.

When evaluating the breakdown of the components, a greater alteration was evidenced in components 2 and 5 of the PSQI, which refer to sleep latency and disturbances during sleep, respectively. Considering the latter, the participants complain of respiratory problems, pain, bruxism and legs movement.

In conclusion, most of the surveyed patients had sleep problems, with close to half of those surveyed being in the severe range, and in particular sleep apnea was also evident.

Early diagnosis and treatment of sleep problems in MS offer a new opportunity to improve some of the daytime fatigue experienced by MS patients and partly improve their quality of life.

To increase this opportunity, the physician should consider sleep disturbances within the routine evaluation of MS patients.

Sleep abnormalities in a 15-year-old boy with epileptic encephalopathy and SCN8A mutation - a case study

K. Avramov[1], T. Georgiev[1], A. Draganova[1], F. Alexiev[2], K. Terziyski[1,3]
[1]Medical University - Plovdiv, Pathophysiology, Plovdiv, Bulgaria, [2]St. Anna Hospital, Clinic of Neurology, Sofia, Bulgaria, [3]Complex for Translational Neuroscience at MU - Plovdiv, Plovdiv, Bulgaria

Introduction: There is a complex interplay between epileptic encephalopathies (EE) and sleep architecture in patients, but literature on the topic is scarce. A small number of studies reports altered sleep structure in patients with EE, compared to healthy controls, with a significant reduction in polysomnographic parameters related to sleep duration and quality; marked sleep fragmentation; abnormal respiratory and limb movement events. It has been illustrated that disrupted sleep can provoke subclinical seizures. Here we present a patient with rare EE caused by de novo mutation of the SCN8A gene.

Materials and Methods: Unattended home-based polysomnography was performed using NOX A1 PSG systems, including: 10-channel electroencephalography according to 10-20 system; electrocardiography – I lead; pulsoxymetry; electromyography; limb movements; respiratory effort; nasal airflow. Documentation from previous hospitalizations and genetic analysis was shared by the parents. Manual scoring of the sleep study was performed by two somnologists following AASM scoring rules.

Results: The patient is a 15-year-old male with treatment-refractory epilepsy with seizure onset at 4 months of age and first generalized tonic-clonic seizure at the age of 6 months. Genetic analysis showed mutation of heterozygous state in exon 27 of SCN8A gene, which is classified as Early Infantile Epileptic Encephalopathy, type 13. The gene encodes transmembrane protein $Na_v1.6$ in a voltage gated sodium channel. The patient was brought to the sleep laboratory due to concerns of his parents related to snoring and witnessed cessations of breathing during sleep, difficulties falling asleep at night and 3-4 hours of sleep in the afternoon. The sleep study showed shortened total sleep time of 5 hours and 53 minutes and increased sleep efficiency - 98.1%. Severely altered sleep structure was present with absent REM sleep (0%) and increased NREM sleep (N2=55.5%, N3=44.1%). The arousal index was normal (7.0). The patient entered sleep through an epileptic seizure, which matches the parents' report. Spike-and-wave epileptiform complexes were interspersed within normal sleep EEG phenomena throughout the recording. Seven episodes of generalized epileptiform discharges, lasting approximately 30 seconds, were detected – 2 during sleep initiation, two from N3 sleep with sleep transition to N2 and 3 in the last 30 minutes before awakening from N2, following arousals. Apnea-hypopnea index was 3.9/hour and periodic limb movements were absent. Epileptic activity was independent of any respiratory or movement events. During the 4 hours of wake EEG recorded before sleep, there was one intrusion of REM for the duration of three epochs with apparent change of body position from upstanding to supine, which was not associated with a seizure.

Conclusions: To the best of our knowledge, this is the first detailed description and analysis of polysomnographic parameters in a patient with SCN8A mutation. The absence of REM sleep in the patient is in concordance with the previously reported decrease in REM in EE. Sleep stage transitions (wake-NREM-wake) were the most vulnerable periods for epileptic discharges, in the absence of abnormal respiratory or movement events.

Sleep characteristics in children with attention deficit hyperactivity disorder

A.L. Decanini Miranda de Souza[1], C.M. Giacheti[1], M.C.H. Couto[1], C.S. Galina Spilla[1], C. Brites[2], M. Proença[3], L. Pinato[1]
[1]São Paulo State University, Speech, Language and Hearing Sciences, Marília, Brazil, [2]Neurosaber, Londrina, Brazil, [3]São Paulo State University, Department of Physiotherapy and Occupational Therapy, Marília/SP, Brazil

Introduction: Attention deficit hyperactivity disorder (ADHD) represents an evolving construct refined and developed over the last few decades in response to research into its nature and clinical structure. The clinical presentation and course of the disease have been extensively characterized. Besides the triad of hyperactivity, inattention, and impulsivity, children with ADHD often present sleep disorders that can exacerbate behavioral problems in various settings. This project aimed to utilize a clinical sample to perform a more thorough examination of sleep characteristics among ADHD compared with typically developing children (TD).

Materials and methods: This study was approved by the local Research Ethics Committee (#2151884/2017). A total of 19 ADHD and 19 TD participated in this study. ADHD and TD were gender- and age-matched, being 7 female and 12 male, from 6 to 12 years of age (ADHD 9 [8-11] years vs. TD 10 [9-11] years; p=0.43). Actigraphy (Act Trust, Condor, Brazil) was used to objectively evaluate the sleep-wake cycle, which records motor activity by an accelerometer system, body temperature, and exposure to light during the period of use. The actigraph was used for seven consecutive days on the wrist of the non-dominant forearm. The data were described as median and interquartile range, and the Mann-Whitney test was used to compare the groups. The significance level adopted was $p<0.05$.

Results: Actigraphy analysis showed that ADHD children had worse sleep quality, with greater latency (15 [11-28] min) to sleep than the TD group (10 [8-14] min), $p<0.04$; and lower sleep efficiency (88 [87-92] %) compared to the TD group (92 [90-93] %), $p<0.01$. There was no difference between the groups in terms of sleep time (ADHD 7 [7-8] hours vs. TD 8 [8-9] hours) and micro-arousals that children experience throughout the night, added to naps during the day (ADHD 36 [24-48] min vs. TD 31 [23-44] min).

Conclusion: ADHD children had higher sleep latency and lower sleep efficiency than TD children of the same age. These results highlight the importance of early detection of sleep disorders in children with ADHD since poor sleep quality can be related to behavioral complications, and the treatment of these disorders improve the condition and, consequently, the quality of life of these children.

Sleep disordered in children who stutter: a descriptive analysis with focus on actigraphy data

M.C.H. Couto[1], C.M.C. Oliveira[1], N.C. Silva[1], A.L.D.M. Souza[1], M. Proença[2], L. Pinato[1]
[1]São Paulo State University -UNESP, Department of Speech, Language, and Hearing Sciences, Marília, Brazil, [2]São Paulo State University -UNESP, Department of Physiotherapy and Occupational Therapy, Marília, Brazil

Introduction: Stuttering is a developmental disorder of speech fluency resulting from neurological dysfunctions in motor and temporal control. Individuals who stutter can be compromised by negative self-perception, anxiety, and depression, leading to sleep problems. On the other hand, sleep disorders can result in decreased motivation and concentration, memory deficit, daytime sleepiness, mood swings, immune decline, and worsening of motor alterations, highlighting the stuttering condition. Additionally, the few studies that address the subject use questionnaires, and their results suggest that children who stutter present more indications of sleep disorders than their peers with typical development. Considering the impact of sleep disorders on clinical conditions and therapies, the present study aimed to evaluate the sleep-wake cycle parameters of children who stutter and compare them to children who do not stutter.

Methods: This study was approved by the local Research Ethics Committee (61001422.1.0000.5406). Children of both sexes, aged 4 to 11 years, participated in the study; there was a group of children diagnosed as stuttering by a professional (CWS - Children who stutter) and another group of children who do not stutter (CWNS), both without additional comorbidities that could interfere in the study. In both groups, the participants were investigated regarding sleep quality by sleep-wake cycle parameters, evaluated using actigraphy (Act Trust, Condor, Brazil) for seven days, a minimum of 22h each day. The data were described as median and interquartile range, and the Mann-Whitney test was used to compare the groups. The significance level adopted was $p < 0.05$.

Results: The study sample consisted of 48 children (24 in each group), in two groups paired by sex (75% male) and with no difference in median age between groups (CWS 8 [7-11] years vs. CWNS 10 [8-11] years; p=0.09). Analysis by actigraphy showed that children who stutter had worse sleep quality, with longer latency to sleep (24 [18-30] min) than the CWNS group (10 [8-14] min), $p < 0.001$; and lower sleep efficiency (87 [84-90] %) compared to the CWNS group (90 [88-92] %), p=0.03. There was no difference between the groups in sleep time (CWS 8 [8-8] hours vs. CWNS 8 [7-9] hours) and micro-awakenings that children experienced during the night, plus daytime naps (CWS 38 [26-67] min vs. CWNS 41 [26-49] min).

Conclusion: This study demonstrated in an unprecedented manner actigraphic sleep parameters in children who stutter. Children who stutter had longer latency to sleep and lower sleep efficiency than children who do not stutter of the same age, demonstrating that the quality of sleep in this population is inferior compared to children with typical development. These findings illustrate the importance of considering possible sleep problems in treating this population.

Sleep disorders in patients with Parkinson's disease in a Venezuelan Hospital

C. Cardenas[1], M.V. Alvarez[1], M. Gonzalez Quintero[1], S. Mata Essayag[2]
[1]Universidad Central de Venezuela / Escuela de Medicina "José María Vargas", Catedra y Servicio de Neurología Hospital Vargas de Caracas, Caracas, Venezuela, [2]Universidad Central de Venezuela / Escuela de Medicina "José María Vargas", Catedra y Servicio de Psiquiatría Hospital Vargas de Caracas, Caracas, Venezuela

Introduction: Parkinson's disease (PD) is a complex neurodegenerative process that appears in adulthood, which is clinically characterized by the presence of the motor triad: akinesia or slow movement, tremor at rest, and rigidity. In recent decades, the recognition of non-motor manifestations such as neuropsychiatric symptoms, sensory symptoms, and sleep disorders has increased. Currently, the incidence of these disorders in patients with PD is unknown in Venezuela, due to the lack of studies that address this issue. For this reason, the researchers set out to determine the prevalence of symptoms and sleep disorders through the application of the Global Sleep Assessment Questionnaire (GSAQ) and Scales for Outcomes in Parkinson's Disease-Sleep (SCOPA-sleep) in a sample Random study of patients diagnosed with Parkinson's disease, from the Neurology service of the Hospital Vargas de Caracas.
Materials and Methods: A descriptive, analytical, and prospective study, based on the application of the GSAQ and SCOPA-sleep scales, to assess sleep disorders in patients with diagnosed Parkinson's disease who attend the Neurology service of the Hospital Vargas de Caracas.
Results: The sample consisted of 50 patients, the age of this group being 65 ± 10 years, the majority male, 30 (60%), and 20 (40%) female. Regarding the identification of non-motor symptoms, these were: smell disorder, 13 (61.9%), sleep disorder, 7 (33.3%), constipation, 3 (14.3%), anxiety, 1 (4, 8%), taste disorder 1 (4.8%) and depressive disorders 1 (4.8%). After applying the QSAQ, 32 patients (64%) were positive for insomnia, 30 (60%) for hypersomnia, 19 (38%) qualify for shift work disorders, and 20 (40%) for sleep apnea, 23 Patients (46%) tested positive for Restless Legs Syndrome (RLS) and Periodic Limb Movement (PEM) in similar amounts for both. 24 patients (48%) tested positive for parasomnia.
Conclusions: Sleep disorders are very prevalent worldwide in any age group, but they are more frequent in the 3rd age, and in PD, they are even more so. In the patients in our study, there was evidence that they had at least one sleep disorder. In turn, the vast majority manifest some type of discomfort regarding the conciliation and maintenance of nighttime sleep and the maintenance of wakefulness during the day, however, the intensity of these symptoms impresses that it does not globally affect the perception of their sleep, nor the feeling that it is predominantly good.

Sleep disturbances in ALS patients: an integrative review

F.D.P. Giudice Junior[1], B.H.A.L. Sousa[1], G.N. Nogueira[1], L.F. Xavier[1], K.E.R. Aureliano[1], F.L.H.B. Cavalcante[1], A.M.F. Leitão[2]
[1]Universidade Federal do Ceará, Fortaleza, Brazil, [2]Universidade Federal do Ceará, Departamento de Morfologia, Fortaleza, Brazil

Introduction: Amyotrophic Lateral Sclerosis (ALS) is a neurodegenerative disease characterized by the degeneration of the motor neurons, causing a progressive muscular paralysis. Weakness of the respiratory muscles is one of the complications present in ALS, associated with sleep disturbances. This condition can evolve to fatigue, dyspnea and, in more severe cases, potentially fatal acute respiratory failure. Given this scenario, it's important to investigate the presence of sleep disturbances in ALS patients, as the identification of this finding may be the first alert to the necessity of an intervention related to the maintenance of ventilation in these patients.
Materials and methods: The present review used articles obtained through a search of the descriptors "Sleep Disorders" AND "Circadian Rhythm" AND "Amyotrophic Lateral Sclerosis" in the PubMed database. We included articles published between 2016 and 2022 in the English language, resulting in a total of 14 studies, of which 12 were analyzed.
Results: After the analysis of 12 relevant academic studies related to the thematic of sleep disturbances, it was possible to verify that the research in sleep disturbances encompasses varied scientific studies, being also very diverse in their nationalities. From the findings in the databases, it is observed that patients with ALS have significantly poor sleep quality, with a high prevalence of sleep disorders, especially sleep-related breathing disorders such as Obstructive Sleep Apnea Syndrome (OSAS), which are early indicators of respiratory impairment due to the disease. Additionally, other disorders such as insomnia, restless legs syndrome (RLS), and, in patients with newly diagnosed ALS, poor sleep quality associated with depression have been reported. Furthermore, some studies also highlight poor sleep quality, excessive daytime sleepiness and fatigue as important comorbidities in ALS patients, with the last being associated with physical impairment and their diagnosis and following treatment being factors that improve quality of life and survival, facilitating the clinical management of the disease itself. In this regard, studies emphasize the importance of investigating signs and symptoms indicative of sleep disorders in ALS patients, with polysomnography being recommended, especially in cases of respiratory or bulbar dysfunction.
Conclusions: Sleep disturbances are common in ALS patients and considerably increase their symptoms, worsening and hindering the prognosis of the patients. Furthermore, it was noticed that ALS patients have a significantly poor sleep quality, that was related to the gravity of the illness and to diurnal somnolence. Therefore, since the present study couldn't reach more assertive conclusions and there is still a scarcity of large, well-designed studies on sleep disorders in ALS patients, further research is necessary, involving longitudinal studies that include detailed clinical evaluations and special polysomnography protocols to help guide therapeutic decisions for these patients.

Sleep features and long-term incident neurodegenerative diseases: a polysomnographic study

A. Ibrahim[1], M. Cesari[1], A. Heidbreder[1], M. Defrancesco[2], E. Brandauer[1], K. Seppi[1], S. Kiechl[1], B. Högl[1], A. Stefani[1]
[1]Medical University of Innsbruck, Department of Neurology, Innsbruck, Austria, [2]Medical University of Innsbruck, Department of Psychiatry, Psychotherapy, Psychosomatics and Medical Psychology, Division of Psychiatry I, Innsbruck, Austria

Introduction: Sleep is altered early in neurodegenerative diseases (NDDs) and may contribute to neurodegeneration. Long-term, large sample size studies assessing this association with objective sleep measures are scant. We aimed to investigate whether polysomnography(PSG)- based sleep features are associated with long-term NDDs incidence.

Materials and Methods: Retrospective cohort-study of patients referred 2004-2007 to the Sleep Disorders Unit, Neurology, Medical University Innsbruck, Austria. All patients ≥18 years undergoing PSG and without NDDs at baseline or within five years were included. Main outcome was NDDs diagnosis ≥five years after PSG (until December 2021).

Results: 999/1454 assessed patients (68.7%) met inclusion criteria (68.3% men; median age 54.9 (IQR 33.9-62.7) years). Seventy-five patients(7.5%) developed NDDs and 924(92.5%) remained disease-free after a median of 12.8(IQR 9.9-14.6) years. After adjusting for demographic, sleep, and clinical covariates, one-percentage decrease in sleep efficiency, N3-, or REM-sleep was associated with 1.9%, 6.5%, or 5.2% increased risk of incident neurodegeneration, respectively (HR 1.019, 1.065, 1.052, respectively). One-percentage decrease in wake within sleep period time (SPT) represented a 2.2% reduced risk of incident NDDs(HR 0.978). Patients in the highest wake-in-SPT quartile(>18.6%) or the lowest REM-(<13.0%) or N3-sleep(0%) quartile had the shortest overall mean disease-free survival time (14.9, CI 14.6-15.3 years). Random forest analysis identified wake, followed by N3 and REM sleep percentages, as the most important feature associated with NDDs development. Additionally, multiple sleep features combination offered more robust discrimination of incident NDDs compared to single sleep stages (Concordance-index 0.72).

Conclusions: In this cohort study, altered sleep architecture at baseline with reduced sleep efficiency, REM- or N3-sleep, or increased wake-in-SPT, was associated with incident neurodegeneration after ≥five years. These findings support the hypothesis that sleep changes may contribute to NDDs pathogenesis, and point to sleep as early neurodegeneration marker and potential target of neuroprotective strategies.

Sleeping soundly: exploring the effect of auditory stimulation during sleep on daytime sleepiness in Parkinson's disease

N.-H. Moser[1,2], J. Horlacher[1], S.J. Schreiner[1,2], R. Sassenburg[1], M.L. Ferster[1,3,4], L. Kämpf[1], V. Mutschler[1], J. Skorucak[1,2,3], S. Fattinger[1,3], W. Karlen[5], R. Huber[2,3,6], C.R. Baumann[1,2], A. Maric[1,2]
[1]Department of Neurology, University Hospital Zurich, University of Zurich, Zurich, Switzerland, [2]Center of Competence Sleep & Health Zurich, University of Zurich, Zurich, Switzerland, [3]Child Development Centre, University Children's Hospital Zurich, University of Zurich, Zurich, Switzerland, [4]Tosoo AG, Zurich, Switzerland, [5]Institute of Biomedical Engineering, University of Ulm, Ulm, Germany, [6]Department of Child and Adolescent Psychiatry, University Hospital of Psychiatry, University of Zurich, Zurich, Switzerland

Introduction: Parkinson's disease (PD) is a neurodegenerative disorder characterized mainly by motor symptoms. Additionally, patients commonly experience non-motor symptoms, such as sleep-wake disturbances, which further impacts their quality of life. Recent studies have found that it is possible to intensify deep sleep, i.e. to enhance SWA, in people with PD using phase-targeted auditory stimulation (PTAS). The current study aims to investigate how PTAS impacts nocturnal recovery and daytime sleepiness in PD patients to evaluate its potential as therapeutic approach.

Materials and methods: In this study, we applied at-home auditory PTAS in ten PD patients using a portable device in a sham-controlled, cross-over study design with 2 periods of 14 days of intervention each (verum/sham). Assessments of sleep intensity (SWA) and subjective sleepiness (Karolinska Sleepiness Scale, KSS) were collected daily. Measures of daytime sleep propensity (Multiple sleep latency test, MSLT) were collected in the sleep laboratory after each intervention period, and a subjective well-being question (Visual analog scale, VAS) was asked before and after each intervention period. The acoustic stimuli (50 ms pink noise) were presented via headphones targeting up-phases of slow waves during the first half of each night in a windowed fashion (6s stimulation enabled, 6s stimulation disabled).

Preliminary analyses included linear mixed effects models to assess the effects of intervention (sham/verum) and time point (pre/post) on the respective outcome measure. Three control variables (period, sequence, sleep duration) and a random term accounted for individual variability. Mixed effects survival analysis was used to estimate differences in daytime sleep propensity.

Results: Across the 269 successfully recorded nights (96%), we found a significant increase in SWA in stimulation enabled windows in verum compared to the corresponding windows in sham (F 7.22, p<0.01; M_{verum} +9.55%±29.22) and compared to stimulation disabled windows in verum intervention (F 42.33 p<0.01; $M_{stimulation\_enabled}$ +15.40%±15.98). The KSS showed that patients felt more awake after verum compared to after sham intervention ($F_{intervention\_x\_timepoint}$ 9.07, p<0.01; M_{verum} -1.1±0.88, M_{sham} +0.56±1.04). Additionally, patients' subjective well-being increased significantly more in verum compared to sham intervention ($F_{intervention\_x\_timepoint}$ 4.38, p=0.05; M_{verum} 15.78%±17.82, M_{sham} 2.11%± 8.89). However, there was no significant effect of PTAS on objective daytime sleep propensity (z -0.42, p 0.67; M_{verum} 12.50 min, M_{sham} 12.00 min).

Conclusions: Our findings highlight the potential of PTAS as a promising, non-invasive approach for intensifying deep sleep in PD patients. Moreover, it clearly shows the feasibility of at-home long-term sleep modulation trials in PD, something that to the best of our knowledge has not been previously demonstrated. While positive effects were present in subjective measures of sleepiness and well-being, further investigation is warranted to explore whether improvements in objective assessments are possible with longer intervention periods. Additional analyses of sleep electrophysiology are currently ongoing and aim to investigate the dissipation of sleep pressure across nights, to directly quantify the effect of PTAS on nocturnal recovery processes.

Sleep-related breathing disorders among individuals living with spinal cord injury: A mixed-method study on screening sleep methods with focus on improving their access to healthcare

J. Furlan[1], S. Hitzig[2], J. Milligan[3], P. Athanasopoulos[4], M. Boulos[5]
[1]KITE Research Institute and Lyndhurst Centre, Toronto Rehabilitation Institute, University Health Network; and University of Toronto, Toronto, Canada, [2]St. John's Rehab Research Program, Sunnybrook Research Institute; and University of Toronto, Toronto, Canada, [3]Mobility Clinic, Kitchener, Canada, [4]SCI Ontario, Toronto, Canada, [5]Sunnybrook Health Sciences Centre; and University of Toronto, Toronto, Canada

Introduction: Sleep-related breathing disorders (SRBDs) occur in up to 50% of the individuals living with paraplegia, and in up to 90% of the individuals living with tetraplegia. Nevertheless, SRBDs remain under-recognized and understudied among individuals living with spinal cord injury (SCI). This prospective study examined: (a) the feasibility of a home-based screening sleep test (HBSST); (b) the validity of four questionnaires used to screen for sleep-related breathing disorders (SRBDs); and (c) the potential association between SRBD and physical features in individuals with SCI.
Patients and Methods: This mixed-methods study included a cross-sectional study and a qualitative analysis. Adults with subacute/chronic (at least 1 month post-injury) SCI of any level, severity, and etiology were recruited. Feasibility of the HBSST was objectively evaluated and the participants shared their experience in a face-to-face, semi-structured interview after completion of the HBSST. The validity of the Berlin, STOP, Medical Outcomes Study Sleep Scale [MOS-SS], and STOP-Bang screening questionnaires was analyzed. Finally, we investigated the association between the degree of SRBD and three physical features that have been studied among the non-disabled people with SRBDs (i.e., neck circumference, body mass index [BMI] and oropharynx opening as assessed using the Modified Mallampati classification [MMC]).
Results: There were 13 females and 18 males with ages varying from 20 to 86 years (mean age of 54.7 years) with motor complete (n=8) or incomplete SCI at cervical (n=21) or thoraco-lumbar levels. Time since SCI varied from 1.5 to 474 months. Overall, 28 individuals completed the HBSST and endorsed its feasibility. Mean apnea-hypopnea index (AHI) was 17.3 events/hour (range: 0.5 to 83.7 events/hour). Of the 28, 67.9% had at least mild SRBD (AHI ≥ 5 event per hour) and 32.1% had moderate-to-severe SRBD (AHI ≥ 15 event per hour). AHI was significantly correlated with Berlin (p=0.036) and STOP-Bang scores (p=0.009). There was no significant correlation between AHI and MOS-SS (p=0.348) or STOP (p=0.165). Also, AHI was not associated with neck circumference (p=0.614), BMI (p=0.958), or MMC (p=0.335).
Conclusions: Our results suggest that HBSST is a feasible screening method for the SCI population, which can enhance their access to healthcare. While the Berlin and STOP-Bang questionnaires were significantly correlated with the AHI, further studies are required to validate those questionnaires for use in the screening of SRBDs in the SCI population. The AHI was not significantly associated with BMI, neck circumference, or MMC among individuals living with SCI. Notably, 32.1% of the study participants were diagnosed with a moderate-to-severe SRBD during the study and, hence, continuous positive airway pressure (CPAP) therapy was recommended.

Sleep spindle dynamics in stroke patients and controls: an exploratory analysis

S. Mythirayee[1], P.R. Srijithesh[1], R. Yadav[1], A. Sasidharan[2], P.N. Ravindra[2], D.V. Seshagiri[1], L.K. Nitish[1], S. Sinha[1]

[1]National Institute of Mental Health and Neurosciences, Neurology, Bengaluru, India, [2]National Institute of Mental Health and Neurosciences, Neurophysiology, Bengaluru, India

Introduction: Sleep spindles are prominent electroencephalographic (EEG) features during non-rapid eye movement (NREM) sleep. In the acute stage of a stroke, sleep disruptions are common. However, there is limited literature on sleep spindle characteristics in acute ischemic stroke survivors.

Aim: To investigate the alterations in sleep spindle characteristics following an acute ischemic stroke.

Methodology: In this study ischemic stroke patients were prospectively recruited to evaluate changes in sleep architecture. Patients underwent overnight polysomnography within 2 weeks of onset of stroke. Sleep was scored according to AASM criteria. Python scripts using YASA were employed to detect and analyze sleep spindles and slow waves, focusing on parameters such as density, duration, amplitude, and frequency.

Results: A total of 40 participants, including 30 stroke patients (mean age: 50 years, SD:11, 70% male) and 10 healthy controls (mean age: 48 years, SD:12, 80% male), underwent overnight polysomnography (PSG) recordings. Stroke patients exhibited a significantly lower overall spindle density [2.34 (SD: 0.981) vs 5.76 (SD: 2.04)] and decreased spindle amplitude ($p = 0.03$) compared to healthy controls. However, no significant differences were observed in spindle frequency ($p = 0.25$) between the two groups.

Among the ischemic stroke patients, patients with large artery atherosclerosis sub-type showed a significant decrease in spindle density ($p < 0.001$) compared to controls. Small vessel occlusion sub-type also exhibited lower spindle density, but the differences were not statistically significant ($p > 0.05$). In terms of spindle duration, amplitude, and frequency, no significant differences were observed among the stroke subtypes.

Conclusion: The findings suggest that acute ischemic stroke has a measurable impact on sleep spindle parameters, characterized by reduced density, shorter duration, and decreased amplitude in stroke patients during the early phase of stroke recovery. Further investigations are required to elucidate the underlying mechanisms and to determine the clinical significance of these changes in stroke rehabilitation.

Substantial post-traumatic sleep differences are driven by the mechanism of traumatic brain injury

T. Green[1], G. Mannino[1], S. Murphy[2], R. Rowe[1]
[1]University of Colorado Boulder, Integrative Physiology, Boulder, United States, [2]Cumberland Biological and Ecological Researchers, Longmont, United States

Introduction: Heterogeneity in physical forces that lead to traumatic brain injury (TBI) has led to TBIs being classified as focal or diffuse. Both TBI classifications trigger sleep-wake disturbances and inflammation that exacerbate neurological symptoms. However, the differences in sleep and inflammatory responses across injury classifications are unknown. Due to the bidirectional relationship between sleep disturbances and inflammation, we hypothesized that acute post-traumatic sleep would differ by injury model and that focal TBI would cause the most robust sleep-wake and inflammatory responses.

Materials and Methods: We subjected male and female mice (n=118) to mild-moderate TBI, or corresponding control sham surgery, using three prominent injury models: controlled cortical impact (CCI, n=33, -1mm depth, focal injury), closed head CCI (CHI, n=34, -1mm depth, diffuse injury), and midline fluid percussion (mFPI, n=34, 1.4 atm, diffuse injury), with additional naïve controls (n=17). Physiological sleep parameters were measured for 3 days post-injury (DPI) using noninvasive piezoelectric cages. Investigation into the TBI-induced inflammatory response, including microglial and astrocytic activation, is ongoing. We analyzed sleep data using hierarchical models with nonlinear time effects.

Results: All injury models caused a significant increase in cumulative minutes slept by both sexes at 1DPI compared to their respective shams. At 1DPI, mFPI mice slept more than both CCI and CHI mice (p=0.0001), and CCI mice slept more than CHI mice (p=0.0395). Only mFPI mice slept more than their respective shams at 2DPI (p=0.0020) and 3DPI (p=0.0018). Robust sex differences existed for each injury model, such that females consistently slept less than males after TBI.

Conclusions: These findings suggest that the sleep response to TBI is dependent on biological sex and the type of physical force that induced the TBI, despite presumed injury severity similarities across models. This work is essential to improve personalized, sex-specific healthcare for TBI survivors.

The aggravation of motor symptom in Parkinson's disease with obstructive sleep apnea is correlated with reduced overnight decline of slow wave activity

Y. Shen[1], M.-x. Tao[2], C. Liu[3]
[1]The Second Affiliated Hospital of Soochow University, Department of Neurology and Clinical Research Center of Neurological Disease, Suzhou, China, [2]Second Hospital Affiliated of Xinjiang Medical University, Ürümqi, China, [3]The Second Affiliated Hospital of Soochow University, Suzhou, China

Introduction: Obstructive sleep apnea (OSA) has been reported in a substantial proportion of patients with Parkinson's disease (PD), but it is unclear whether it affects the quality of life or it is associated with other manifestations of the disease.

Methods: 88 PD patients without OSA, 54 PD patients with OSA, and 42 controls underwent polysomnography followed by spectral analysis of non-rapid eye movement (NREM) sleep Electroencephalography (EEG) to calculate global relative power in theta, spindle, alpha, beta bands, slow wave activity (SWA), as well as overnight SWA decline, that reflects the dissipation of homeostatic sleep pressure. Demographic, clinical, and polysomnographic data were compared between PD patients with and without OSA. The association between SWA and clinical symptom of PD was examined using multiple linear regression model.

Results: PD patients with OSA showed reduced overnight decline of SWA (p=0.036) and higher the Unified Parkinson's Disease Rating Scale part III (UPDRS3) score (p=0.012) compared to patients without OSA. Likewise, more severe OSA was associated with reduced SWA decline (ß=-1.067 p=0.029) and reduced spindle frequency activity (ß= -31.728 p=0.009) across all patients. Reduced SWA decline was correlated with higher UPDRS3 score (ß= -10.745 p=0.00) in PD patients.

Conclusions: We provide novel evidence suggesting that the aggravation of motor symptoms in PD with OSA is correlated with reduced overnight decrease of slow wave activity. Our data contributes to the growing evidence for an interplay between sleep and PD.

The relationship between CREBBP variants and Insomnia: from Rubinstein-Taybi syndrome into energy metabolism

L. Cunha[1], B.P. Marquezini[1], M. Moysés-Oliveira[1], A. Kloster[1], T.B. Deconto[1], A.C. Mosini[1], P. Guerreiro[1], M. Paschalidis[1], L.N.G. Adami[1], M. L. Andersen[1,2], S. Tufik[1,2]
[1]Sleep Institute, Associação Fundo de Incentivo à Pesquisa, São Paulo, Brazil, [2]Universidade Federal de São Paulo, Departamento de Psicobiologia, São Paulo, Brazil

Introduction: Insomnia is a well-known sleep problem that affects people from mild to severe forms. It has a multifactorial origin, with genetic and environmental contributing factors. Even though insomnia has been reported as a common trait among patients with rare neurodevelopmental syndromes, the pathogenetic underlying factors for this overlap remain to be uncovered. Rubinstein-Taybi syndrome (RTS), a rare condition caused by loss of function variants on CREBBP, is a study model for the identification of genetic factors which are convergent between insomnia and neurodevelopment. CREBBP (CREB binding protein) gene encodes a protein with acetyltransferase activity, whose main function is to activate transcription factors and to serve as a scaffold to the transcriptional complex.
Aim: We performed a genotype-phenotype correlation between CREBBP variants previously described and their insomnia implications. We then identified genes associated with insomnia traits among the CREBBP regulatory targets, aiming to dissect the molecular pathways that, when disturbed by CREBBP mutation, contribute to the etiology of insomnia phenotypes in these patients.
Methods: CREBBP variants described in patients' reports which included subjective evaluation of sleep were collected and screened according to their mutational mechanism. Benefited from recent large-scale genome wide association studies, we manually curated a set of genes associated with insomnia traits. We generated a list of genes directly regulated by CREBBP by mapping previously described CREBBP genomic binding sites to gene promoters using Biomart. We contrasted these 2 gene lists to generate an intersection gene list. A gene enrichment study was performed using the intersection gene list as input. The Benjamini–Hochberg test was used to identify enriched pathways, with a significance threshold of Adjusted p-value<0.05. Gene Ontology (GO) and Kyoto Encyclopedia of Genes and Genomes (KEGG) terms were considered in the over-representation analysis.
Results: Sleep disturbances were observed in 52% of patients' reports with RTS, with 11% of the patients having sleep problems in adulthood. Mutations that affect CREBBP acetyltransferase domain were the most common cause of severe manifestation of RTS, and consequently the mechanism associated with sleep phenotypes. There were 7 overlapping genes between the gene lists associated with insomnia (60 genes total) and the CREBBP regulatory targets (238 genes total). Significantly enriched pathways among these 7 intersect genes perform in the mitochondrial inner membrane (p-value=2.08E-4; OR=40.11), organelle inner membrane (p-value =2.58E-04; OR=37.21) and mitochondrial membrane (p-value=6.32E-04; OR=27.17).
Conclusions: The enrichment of mitochondrial and organelle membrane pathways among the intersect gene list disclose that alterations of CREBBP affects the regulation genes linked to processes related to energy metabolism. Oxidative stress and mitochondrial dysfunctions have been previously described as related to sleep disturbances. The overlapping gene set and biological pathways highlighted by this study may serve as a primer for new functional investigations of shared molecular mechanisms between insomnia and CREBBP regulatory targets.
Acknowledgements: AFIP, FAPESP (#2020/13467-8, #2021/09089-0) and CNPq
Keywords: Sleep, insomnia, CREBBP, neurodevelopmental disorders, energy metabolism, sleep disturbance.

Topographic characterization of thalamic strokes: contributions to sleep stability and cognition in humans and mice

I. Lenzi[1], J. Picard[2], I. Filchenko[2], M. Borsa[1], A. Orero Lopez[1], V. Jaramillo[3], T. Rusterholz[2], J. Lippert[2], A. Mensen[2], N. Denier[4], R. Wiest[4], R. Huber[5,3], M. Schmidt[4,1,2], C. Bassetti[2,4], C. Gutierrez Herrera[2,1]
[1]Center of Experimental Neurology, Neurology, Bern University Hospital, Bern, Switzerland, [2]University of Bern, Neurology, Bern, Switzerland, [3]University of Zürich, Psychiatric Hospital, Child and Adolescent Psychiatry and Psychotherapy, Zurich, Switzerland, [4]Sleep-Wake-Epilepsy Center, Inselspital University Hospital Bern, Neurology, Bern, Switzerland, [5]University of Zurich, Child Development Center, University Children's Hospital Zurich, Zurich, Switzerland

Introduction: Thalamic vascular syndromes encompass a spectrum of clinical outcomes contingent upon the specific territory within the thalamus affected by lesions. Nevertheless, the individual contributions of distinct thalamic nuclei to diverse sleep-related clinical manifestations remain enigmatic. This study sought to elucidate the intricate interplay between thalamic lesion topography, the regulation of sleep-wake cycles, and oscillatory activities. To achieve this, a novel stroke mouse model and an investigation of stroke patients were employed.

Materials and Methods: A cohort of fifteen thalamic stroke patients, alongside age and gender-matched controls, was examined. In conjunction with SHAM control mice, the optical mini-stroke (OPTO-Stroke) mouse model was used in parallel. Thalamic lesions were categorized based on diffusion-weighted images. In-depth assessments of sleep-wake architecture and oscillations were conducted using high-density and frontal-parietal EEG recordings in humans and mice. Comprehensive circuit-based exploration of anatomical and behavioral consequences of thalamic-induced lesions in mice was undertaken, utilizing acoustic slow wave (SW) induction for stroke-deficit recovery in mice.

Results: Patients afflicted with intralaminar (IL) or mediodorsal (MD) nuclei strokes exhibited elevated sleepiness ($p<0.001$), a higher percentage of NREM1 sleep, and an increased number of NREM2-NREM1 or NREM1-wake transitions ($p<0.01$) in comparison to controls similar to the increased sleep instability shown in Opto-stroke mice. Notably, both humans and mice discerned a significant reduction in frontal spindle power ($p<0.001$). Intriguingly, mice with medial thalamic strokes displayed diminished connectivity between the IL nucleus and the prefrontal cortex. This correlation aligned with sleep deficits, SWs, spindling correlated to working memory, and pain perception. Encouragingly, these impairments were largely ameliorated following acoustic SW therapy.

Conclusions: Collectively, our findings underscore the influential role of IL/MD lesions in instigating sleep fragmentation and diminishing frontal spindle activity. The data collected from the mouse model propose that perturbations in sleep patterns, spindle topography, and working memory could stem from alterations in the connectivity between medial-anterior cortical regions, thereby suggesting a potential avenue for intervention through modulation of cortical excitability. Moreover, our study reaffirms existing insights into thalamic regulation of sleep and spindle dynamics. It offers fresh perspectives on thalamic sub-networks intricately linked to sleep, sensory processing, and cognitive functions. Notably, this investigation identifies promising targets for developing novel sleep-related therapeutic interventions.

Transcranial near-infrared stimulation of the left DLPFC relieved anxiety: a randomized, double-blind, sham-controlled study Transcranial near-infrared stimulation of the left DLPFC relieved anxiety. A randomized, double-blind, sham-controlled study

W. Huicong[1]
[1]Xuanwu Hospital, Capital Medical University, Department of Neurology, Beijing, China

Introduction: Generalized anxiety disorder (GAD) is a common chronic disease characterized by decreased activity in the left dorsolateral prefrontal cortex (DLPFC). Transcranial near-infrared stimulation (tNIRS) was used to stimulate the left DLPFC to relieve anxiety, and transcranial magnetic stimulation with electroencephalography (TMS-EEG) was used to assess changes in brain connectivity associated with the anti-anxiolytic effect.

Materials and Methods: A double-blind, randomized controlled trial was conducted to assess the efficacy of tNIRS on the left DLPFC in patients with GAD. 36 patients with GAD were randomized to receive active tNIRS or sham stimulation for two weeks. Clinical effectiveness was assessed before, after, and at the 2-, 4-, and 8-week follow-ups. TMS-EEG was performed for twenty minutes before and immediately after the tNIRS treatment, and healthy controls were collected only once.

Results: The active stimulation group's posttreatment Hamilton Anxiety Scale (HAMA) scores decreased more than the sham stimulation group's, a statistically significant difference (p=0.021). The HAMA scores of both the active and the sham stimulation groups at posttreatment and at the 2-, 4-, and 8-week follow-up visits were lower than the scores before the treatment. However, the active stimulation group improved significantly greater than the sham group. TMS-EEG targeting the left DLPFC of patients after active treatment induced information outflow from the left DLPFC and left posterior temporal region.

Conclusions: Stimulation of the left DLPFC by tNIRS in patients with GAD relieved anxiety, which promoted the recovery of brain network connectivity.

Other

A course on cognitive and behavioural interventions for sleep disorders within a master's degree programme in clinical and health psychology: an update based on a half-decade experience

A. Allen Gomes[1,2]
[1]University of Coimbra, Faculty of Psychology and Educational Sciences, Coimbra, Portugal,
[2]University of Coimbra, Center for Research in Neuropsychology and Cognitive and Behavioral Intervention, Coimbra, Portugal

Introduction: Given the prevalence of sleep disorders, and the efficacy and effectiveness of behavioural and cognitive interventions, mainly CBT for insomnia, we consider that a course on the topic should ideally be introduced within the psychology master degree programmes, in particular, those focused on preparing future psychologists on CBT for a variety of disorders. Therefore, since 2017/18 we have been offering an optional course called Psychological Interventions for Sleep Disorders at the University of Coimbra, recently renamed Cognitive-Behavioural Therapies for Sleep Disorders. The present work summarizes the course syllabus, and the participants, and analyses the students' perceptions regarding the first five editions.

Materials and Methods: The course consists of an optional unit of the Master's Degree in Cognitive-Behavioural Interventions in Clinical and Health Psychology, albeit it may be attended by students from other psychology master's degree programs also. A summary of the syllabus may be consulted online, https://apps.uc.pt/courses/EN/unit/90096/21063/2023-2024?common_core=true&type=ram&id=8973. Data for the present work were collected via the standardized online institutional university questionnaires assessing the pedagogical aspects of the course. These questionnaires were completed anonymously and voluntarily at the end of the semester. Participants were asked to rate the course in a variety of parameters, using a 5-point scale on each item, ranging from 1 (=minimum) to 5 (=maximum), where higher scores represent better quality.

Results: A total of 180 psychology master's degree students have voluntarily registered for the course - 32 in the 1st edition (2017/18), 41 in the 2nd (2018/19), 47 in the 3rd (2018/19), 40 in the 4th (2019/20), and 20 in the 5th (2020/21). End-of-semester questionnaires were completed by 129 students (71.67%). Mean scores on each item of the questionnaire (encompassing: recommended bibliography and other learning materials; overall quality of learnings; learning results; non-redundancy concerning curricular contents of other courses; articulation between theoretical and practical contents within the course; students' active participation in the learning processes; development of analysis and critical reflection/thinking skills; students overall self-assessment of their performance) ranged between 4.28 and 4.46. The overall inter-item mean score was 4.38.

Conclusions: Results of this half-decade experience have been positive according to students' perceptions. In the second year of the master's degree program, two students may pursue a curricular placement at the Sleep Medicine Center, Hospital and University Centre of Coimbra (CHUC). By offering a course on CBT-I and behavioural interventions for sleep disorders at the master's degree level, we hope to contribute to increasing their delivery in health contexts so that future professionals may be more prepared to implement behavioural sleep interventions.

An investigation of relationships between sleep time and quality, psychological affect, and exercise performance in elite cyclists during the Tour De France

J. Fitton[1], J. Manners[1], B. Lechat[1], K. Loffler[1], T. Altree[1], P. Catcheside[1], A. Reynolds[1], D. Eckert[1]
[1]Flinders University, Adelaide Institute for Sleep Health/FHMRI Sleep Health, Adelaide, Australia

Introduction: Elite endurance athletes likely require more sleep than non-athletes due to the psychophysiological load of training and competition. Prior research into the influence of impaired sleep on exercise performance has focused mainly on the effects of complete/severe overnight sleep deprivation. However, effects of partial sleep restriction and more modest sleep impediment on endurance exercise output remain incompletely understood. In addition, laboratory-based research suggests psychological factors (e.g., motivation, perceived effort) are implicated in the connection, or lack thereof, between sleep and endurance exercise performance. Relationships between sleep, psychological factors, and endurance exercise performance in elite athletes during real-world competition have not been rigorously investigated. Through daily monitoring, this study aimed to investigate potential relationships between sleep, psychological factors, and exercise performance in elite cyclists during the Tour de France, a professional cycling race.

Materials and methods: Data from eight professional cyclists were collected over approximately 6-weeks, including immediately before, during, and after the 3-week *Tour de France 2020*. Objective sleep and performance data were collected through chest heart rate monitors, Garmin smart-wristwatches, and bicycle-based measuring instruments (e.g., Garmin cycling computer, crank power meter). Psychological affect (e.g., mood, stress, motivation) was assessed daily using a brief smartphone-administered questionnaire. Correlation and ANOVA analyses were performed to assess potential relationships between, and temporal changes in, sleep, affect, and performance metrics.

Results: Participants were all male, with an average age of ~30 (SD ~ 4) years. Sleep duration over the entire monitoring period was 08:11 ± 00:58$_{[SD]}$, with sleep onset and wakeup times of 23:46 ± 00:44 and 07:57 ± 00:52, respectively. Overall, sleep duration was positively associated with relative mean-maximum power output (Watts/Kg) sustained for 30 minutes ($r = 0.33$) and 3 hours ($r = 0.32$); sleep quality positively predicted self-reported performance ($r = 0.29$); and performance index (aggregated peak power, factored by weight) was negatively associated with wakeup time ($r = -0.40$) and sleep quality ($r = -0.32$). Compared to pre-race, sleep onset and wakeup time were delayed, and sleep duration increased, during the race (00:26 ± 00:14$_{[95\%CI]}$; 00:48 ± 00:16; 00:22 ± 00:20, respectively). Sleep quality and subjective mood (scale of 0-100) declined during the race [$MD ± 95\%CI$, $MD\%$] (-6.4 ± 5.2, -9.5%; -5.7 ± 4.4, -9.1%, respectively), and motivation was lower post-race than pre-race (-9.4 ± 7.5, -17.1%). All $p < .05$.

Conclusions: Associations between specific sleep, perceptual, and performance metrics suggest the presence of inter-relationships between sleep, psychological affect, and performance during a real-world, high-profile, endurance sporting competition. Increased psychophysiological strain likely explains the greater sleep duration observed during the race, whilst event-related factors (e.g., stress, travel) may have contributed to the delayed sleep period and concomitant decline in sleep quality. These findings highlight the importance of sleep in endurance sporting performance within a naturalistic context. Continued exploration into the temporal interplay between sleep, psychological affect, and exercise performance of elite endurance athletes during real-world competitive periods is now needed.

Association between sleep spindles and thalamic grey matter volume following moderate to severe traumatic brain injury

N. Kalantari[1,2], V. Daneault[1,2], H. Blais[1], E. Sanchez[3], J.-M. Lina[1,4], J. Carrier[1,2], N. Gosselin[1,2]
[1]Hôpital du Sacré-Cœur-de-Montréal, Center for Advanced Research in Sleep Medicine, Montreal, Canada, [2]Université de Montréal, Psychology, Montreal, Canada, [3]Sunnybrook Research Institute, Cognitive Neurology Research Unit, Toronto, Canada, [4]École de Technologie Supérieure, Electrical Engineering, Montreal, Canada

Introduction: Sleep spindles, waxing and waning electroencephalographic (EEG) activity between 11-15 Hz, are integral to cognitive functioning and rely on the thalamo-cortico-thalamic loop for their generation, synchronization, and termination. Our team previously discovered an association between diminished thalamocortical white matter integrity due to moderate to severe traumatic brain injury (TBI) and lower spindle duration and frequency. The present study investigates the relationship between thalamic grey matter volume—critical for spindle generation—and spindle characteristics in healthy controls and participants with moderate to severe TBI. We hypothesized that a lower thalamic grey matter volume would correlate with reduced spindle density and smaller amplitude, shorter duration, and lower frequency spindles.

Materials and Methods: Our study included 27 chronic moderate to severe TBI patients (32.0 ± 12.2 years) and 32 healthy controls (29.2 ± 11.5 years) of similar age and sex. They underwent overnight polysomnography with a 19-channel EEG and an MRI using a 3D T1-weighted 4-echo MP-RAGE sequence, on the same day. Sleep spindles were automatically detected from artifact-free epochs and their density, peak-to-peak amplitude, duration, and frequency were computed from frontal, central and parietal EEG channels. Thalamic grey matter volume was extracted from T1 sequences processed using the SPM12 Computational Anatomy Toolbox and was normalized against total intracranial volume. We performed multiple regression analyses, adjusting for age, to determine if thalamic grey matter volume was associated with sleep spindles. We included the Group as a moderating variable to examine between-group differences in the correlations between thalamic grey matter and spindles

Results: Despite the smaller thalamic grey matter volume in the TBI group compared to controls ($p = .012$), no significant between-group differences were found for spindle characteristics. Across all participants, thalamic grey matter volume was positively associated with spindle amplitude (frontal: $b = 4679.38$, $p < .001$; central: $b = 3554.24$, $p = .0027$; parietal: $b = 3228.59$, $p = .012$). We also found a significant moderating effect of Group for the association between thalamic grey matter volume and spindle frequency (frontal: $b = -122.75$, $p = .013$; central: $b = -154.65$, $p = .007$; parietal: $b = -177.33$, $p = .020$). Specifically, we observed a positive association between thalamic grey matter volume and spindle frequency, exclusively in healthy participants (frontal: $b = 140.76$, $p < .001$; central: $b = 147.45$, $p < .001$; parietal: $b = 165.47$, $p = .004$). No other significant associations were found.

Conclusions: We demonstrated that a lower thalamic grey matter volume correlates with smaller sleep spindles across all participants, possibly reflecting reduced neuronal synchrony within the thalamocortical loop. Despite severe brain injury, no significant association was found between the grey matter volume and spindle frequency or duration in the TBI group. In combination with previous findings, we propose that cerebral white matter might explain spindle frequency and duration more accurately than grey matter changes in the context of cerebral atrophy.

Association of chrononutritional variables with food consumption and body mass index among US adults: findings from NHANES 2017-2018

G.P. Teixeira[1], N.B. Cunha[1], A.E.M. Rinaldi[1], C.M. Azeredo[1], C.A. Crispim[1]
[1]Federal University of Uberlandia, Uberlândia, Brazil

Introduction: Studies from chrononutrition area have suggested that perform meals in later times and extend the eating window during the day are associated with higher energy and nutrients intake and obesity. However, populational studies in this area are scarce. The aim of this study was to investigate the association of chrononutritional variables with energy and nutrients intake and body mass index (BMI) at a populational level.

Materials and Methods: We used data from the National Health and Nutrition Examination Survey 2017-2018. Both sex individuals aged 18 years or over were included, and 3,927 data were analyzed. Linear regression analysis were performed to evaluate the association of chononutritional variables tertiles (sleep end-first meal, last meal-sleep onset, caloric midpoint, energy intake after 8 pm and eating duration; independent variables) with food intake variables and BMI < 25kg/m²; BMI between 25 and 29.9kg/m², and BMI ≥30kg/m² (dependent variables).

Results: The second and third tertiles of sleep end-first meal were negatively associated with calories (p=0.009; p<0.001) and sugar (p=0.026; p<0.001) intake, and the third tertile was negatively associated with carbohydrate (p=0.001), protein (p<0.001) and fat (p<0.001) intake. The third tertile of last meal-sleep onset was negatively associated with calories (p<0.001), carbohydrate (p<0.001), protein (p=0.007), fat (p=0.006) and sugar (p<0.001) intake. A positive association was found between second and third tertile of energy intake after 8 pm with calories (p=0.032; p<0.001), carbohydrate (p=0.011; p<0.001), and sugar (p=0.019; p<0.001) intake; and between third tertile and protein (p<0.001) and fat (p<0.001) intake. A positive association was also found between second and third tertile of eating duration and calories (p<0.001), carbohydrate (p<0.001), protein (p<0.001), fat (p<0.001) and sugar (p=0.002; p<0.001); and between second tertile and cholesterol (p=0.024). The second and third tertiles of caloric midpoint was positively associated only with calories (p=0.024) and cholesterol (p=0.032) intake, respectively. A positive association was found between third tertile of sleep end-first meal and obesity (p=0.017); between third tertile of eating duration and overweight (p=0.006); and between second tertile of energy intake after 8 pm and BMI ≥ 30kg/m² (p=0.04).

Conclusions: Eating later in the day and having a longer eating duration seem to reflect a higher energy and nutrient intake during the day, while take longer to perform first meal and eat dinner early seems to reflect a less energy and nutrient intake during the day. Also, take longer to perform first meal, longer eating duration and high intake after 8 pm seem to reflect in higher BMI at the population level.

Awakening approach towards sleep disorders-dreaming big enough?

S. Javaid[1], Z. Iqbal[1]
[1]Lady Reading Hospital, Pulmonology, Peshawar, Pakistan

Introduction: The Sleep and its associated disorders have been taken as the Cinderella branch of Medicine for years receiving lesser than required attention and hence the neglect in the research in this area. Sleep, a vital part of life that helps improve brain memory, mood and prevent chronic ailments yet its deprivation attributes to reduced drive, innate immunity along with depression. In a nutshell, sleep and health difficulties are inextricably linked. Individuals who do not get enough sleep are more prone to suffer health problems. On the other side, health-related difficulties create sleep deprivation. The underappreciated sleep disorders encompass a wide spectrum of diseases that has health consequences and high economic burden which needs to be addressed in the area of research and treatment guidance.

Materials and Methods: A variety of digital databases were put to use to determine the type of sleep disorders and their management strategy from 2005 to 2022. A total of 255 studies were initially found which mainly consists of sleep disorders and their management. Out of 255 studies, 68 were not involved in final analysis due to repetition whereas 95 studies not met the criteria. The review was constructed using 92 studies. The prevalence of sleep disorders is varying worldwide. In developing nation like Pakistan, there is scarcity of data with respect to sleep disorders and their management.

Results: This review is first from developing nation like Pakistan identifying insomnia, narcolepsy, obstructive sleep apnea syndrome, restless leg syndrome, periodic limb movement disorder, circadian rhythm sleep disorders and arousal disorders. Insomnia had a female predominant prevalence reported to affect up to 20 %of population compromising the quality and quantity of sleep. Based on duration of symptoms, transient, short term and chronic varieties were identified. Cognitive behavioral therapy, stimulus control therapy and hypnotics are the main stay of treatment. Hypnopompic and hypnagogic attacks of narcolepsy were found to respond best to pharmacological management. The 10 second pause of breathing of Obstructive sleep apnea had better symptom control with CPAP along with other operative modes of treatment. Dopaminergic drugs, opioids and anti-epileptics counter act the symptoms of restless leg syndrome. Circadian rhythm sleep disorders, characterized by daytime drowsiness included delayed sleep phase syndrome and advance sleep phase disorder responding best to light therapy and behavioral modification whereas shift work sleep disorder had its effective treatment in the form of sleep hygiene. Arousal disorders warranted no treatment particularly in children. The commonest in children was sleep walking and sleep terror. Their treatment consisted of managing underlying condition, medications such as TCA or benzodiazepines, anticipatory awakenings and therapy or counselling.

Conclusions: Based on our analysis, we found out that sleep is important for improving memory, mood and preventing chronic ailments. If remains untreated it can have major negative outcomes on mental as well as physical performance. In developing countries like Pakistan, this review will give awareness to clinicians to learn about the mutual interaction between sleep disorders and their treatment strategy and enhance care for patients with sleep disorders.

A weighted blanket increases pre-sleep salivary concentrations of melatonin in young, healthy adults

E. Ms Meth[1], P. Xue[1], C. Benedict[1]
[1]Uppsala University, Pharmaceutical Biosciences, Uppsala, Sweden

Introduction: Weighted blankets have emerged as a potential non-pharmacological intervention to ease conditions such as insomnia and anxiety. Despite a lack of experimental evidence, these alleged effects are frequently attributed to a reduced activity of the endogenous stress systems and an increased release of hormones such as oxytocin and melatonin.

Materials and Methods: Thus, the aim of the present in-laboratory crossover study (26 young and healthy participants, including 15 men and 11 women) was to investigate if using a weighted blanket (~12% of body weight) at bedtime resulted in higher salivary concentrations of melatonin and oxytocin compared with a light blanket (~2.4% of body weight). We also examined possible differences in salivary concentrations of the stress hormone cortisol, salivary alpha-amylase activity (as an indicative metric of sympathetic nervous system activity), subjective sleepiness, and sleep duration.

Results: When using a weighted blanket, the 1 hour increase of salivary melatonin from baseline (i.e., 22:00) to lights off (i.e., 23:00) was about 32% higher (p = 0.011). No other significant differences were found between the blanket conditions, including subjective sleepiness and total sleep duration.

Conclusions: Our study is the first to suggest that using a weighted blanket may result in a more significant release of melatonin at bedtime. Future studies should investigate whether the stimulatory effect on melatonin secretion is observed on a nightly basis when frequently using a weighted blanket over weeks to months. It remains to be determined whether the observed increase in melatonin may be therapeutically relevant for the previously described effects of the weighted blanket on insomnia and anxiety.

Barbed pharyngoplasty experience in Brazil

C.H.L. Martins[1], M.H.R. Kim[1], H.D.S. Nunes[1], J.A. Pinto[1]
[1]Nucleus of Otolaryngology, Head and Neck Surgery and Sleep Medicine of São Paulo, Otolaryngology and Sleep Medicine Department, São Paulo, Brazil

Introduction: Uvulopalatopharyngoplasty (UPPP) remains the most common surgical procedure for OSAS alone or in combination with adjunctive multilevel procedures. New procedures involve reconstruction of the upper pharyngeal airway tissues, modifying structural abnormalities and improving form and function. With the advent of polypropylene barbed sutures, the capacity of sutures to withstand loads has greatly increased.

Materials and Methods: We started this technique in São Paulo, Brazil in 2018 after spending an enlightening time at Morgagni Pierantoni Hospital, Forlì, Italy. It consists of adapting lateral-expansive pharyngoplasty technique with barbed technology. To obtain better palatal expansion in patients with retropalatal and laterolateral collapse, we proposed the combined use of two techniques, lateral and expansion pharyngoplasty. Lateral-expansive pharyngoplasty consists of bilateral tonsillectomy, dissection and section of the upper pharyngeal constrictor muscle and after identification and elevation of the palatopharyngeal muscle. The first step in using barbed suture is to mark the points of tension of the palate: posterior nasal spine, supra tonsillectomy bed point, and pterygomandibular raphe bilaterally. We used a single barbed suture, bidirectional polydioxanone absorbable monofilament, size 0, with or without transition zone in the middle. One needle was introduced at the center point then passed laterally within the palate to a superior tonsillectomy bed point and then rotated around the pterygomandibular raphe until it came out at the uppermost raphe; the wire was pulled until it locked in the central transition zone, which is a free zone between the two directions of the wire. The needle was reintroduced close to the exit point, passing around the pterygomandibular raphe until it came out in the tonsillectomy bed, then to the uppermost part of the palatopharyngeal muscle and came out close to the mucosa of the posterior pillar, and not through it. Again the needle was passed back through the tonsillectomy bed and then this suture was suspended again around the raphe. The opposite side underwent the same. Each thread came out of the raphe on the same side, then the thread was cut while the tissue was pulled down for greater traction. Instead of fixing the palatopharyngeal muscle near the hamulus of the pterygoid bone, we sutured it in the pterygomandibular raphe. The inclusions criteria was who had an anterior-posterior palate collapse or circular collapse confirmed by DISE or primary snore, mild and moderate OSAS.

Results: From July 2018 to June 2023, our group selected 30 cases. The mean age was 44 years, the mean AHI was 28,6. A total of 60% performed septoplasty and turbinectomy plus barbed pharyngoplasty and 40% of patients were submitted to glossectomy with coblation plus septoplasty, turbinectomy, and barbed pharyngoplasty. All patients had a significant reduction in excessive daytime sleepiness and snoring. As complications after surgery: thread exposure (6,6%), needle inserted in the wrong way (3,3%) and heart attack (3,3%).

Conclusions: Barbed suture is an extremely promising technology in the field of pharyngoplasty. The use of barbed reinforces stability, distributes tension, avoids damage of velopharyngeal tissues, and prevents collapse, with an important effect on long-term outcomes.

Basic knowledge of sleep medicine among Venezuelan physicians

C. Cardenas[1], M. Gonzalez Quintero[1], G. Zambrano[1], S. Grela[1]
[1]Clinica Sonares, Neurosueño, Caracas, Venezuela

Introduction: Despite growing recognition of the negative impact of poor-quality sleep and sleep disorders in different areas of health, education in sleep medicine remains limited at all levels of medical training. In Venezuela, 8 different institutions offer medical education but none of them include Sleep Medicine in the curricula. Furthermore, Sleep Medicine is not academically recognized at any of these medical schools [1], and is not a core educational requirement in any primary medical specialty or subspecialty [2] such as neurology, pulmonology, and otolaryngology. Sleep disorders are usually seen as a natural events that does not merit treatment. In a study, using the validated ASKME-survey, the investigators found little knowledge of sleep medicine in 94.8% of the students [3].

Objectives: Determine the level of basic knowledge in sleep medicine in a group of general practitioners and specialists belonging to both public and private health centers in Caracas, Venezuela.

Methods: This is a descriptive, prospective study, in which a questionnaire developed by the authors and containing 20 items was administered. The questions were based on the contents of the following widely available resources: "An Introduction to Sleep Disorders" (American Academy of Sleep Medicine)[4] and "Basics of Sleep" (Sleep Research Society) [5]. The questionnaire was previously validated (Kr20=0.63), an administered to physicians from public and private health institutions in Caracas, Venezuela. The sample was deliberately non-probabilistic and made up of volunteers and included a toral of 118 participants. Sufficient knowledge was defined as those who answered more than 10 questions correctly. The results are presented in frequency distributions and tables of means.

Results: Physician with sufficient knowledge about sleep medicine were predominant (86.44%), with the predominant result in all specialties, without a statistically significant association (P > 0.05). The average of questions answered correctly was 13.49 points ± 2.44, with a median of 14 points, with those in the medical-surgical field registering the highest average (difference was not statistically significant - P > 0.05), The domains that showed the greatest deficit were: neurobiology of sleep, insomnia treatment, formal indications of melatonin and circadian rhythm disorders.

Conclusion: Venezuelan doctors have some basic knowledge about sleep medicine, despite Sleep not being part of the academic curriculum during undergraduate or postgraduate studies. However, knowledge in areas such as the neurobiology of sleep, the appropriate treatment of insomnia and less common sleep disorders such as circadian rhythm disorders, could be reinforced with formal medical education in the area, formalizing sleep medicine as a specialty in our country and adding it to the curricula in undergraduate studies contributing to sleep quality in our patients. Although these results were not statistically significant, this is the first work carried out in Venezuela in order to address the knowledge of sleep medicine in the medical profession, setting the framework the to expand this research to the rest of the national territory.

Changes in sleep in people with cystic fibrosis and primary ciliary dyskinesia over time and after CFTR modulator therapy

M. Cohen-Cymberknoh[1], M. Lehavi[2], A. Gileles-Hillel[1], O. Atia[3], O. Breuer[1], J. Reiter[1]
[1]Hadassah-Hebrew University Medical Center, Jerusalem, Israel, [2]Hebrew University, School of Medicine, Jerusalem, Israel, [3]Shaare-Zedek - Hebrew University Medical Center, Jerusalem, Israel

Introduction: Cystic Fibrosis (CF) and Primary Ciliary Dyskinesia (PCD) were shown in cross-sectional studies to be associated with sleep disturbances, affecting quality of life (QOL). However, little is known about the progression of these complaints over time, and the effect of CFTR modulator (CFTRm) therapies.

Materials and methods: Participants completed sleep quality (SDSC, PSQI) and quality of life questionnaires (PedQL, QOL-BE) as well as the Epworth sleepiness scale (ESS) at baseline and after 4 years. Medical records were reviewed for clinical data and correlations were sought between sleep, QOL and clinical parameters.

Results: Sixty-seven patients, 33 children and 34 adults: 37 pancreatic insufficient CF (CF-PI), 15 pancreatic sufficient CF (CF-PS), and 15 PCD patients, completed the study. In adults, the global sleep quality decreased from 85.8% (76.2-90.5) to 80.9% (71.4-85.7); (p=0.009). Analysis by disease cohort showed a significant deterioration only in the CF-PS group from 90.5% (76.8-95.7) to 80.95% (71.4-90.7); (p=0.006). In adults *off* CFTRm, sleep quality decreased from 85.7% (78.6-88.2) to 80.9% (71.4-87.3); (p=0.021) and from 85.8% (76.2-92.9) to 76.2% (71.4-85.8); (p=0.078) in people *on* CFTRm. Changes in sleep quality and changes in QOL over-time were strongly associated with each other.

Conclusions: Sleep quality deteriorates over time in people with CF and PCD, correlates with QOL, and is driven primarily by adults and CF-PS patients. Comparing change over time in patients *on* and *off* CFTRm, revealed no clear effect; however, results are mixed, and further long-term studies are required.

Circadian typology, a bridge between caffeine consumption and psychological distress: a correlation elicited by mediation analysis among young Sudanese adults

A.A.M. Mohamed[1,2,3], F. Fathelrahman[2,3], S. Algam[4,2], A. Nogdallah[4,2], M. Omer[4,2], R. Abdul Monem[2,4], A. Abdullah[5,2], A. Izzaldin[2,5], A. Altayeb[2,4], A. Jafar[2,5], M. Osama[2,4]
[1]Al Neelain University Faculty of Medicine, Biochemistry and Molecular Biology, Khartoum, Sudan, [2]Al Neelain Institute for Medical Research, Molecular Biology and Genetics, Khartoum, Sudan, [3]National University Biomedical Research Institute, Molecular Medicine and Bioinformatics, Khartoum, Sudan, [4]Al Neelain University Faculty of Medicine, Khartoum, Sudan, [5]Al Neelain University Faculty of Medicine, Physiology, Khartoum, Sudan

Introduction: Caffeine's wakefulness-promoting and sleep-disrupting effects are well established, yet whether caffeine affects human circadian timing is unknown. Also, Evidence suggests evening-type individuals have a higher risk of reporting psychological distress than morning-type individuals. However, less is known regarding the underlying processes that might mediate this association among Sudanese young adults. This study aimed to investigate whether chronotype would mediate the association between Caffeine consumption and psychological distress through either the direct or indirect effect of the mediation model.

Materials and Methods: This is a cross-sectional study conducted in among young adults – al-neelain university. Morningness-Eveningness Questionnaire (MEQ) was used to assess chronotype, Kessler 10-item Questionnaire (K-10) for psychological distress and Caffeine was addressed in the context of amount (in milligrams), frequency and time separating bed time. Hayes PROCESS macro (model 4) was used to perform the mediation analysis.

Results: Among the participants (n = 303), the mean age of the participants was (22.71±2.49) years. 72.2% of participants were low amount caffeine consumers (0-200mg/day). the mean for chronotype (MEQ) was (52.12±9.71) and neutral type comprised most of the population circadian typology (58.1%). Most of the individuals were severely psychologically distressed (42.2%) . Multiple regression analysis showed that Increased Caffeine consumption was negatively associated with lower MEQ scores(β=-2.49, P<0.01). which indicated that increased Caffeine consumption predicted evening chronotype. In addition, MEQ scores was negatively associated with psychological distress while controlling for caffeine amount (mg) and self-rated health(β= -.1136, P<0.05). Which showed the negative association between chronotype and psychological distress. Finally, the results of bias-corrected percentile bootstrap method presented that the total effect was positively significant (β=1.538, P<0.05, SE=.7518 95% CI=[0.0583 - 3.0173], mainly as a completely indirect path between caffeine consumption and psychological distress via chronotype (MEQ) score. (β=0.2838, SE=0.1658, 95% CI=[0.026 - 0.657]). Caffeine frequency before bed was also significantly positively associated with higher scores of K-10 scores after controlling for chronotype (MEQ scores) and self-rated health. β=1.246, SE=0.393, P<0.01, 95% CI=[0.4737 - 2.018]. indicating that higher frequency of consumption predicted higher levels of psychological distress.

Conclusions: Caffeine resulted in a dose-dependent lengthening of the circadian period by caffeine which completely Mediated the association between Caffeine consumption and psychological distress. Although timing apart from sleeping and frequency of consumption before bed didn't affect circadian typology, it had a direct deleterious effect on psychological well-being. Reduction of caffeine consumption is advised and Interventions for the enhancement of circadian typology (morning typology) to prevent and reduce psychological distress should be prioritized to medical students who are prone to eveningness.

Consumption of Benzodiazepines in the university population of Rio de Janeiro

A. Svaiter Tominaga[1], A.J. Rodrigues Bezamat[1], M. Frota Bacelar Rêgo[1], A.C. Brando Lima Simões[1]
[1]IDOMED Campus Città, Rio de Janeiro, Brazil

Introduction: Joining higher education is characterized by changes in the personal, social and academic spheres, requiring several adaptations from university students to better perform their role in this new context surrounded by expectations. It brings a huge amount of content, making them overwhelmed. Additionally, the constant demand for results from family members, teachers and the student himself can directly reflect on their mental health and on the abuse of psychoactive substances such as benzodiazepines. Benzodiazepines are psychotropic drugs with restricted prescription and subject to special control, according to Ordinance No. 344, of May 12, 1998, they have been widely used as hypnotics and sedatives, being quite common in clinical practice. The prolonged use of these drugs associated with misuse, can cause several long-term consequences, including dependence, which concerns public health and cannot be overlooked.

Materials and methods: From this perspective, the present study addresses, as its main theme, the consumption of benzodiazepines in the university population of Rio de Janeiro. The objectives were to describe the characteristics of the population which uses this drug, their level of use, identify the main causes related to their consumption and describe the possible relations between the use of this medication and their study area. To analyze that, a quantitative, cross-sectional and descriptive approach was carried out with students from different undergraduate courses, regularly enrolled in colleges located in the Metropolitan Region of Rio de Janeiro. Data was collected through a self-applied semi-structured questionnaire, available online in the Google Forms tool, and sent via email and WhatsApp to the target audience. Responses involving medications, which did not fit the classification of benzodiazepines, were discarded from the survey. The elaboration of the work also involved the reading and analysis of articles through a search in the databases *Scientific Electronic Library Online* (SciELO) and PubMed.

Results: The literature illustrates that factors such as family emotional support, strengthening social relationships with teachers and colleagues, expansion of strategies for a good academic performance, among others, contribute to an emotional improvement towards adversity at the university. The lack of protective factors may contribute to the increase and development of anxiety and stress between academics. Due to that, the exaggerated use of benzodiazepines by students in Brazil has been noticed. In the present study, a total of 114 university students, mostly from the health area, use or have used this medication. Among the most used, Clonazepam and Alprazolam stood out. The questionnaire showed that the most frequent reason for use is anxiety, followed by insomnia. The work also presented the prevalence of chronic and sometimes irregular use of this class of drugs. It should be noted that indiscriminate use is made, mostly, by medical professionals and students.

Conclusions: Therefore, it is important to identify your prescription profile to develop strategies that guarantee the administration of these drugs only when necessary and in a safe and responsible way. In this way, our work can contribute to a better quality of life for medical students.

Correlation between self-perceived and objectively analysed sleep quality in liver transplant waiting list patients

L. Martínez-Alarcón[1], M. Jover-Aguilar[2], J.A. Madrid[3], C. García-Carrillo[4], P. Ramírez[2], G. Ramis[5]
[1]Hospital Clínico Universitario Virgen de la Arrixaca, UDICA, Murcia, Spain, [2]Hospital Clínico Universitario Virgen de la Arrixaca, Servicio de Cirugía, Murcia, Spain, [3]Universidad de Murcia. Facultad de Biología, Departamento de Fisiología, Murcia, Spain, [4]Universidad de Murcia. Facultad de Enfermería, Departamento de Enfermería, Murcia, Spain, [5]Universidad de Murcia. Facultad de Veterinaria, Departamento de Producción Animal, Murcia, Spain

Introduction: The holistic approach to patients on the transplant waiting list requires careful monitoring of sleep health, nutrition and physical exercise, beyond the medical care required by the chronic liver disease itself. Sleep quality has been measured on numerous occasions using questionnaires to help understand the patient's self-perception.
In this study we have analysed the correlation between the results obtained in three sleep assessment questionnaires and objective parameters.
Materials and methods: Nine patients, with a mean age of 58 years; 5 men and 4 women, included in the waiting list for liver transplantation at the Hospital Clínico Universitario Virgen de la Arrixaca (Murcia, Spain) has been included in the study. Sleep-related parameters were monitored using a Kronowise K6 wrist device (Kronohealth, Murcia, Spain) and data were analysed using Kronowise 100 software (Kronohealth, Murcia, Spain). Patients wore the device on the non-dominant wrist for at least 7 days before transplantation. Parameters such as Interdaily Stability (IS), Intradaily Variability (IV), Relative Amplitude (RA), Circadian Function Index (CFI), and the mean of the variable (MEAN), Sleep Latency (min), Total Sleep Period (min), WASO (min), No. of awakenings/hour, Sleep Efficiency (%), Actual Sleep Time (min), Duration of Naps (min) and Frequency of Naps per day were calculated on the basis of the recorded data. On the other hand, Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS) and he Munich Chronotype Test (MCTQ) were self-administered by patients to obtain subjective sleep quality. A controlled partial correlation was performed for sex, BMI and Child-Pough.
Results: Comparing the total scores of the 3 questionnaires, a positive correlation was observed between the ESS total score with the duration of naps ($r=0.971$; $p=0.029$) and between the MCTQ total score with WASO ($r=0.979$, $p=0.021$), mean activity during sleep ($r=0.952$, $p=0.046$) and total light ($r=0.996$; $p=0.004$) and blue light received into 2 hours after sleep onset ($r=1$, $p<0.0001$).
On the other hand, self-perceived sleep efficiency and sleep duration in the ESS correlated negatively with sleep onset time ($r=-0.997$, $p=0.004$), and total sleep duration ($r=-0.996$, $p=0.004$).
Interestingly, the correlation between self-perceived efficacy and objectivity correlated negatively ($r=-0.533$, not significant), given that in the ESS questionnaire the higher the score, the worse the efficacy. The subjective perception of sleep disturbance in the ESS questionnaire correlated positively with the duration of daytime napping ($r=0.971$; $p=0.029$)
Conclusions: Parameters related to sleep quality do not improve per se after liver transplantation. This means that even if the general health status improves and the chronic liver disease disappears, patients do not change their sleep habits. In this case, the absence of any intervention and the lack of differences show the need for professional intervention on the quality of sleep of patients before and after transplantation.

Correlation between the circadian parameters of temperature and movement with subjective sleep assessment in patients in waiting list for liver transplant

L. Martínez-Alarcón[1], M. Jover-Aguilar[2], C. García-Carrillo[3], P. Ramírez[2], G. Ramis[4]
[1]Hospital Clínico Universitario Virgen de la Arrixaca, UDICA, Murcia, Spain, [2]Hospital Clínico Universitario Virgen de la Arrixaca, Servicio de Cirugía, Murcia, Spain, [3]Universidad de Murcia. Facultad de Enfermería, Departamento de Enfermería, Murcia, Spain, [4]Universidad de Murcia. Facultad de Veterinaria, Departamento de Producción Animal, Murcia, Spain

Introduction: Sleep is a critical element in the maintenance of human health. It should be much more relevant in patients, especially those who are on the transplant waiting list and who should be in the best possible state of health to face such a complex surgery. Another key element in this holistic approach is physical activity, which should be a regular health maintenance element in patients waiting for a liver. On the other hand, body temperature and the ability to thermoregulate is intrinsically related to both elements.
Therefore, the aim of this study was to correlate the circadian parameters of distal temperature (DST), movement time (Tmov) and acceleration during movement in patients on the waiting list with the subjective quality of sleep perceived by the patients.
Materials and methods: Prospective cross-sectional study conducted in a University Clinical Hospital with liver transplant activity (2020-2023) was performed, including 35 patients on the waiting list for orthotopic liver transplantation in the Hospital Clínico Universitario Virgen de la Arrixaca (Murcia, Spain). Distal temperature, time in motion and acceleration were measured using a Kronowise K6 wrist device, placed on the non-dominant wrist for one week at the time of waitlisting. Subsequently, the data recorded on the device were extracted and the circadian data for the three parameters mentioned above were calculated: Intra-day stability (IS), inter-day variability (IV), relative amplitude (RA) and robustness (CFI). In addition, patients completed a self-administered Pisstburgh sleep quality assessment questionnaire, based on the evaluation of 7 items (sleep quality, sleep latency, sleep duration, sleep disturbances, sleep efficiency, use of sleep medications and daytime dysfunction due to sleepiness). Finally, a score is obtained as a sum of the scores obtained on these items (0=excellent sleep quality; 21=poor sleep quality). A controlled partial correlation was performed for age, BMI and Child-Pough Grade.
Results: There were negative correlations between sleep duration and SI (r=-0.488) and between daytime dysfunction with SI (r=-0.603), RA (r=-0.536) and IFC (r=-0.582) and between Total Pittsburh score with RA (r=-0.502) and IFC (r=-0.475) of DST. Regarding Tmov, correlations were found between subjective sleep quality and AR (r=-0.480) and between perceived dysfunction during the day with SI (r=-0.503), IV (r=0.664), AR (r=-0.677) and CFI (r=-0.658). There is no correlation of any item of the questionnaire with acceleration during movement.
Conclusions: Patients with lower intraday stability and sobriety in distal temperature and time on the move have daytime somnolence dysfunction, indicating that the Pittsburgh test correlates with some objectively measured circadian data.

Cortical hyperarousal and depressive symptoms relationship in individuals with sleep-wake disorders

A. Defillo[1], S. Daccò[2,1,3], D. Caldirola[2,3], M. Grassi[2,1,3], Z. Wolfy[1], G. Perna[2,1,3], T. Young[1]
[1]Medibio Limited, Research and Development, Savage, United States, [2]Humanitas University, Biomedical Sciences, Pieve Emanuele, Milan, Italy, [3]Villa San Benedetto Menni Hospital, Hermanas Hospitalarias, Clinical Neurosciences, Albese con Cassano, Como, Italy

Introduction: Cortical hyperarousal (CH) during sleep has consistently been associated with difficulty falling asleep, maintaining sleep, and non-restorative sleep. This relationship is explained by the presence of high-frequency brain activity during pre-sleep phase and non-rapid eye movement (NREM) sleep, usually characterized by slow-wave activity. Given the important role of sleep in emotion regulation, CH may contribute to increasing the risk of psychiatric conditions by affecting sleep microstructure. Studies showed an increased prevalence of depressive symptoms (DSs) in individuals with sleep-wake disorders. However, no studies investigated the direct relationship between CH and DSs in this population.

Our study aimed to investigate the relationship between CH and DSs severity in a sample of individuals referred to sleep clinics (SCs) for sleep-wake disorders.

Materials and methods: This study is based on sub-analyses of data collected in an ongoing cross-sectional, multicenter study aiming to develop a machine learning-based device to screen for current major depressive episode in adults referring to SCs.

We used electroencephalography (EEG) signals from polysomnography (PSG) processed by automatic sleep-staging software to extract EEG bands throughout the sleep stages.

CH was defined by alpha\beta ratio and high beta frequency around sleep onset (ASO), and beta\delta ratio and high beta frequency in N3 sleep. Both absolute and relative values were considered. DSs were assessed by the Patient Health Questionnaire, 9 items (PHQ9).

To investigate the association between CH and DSs, we performed Pearson's partial linear correlation, controlling for age. The statistical significance level was set at 0.05.

Results: Data from 459 patients (females, 226 (49.2%); mean age 45.6± 14.4) were analyzed. According to the PHQ9 range severity, 132 subjects (28.8%) had mild depression, 87 (20%) moderate, 54 (11.8%) moderately severe, and 13 (2.8%) severe.

The statistical analysis showed a significant positive correlation between DSs and beta\delta ratio (p: 0.023; p: 0.007) and high beta frequency (p: 0.015; p: 0.032) absolute and relative power in NREM sleep, and high beta absolute power (p: 0.034) in ASO. In addition, a negative correlation between DSs and alpha\beta ratio absolute and relative power in ASO (p: 0.024; p: 0.016) was shown.

Conclusion: To the best of our knowledge, our findings showed for the first time that cortical hyperarousal in the pre-sleep phase and deep sleep is correlated with the severity of DSs.

Cortical hyperarousal has been shown in subjects with insomnia, frequently comorbid with other sleep-wake disorders. Studies reported a bidirectional relationship between insomnia and depression. Cortical hyperarousal has been associated with autonomic arousal in patients with insomnia which may lead to emotional disturbances and DSs. On the contrary, emotional dysregulation can proceed and lead to insomnia which increases the severity of DSs.

Given the scarcity of the studies, additional confirmatory findings and more sophisticated statistical strategies are warranted. However, our results highlight the importance of developing monitoring and treatment interventions that target cortical hyperarousal and DSs in individuals with sleep-wake disorders.

Country differences in nocturnal sleep patterns in working age adults revealed by wearable sleep technology

A. Willoughby[1], I. Alikhani[2], M. Karsikas[2], X.Y. Chua[1], M. Chee[1]
[1]National University of Singapore, Centre for Sleep and Cognition, Yong Loo Lin School of Medicine, Singapore, Singapore, [2]Oura Health Oy, Oulu, Finland

Introduction: It is now well-known that sleep duration differs across countries. However, much less is known about how sleep patterns vary across the week in different parts of the world, and what factors might explain differences in sleep behaviour. Emerging evidence from studies of social jetlag and weekend sleep extension suggests that these aspects of sleep variability also vary across countries; however, there is little data on sleep variability measures requiring higher resolution data, such as variability within the work week. Furthermore, cross-country comparison is often complicated by the different methodologies used across studies. In this study, we took advantage of the increased use of wearable sleep technology to investigate nocturnal sleep patterns, using the same objective measurement device, in a large, globally distributed sample.

Materials and Methods: Sleep data, collected via the Oura Ring, from the 52-week period from Monday 4th January 2021 to Sunday 2nd January 2022 was analysed. Only users with more than 90 nights' data, and only countries with an average of at least 200 users per week over the analysis period, were included. This resulted in a dataset including over 50 million nights' sleep from ~220,000 wearable device users from 35 countries (with each person contributing an average of ~242 nights of data). Multiple regression was used to assess the impact of country of residence on a number of sleep measures, including sleep duration, weekday sleep variability, weekend sleep extension and social jetlag.

Results: Our results demonstrated that bedtimes were later, and nocturnal sleep was shorter, in Asia compared with other global regions. Additionally, weekend sleep extension varied across countries; European countries, where sleep duration was longest, also showed the greatest weekend sleep extension. There were cross-country differences in social jetlag although the regional differences were less distinct than for weekend sleep extension. Weekday variability in both sleep duration and timing was greater in Asia than Europe despite shorter overall sleep duration.

Conclusions: The results showing shorter and later sleep in Asia compared with other global regions is consistent with previous research. Furthermore, we showed that sleep patterns across the week vary across countries; even though weekday sleep was both longer and more stable in Europe than in Asia, people in Europe showed the greatest weekend sleep extension. These results suggest that weekend sleep extension is unlikely to be driven solely by an accumulation of sleep pressure resulting from sleep restriction during the week. While sleep is undoubtedly influenced by many factors, we hypothesize that working conditions and work culture may explain some of the differences in sleep patterns observed in different parts of the world.

Development of a clinical decision support system for CVD screening based on artificial intelligence using polysomnographic records

U. Erdenebayar[1], Y. Kim[1], Y.J. Kim[2], J.W. Yang[2], S.-H. Kim[2]
[1]Yonsei University Wonju College of Medicine, Artificial Intellenge Big Data Medical Center, Wonju, Korea, Republic of, [2]Yonsei University Wonju College of Medicine, Department of Internal Medicine, Wonju, Korea, Republic of

Introduction: Cardiovascular disease (CVD) is the major cause of death worldwide. Early detection and diagnosis of CVD is very important in the primary prevention of CVD death, and secondary prevention by risk factors and lifestyle. Thus, a convenient and accurate detection or screening method is important for screening and identifying CVDs. In this study, we proposed a clinical decision support system (CDSS) for CVD screening based on deep learning model using polysomnographic records.

Materials and methods: To implement the demonstrated CDSS based on a deep learning model— named a sleepCVD designed for automatic screening of major CVD namely stroke (STK), angina (ANG), and chronic heart failure (CHF). The sleepCVD was constructed using deep convolutional neural networks that can extract and analyze the complex and cyclic rhythm of CVD that affect ECG patterns. The sleepCVD designed multimodal architecture to analyze multi input data such as ECG, SpO2, and Airflow and it is optimized via dropout and batch normalization. The PSG record was extracted from the 194 subjects with the 80 control and 114 CVD subjects in the SHHS database. The PSG data was pre-processed, segmented at 30-s intervals, and divided into the training, validation, and test sets consisting of 104511, 51476, and 76830 segments, respectively.

Results: The proposed sleepCVD model for the CVD screening based on sleep recordings showed very high performance. We achieved F1-scores of 97.97%, 96.35%, 97.79%, and 97.49% for the control, STK, ANG, and CHF patients, respectively.

Conclusions: We demonstrated CDSS for the CVD screening based on AI during PSG recording. Our results represent the possibility of the CVD screening during the nocturnal PSG. In addition, it can be a useful tool or an alternative screening method for cardiac activity monitoring and screening.

Does the odds ratio product predict treatment response in people with co-morbid insomnia and sleep apnoea

J. Fitton[1], B. Lechat[1], D. Eckert[1], M. Younes[2], A. Sweetman[1]
[1]Flinders University, Adelaide, Australia, [2]University of Manitoba, Winnipeg, Canada

Introduction: Co-morbid insomnia and sleep apnoea (COMISA) is a prevalent sleep disorder that is harder to treat and has more severe outcomes than either disorder alone. First-line treatments for insomnia and sleep apnoea are cognitive-behavioural therapy for insomnia (CBTi) and continuous positive airway pressure therapy (CPAP), respectively. To date, no consistent predictors of treatment-response to these therapies have been found in people with COMISA. The odds ratio product (ORP) is a novel EEG-derived measure of sleep depth/propensity that, having shown promise in recent clinical samples, may help predict treatment-response in people with COMISA. This study investigated the effect of baseline ORP metrics on response to CBTi and CPAP in a COMISA sample.

Materials and methods: 145 people with COMISA were randomised to either CBTi or no-treatment control conditions, before all participants commenced CPAP. Participants completed an at-home polysomnographic sleep study to determine ORP metrics (ORP_{NREM}, ORP_{Wake}, ORP-9) and the apnoea-hypopnea index at baseline, and 6-week (post-CBTi/Control) and 6-month (post-CPAP) follow-ups. A questionnaire battery including the insomnia severity index (ISI) was completed at each follow-up. Mixed models were used to investigate interaction effects between baseline ORP metrics, treatment condition (CBTi+CPAP, CPAP-alone) and time on insomnia and sleep apnoea symptom severity.

Results: Participants (44.8% female) were middle aged ($M = 58.2$, $SD = 9.9$ years), had severe sleep apnoea (AHI: $M = 34.5$, $SD = 21.9$ events/hr) and moderately severe insomnia (ISI: $M = 18.2$, $SD = 5$). ORP_{Wake} and ORP-9 did not predict treatment-specific change in insomnia severity, though ORP_{NREM} did. For people with high baseline ORP_{NREM} (95th percentile), decline in ISI score was notably greater post CBTi+CPAP (14.2-point) than CPAP-alone (5.3-point). For people with low baseline ORP_{NREM} (5th percentile), there was minimal difference in ISI change between conditions (CBTi+CPAP, 6.8-point; CPAP-alone, 7.3-point). In the CBTi+CPAP condition only, baseline ORP_{NREM} ($r = .42$, $p < .001$) and ORP-9 ($r = .32$, $p = .012$) were positively associated with total CPAP use. No tested ORP metrics at baseline predicted treatment-specific change in sleep apnoea severity.

Conclusions: These findings provide insights into the potential use of ORP as a tool to help predict treatment-response in COMISA and other clinical sleep populations. Baseline ORP_{NREM} predicted treatment-specific change in insomnia severity, suggesting 'shallower' sleepers at baseline have greater improvement in insomnia severity from CBTi+CPAP than CPAP-alone. This effect likely occurred through greater CPAP adherence, as baseline ORP_{NREM} positively predicted total CPAP use in the CBTi+CPAP condition. Knowledge of ORP_{NREM} may help to guide personalised management for COMISA. In addition, this finding highlights the need for further hypothesis-driven research into the use of ORP_{NREM} as a predictive tool in COMISA and related clinical sleep populations.

Do sleep parameters improve one year after liver transplantation?

L. Martínez-Alarcón[1], J.A. Madrid[2], M. Jover-Aguilar[3], P. Ramírez[3], G. Ramis[4]
[1]Hospital Clinico Universitario Virgen de la Arrixaca, UDICA, Murcia, Spain, [2]Facultad de Biología, Departamento de FIsiología, Murcia, Spain, [3]Hospital Clínico Universitario Virgen de la Arrixaca, Servicio de Cirugía, Murcia, Spain, [4]Universidad de Murcia, Departamento de Producción Animal, Murcia, Spain

Introduction: Sleep status in patients on the waiting list for liver transplantation has been little studied and is not considered a necessary intervention for the maintenance of their health. However, chronic liver disease itself and the social isolation that sometimes results from the disease lead to the loss of proper sleep health in many patients. In this study we have determined whether simply undergoing liver transplantation, without further intervention on sleep health, leads to an improvement in sleep-related parameters.

Materials and methods: Nine patients, with a mean age of 58 years; 5 men and 4 women, included in the waiting list for liver transplantation at the Hospital Clínico Universitario Virgen de la Arrixaca (Murcia, Spain). Sleep-related parameters were monitored using a Kronowise K6 wrist device (Kronohealth, Murcia, Spain) and data were analysed using Kronowise 100 software (Kronohealth, Murcia, Spain). Patients wore the device on the non-dominant wrist for at least 7 days at two time points: before transplantation (Pre); at the time of recruitment for this study, which was the day of inclusion in the waiting list; and one year (1Y) after receiving the liver transplant. Patients were transplanted between April 2021 and May 2022. Among others, we analysed Sleep Start and End Time (hh:mm), Sleep Latency (min), Total Sleep Period (min), WASO (min), No. of awakenings/hour, Sleep Efficiency (%), Actual Sleep Time (min), Duration of Naps (min) and Frequency of Naps per day.

Results: We observedthe following data: 23:23±3:36 and 23:28±3:12 for sleep onset time (hh:mm), 8:28±0:31 and 8:33±0:23 for sleep end (hh:mm) , 17.2±4.9 and 13.4±2.0 for sleep latency (m), 482.3±29.1 and 501.5±25.9 for total sleep period (m), 90.8±14.5 and 86.5±8.3 for WASO (m), 76.5±3.3 and 79.4±1.5 for sleep efficiency (%), 2.7±0.2 and 3. 1±0.2 for number of awakenings/hour, 392.6± and 390.8± for actual sleep time (m), 35.54±7.9 and 37.69±8.7 for total duration of naps (m) and 0.65±0.1 versus 0.83±0.2 for frequency of naps observed before transplantation and one year later, respectively (Mean±SEM).

There was difference between pre-transplant measurements and one year after receiving the organ for awakenings/hour (p=0.005). Only a trend towards a difference was found in Sleep Start Time and Actual Sleep Time (min). It is interesting to see how the number of awakenings per hour increases, which could be related to the reduction of the effects of the encephalopathy suffered by some of the patients.

Conclusions: Most parameters related to sleep quality do not change after transplantation. This means that even if the general health status improves and the chronic liver disease disappears, patients do not change their sleep habits. In this case, the absence of any intervention and the lack of differences show the need for professional intervention on the quality of sleep of patients before and after transplantation.

Effect of insulin on sleep architecture in diabetic patients with Sleep Apnea

M. Varma[1], M. Eghbali[1], D. Hung[1], A. Sahai[2]
[1]California University of Science and Medicine, Colton, United States, [2]Trika Medical Inc, Apple Valley, United States

Introduction: Sleep disorders are significantly more common in individuals with Diabetes as compared to those without Diabetes. The etiology of sleep disturbances in these patient is often multifactorial, related both to diabetes per se and due to secondary complications from associated comorbidities. Shorter sleep duration and erratic sleep behavior have been linked with higher incidence of obesity, metabolic syndrome, and Type 2 Diabetes mellitus (DM) which affects nearly 10% of adult US population. Higher rates of insomnia are reported by diabetic patients than controls. This disruption in sleep cycle affects insulin secretion affecting glycemic regulation. Intermittent hypoxia as seen in Obstructive Sleep Apnea (OSA) further deteriorates insulin resistance. We previously examined sleep architecture in patients with diabetes and found that both N3 and REM sleep were significantly affected. We now seek to evaluate changes in sleep architecture in patients taking Insulin for their DM management.

Materials and Methods: Twenty known diabetic patients on Insulin therapy were evaluated for sleep apnea by an overnight polysomnogram, Patients underwent 6 channel EEG, EOG, EMG EKG along with pulse oximetry, respiratory and flow monitoring. Sleep staging was done using AASM guidelines by technician and verified by physician both of whom were blind to the study. Information on age, gender, BMI, and medications was noted. N1, N2, N3 and REM sleep stage data was analyzed. Data analyzed and shown as mean ± SD, t test $p < 0.05$ significant.

Results: All the patients were diagnosed with OSA as per AASM guidelines. Average age of the patient with DM and OSA on insulin therapy was 62 years, average BMI 38. AASM stage distribution was N1 3.45 % $\pm$ 0.02, N2 59.96% $\pm$ 0.15 , N3 9.83 % $\pm$ 0. 07, with 7.20% $\pm$0.05 REM sleep. We further examined the REM sleep pattern by sex and found REM duration in Men was 7.23% $\pm$ 0.07and in women patients it was 7% $\pm$ 0.05 of their sleep, p-0.3, Although no significant gender changes were observed REM sleep was significantly reduced from sleep in healthy adults. Compared to REM sleep in Diabetic patients, REM sleep was further reduced in those on Insulin therapy although t test was not significant p= 0.4. Diabetic women patients on Insulin therapy had a significantly higher BMI (42 vs 32 in men). REM sleep showed no significant difference between men (7.23%) and women (7%). N3 sleep also was similar in duration between men (10%) and women (8%).

Conclusions: : Insulin treatment in diabetic patient is suggestive of advanced disease with poor glycemic regulation and increased insulin resistance. All twenty patients with sleep apnea had high BMI. Their sleep architecture showed reduced REM and deep sleep -N3 duration in both men and women affecting overall quality of sleep. There was no significant gender difference in sleep architecture observed despite differences in BMI. This suggests that advanced diabetes affects neuronal regulation of sleep so that the normally observed gender differences in sleep patterns are obliterated.

Effect of ventilatory support on sleep parameters studied by polysomnography in infants born prematurely with bronchopneumodysplasia

S. Scaillet[1], A. Vuckovic[2], D. Vens[3], C. Haegenmacher[3], D. Qachri[3], S. Van Beeck[3]
[1]Hôpital Universitaire des Enfants Reine Fabiola, Neurology and Sleep, Bruxelles, Belgium, [2]Hôpital Universitaire des Enfants Reine Fabiola, Neonatology, Bruxelles, Belgium, [3]Hôpital Universitaire des Enfants Reine Fabiola, Intensive Care, Bruxelles, Belgium

Introduction: CPAP is a common treatment of respiratory insufficiency in the Neonatal intensive care unit. However, prematurely born infants are rarely discharged with ventilatory support to be used at home. This study uses polysomnography to measure the effect of ventilatory support on sleep parameters around the time of discharge from the hospital.

Materials and Methods: Five infants born after 26 weeks and 2/7 with a mean birth weight of 765 gr were discharged to go home with ventilatory support (3 with a CPAP and 2 with a BIPAP) to be used during sleep. All had bronchopneumodysplasia, with no additional factor to worsen their respiratory insufficiency. They were discharged with no supplemental oxygen. They had a polysomnography before the ventilatory support was instituted at 116 days of life, and again 9 days later with the ventilatory support.

Results: There were no significant differences in total sleep time, sleep efficiency, mean oxygen saturation in NREM sleep and heart rate. However, the apnea-hypopnea index and the breathing rate were significantly lower, and the minimum saturation recorded during sleep was higher.

Conclusions: Ventilatory support diminished significantly the presence of apnea of prematurity and stabilised both the breathing rate and the oxygen saturation. Further studies are required to investigate the use of ventilatory support as home treatment for bronchopneumodysplasia.

Evaluation of sleep patterns during a preparatory season of female college athletes

J.C. Barbosa de Lima Pinto[1], T.C. Barbosa Menezes[2], A.I. Fonteles[3], <u>A. Mortatti</u>[1]
[1]Federal University of Rio Grande do Norte, Physical Education Department, Natal, Brazil, [2]University of Fortaleza, Physical Education, Fortaleza, Brazil, [3]Federal Institute of Education, Science and Technology, Itapipoca, Brazil

Introduction: College athletes often struggle with poor sleep quality, which can negatively affect their mental health, particularly in women who experience double demands from academic and training routines. The aim of this study was to evaluate the sleep patterns, sleep quality, and sleepiness of female college basketball athletes during a preparatory period and correlate them with total mood disturbance (TMD) and stress tolerance.

Materials and Methods: Fourteen female college basketball athletes (22.2±3.0 years, 68.5±3.0 kg, and 1.7±3.0 m) were evaluated at the end of each month between July and October 2021 [time-point (TP) 1, 2, 3, and 4]. During this period, the athletes completed 40 training sessions, seven friendly matches, and nine official matches. Sleep behavior was evaluated using the Athlete Sleep Behavior Questionnaire, sleep quality was measured using the Pittsburgh Sleep Quality Index Questionnaire, and daytime sleepiness was evaluated using the Epworth Sleepiness Scale. TMD was measured using the Brunel Mood Scale, and stress tolerance was assessed using the Daily Analysis of Life Demands in Athletes. The athletes were divided into a "good" sleep behavior (GSB) group and "poor" sleep behavior (PSB) group, according to the ASB score, and the Mann-Whitney test compared sleep quality, sleepiness, TMD, and stress tolerance between groups. Additionally, the Spearman correlation coefficient verified the correlations between sleep-related variables and psychological variables, adopting a significance level of $p < 0.05$.

Results: It was showed that 70% of the athletes had poor sleep quality in TP-1, which remained consistent through TP-3, with 80% of athletes experiencing poor sleep quality. However, in the last period, 50% of the athletes had poor sleep quality. Higher TMD was observed in athletes with PSB in TP-3 ($\chi^2=5.042$, $p=0.025$), along with higher scores of sleepiness ($\chi^2=4.573$, $p=0.026$), higher scores of TMD ($\chi^2=4.127$, $p=0.042$), and lower stress tolerance ($\chi^2=5.042$, $p=0.025$) in athletes with PSB during TP-4. Sleep behavior and sleepiness correlated positively with TMD in TP-3 ($r=0.86$, $p=0.001$) and 4 ($r=0.83$, $p=0.003$), while sleep quality correlated positively with TMD in TP-1 ($r=0.63$, $p=0.049$), 2 ($r=0.66$, $p=0.035$), and 4 ($r=0.83$, $p=0.003$).

Conclusions: Basketball athletes with poor sleep behavior have a greater total mood disturbance, more sleepiness, and lower stress tolerance throughout a preparatory season. Additionally, sleep behavior, sleep quality, and sleepiness have a moderate to strong positive correlation with total mood disturbance. This study emphasizes the importance of addressing sleep behavior and quality in university athletes, particularly women, to improve their overall mental health and athletic performance.

Global genome-wide association analysis of Long COVID

V. Lammi[1], T. Nakanishi[2,3], S.E. Jones[1], H. Zeberg[4,5], H.M. Ollila[1,6,7], and the Long COVID Host Genetics Initiative

[1]University of Helsinki, Institute for Molecular Medicine (FIMM), Helsinki, Finland, [2]McGill University, Department of Human Genetics, Department of Medicine, Lady Davis Institute, Jewish General Hospital, Quebec, Canada, [3]Kyoto University, Kyoto-McGill International Collaborative Program in Genomic Medicine, Graduate School of Medicine, Kyoto, Japan, [4]Karolinska Institutet, Department of Physiology and Pharmacology, Stockholm, Sweden, [5]Max Planck Institute for Evolutionary Anthropology, Department of Evolutionary Genetics, Leipzig, Germany, [6]Broad Institute of MIT and Harvard, Cambridge, United States, [7]Massachusetts General Hospital and Harvard Medical School, Boston, United States

Introduction: Post acute sequelae of COVID-19 (PASQ), or Long COVID, is characterized by a range of symptoms including fatigue, dyspnea, cognitive dysfunction, and sleep disturbances. To elucidate genetic factors and mechanisms contributing to the risk of developing prolonged health issues after SARS-CoV-2, we have built a global collaboration, the Long COVID Host Genetics Initiative.

Materials and Methods: 24 studies from 16 countries, representing 6 genetic ancestries, conducted genome-wide association studies (GWAS) comparing Long COVID (N=6,450) to subjects recovered from COVID-19 (N=46,208) or population controls (N=1,093,995). Long COVID was defined using questionnaire data on symptoms and recovery from COVID-19, or electronic health record data with specific diagnosis codes for post COVID-19 conditions.

Results: A cross-ancestry meta-analysis of Long COVID after test-verified SARS-CoV-2 (N = 3,018) and population controls (N = 994,582) identified a haplotype spanning the genomic region chr6:41,512,355-41,537,458 associated with increased risk for Long COVID (chr6:41,515,652G>C, GRCh38, rs9367106, as the lead variant; $P = 1.8{\times}10^{-10}$, odds ratio = 1.63, 95% confidence interval: 1.40-1.89, risk allele frequency = 4.2%).

A variant (rs12660421-A) in the Long COVID risk region associated with an increase in *FOXP4* expression in the lung ($P = 5.3{\times}10^{-9}$, normalized effect size (NES) = 0.56) and in the hypothalamus ($P = 2.6{\times}10^{-6}$, NES = 1.4) (GTEx dataset V8). The association signals for Long COVID and differential expression of *FOXP4* in the lung colocalized with posterior probability (pp) = 0.91. Single cell sequencing data showed *FOXP4* expression present in cell types participating in immune regulation in the lung, namely type 2 alveolar cells and granulocytes.

Variants in the *FOXP4* region have earlier been associated with the severity (hospitalisation) of acute COVID-19 and lung cancer, and a colocalization analysis demonstrated these signals were shared (pp = 0.97 and 0.98, respectively). Mendelian Randomization supported the role of COVID-19 severity as a causal risk factor for Long COVID ($p = 2.4{\times}10^{-3}$).

Conclusions: We have built a global collaboration and identified the first genome-wide significant association for Long COVID. The risk locus upstream of the *FOXP4* gene in chromosome 6 has been previously associated with severity of acute COVID-19 as well as lung functions and cancers.

This Long COVID association signal colocalized with an expression quantitative trait locus (eQTL) in the lung, supporting a role for lung functions and immune system regulation in the pathophysiology of Long COVID. eQTL in the hypothalamus may contribute to the aetiology of fatigue and sleep-related symptoms.

Mendelian Randomization supported COVID-19 severity as a causal risk factor for Long COVID, but further analyses comparing the effects of *FOXP4* variants and other severity variants suggested that the *FOXP4* association with Long COVID cannot be explained by severity alone.

Identifying longitudinal patterns of CPAP treatment in OSA using growth mixture modeling: disease characteristics and psychological determinants

H. Yi[1,2], X. Dong[1], S. Shang[2], C. Zhang[1], L. Xu[1], F. Han[1]
[1]Peking University People's Hospital, Department of Sleep Medicine, Beijing, China, [2]Peking University, School of Nursing, Beijing, China

Introduction: In this study we aim to identify the distinct subtypes of continuous positive airway pressure (CPAP) user profiles based on the telemedicine management platform and to determine clinical and psychological predictors of various patterns of adherence.

Materials and methods: A total of 301 patients used auto-CPAP (Autoset 10, Resmed Inc.) during the treatment period. Four categories of potential predictors for CPAP adherence were examined : (1) demographic and clinical characteristics, (2) disease severity and comorbidities, (3) sleep-related health issues and (4) psychological evaluation. Then, growth mixture modeling was conducted using Mplus 8.0 to identify the unique trajectories of adherence over time. Adherence data were collected from the telemedicine management platform (Airview, Resmed Inc.) during the treatment.

Results: Three novel subgroups were identified and labelled "Adherers" (53.8% of samples, intercept = 385, slope = -51, high mean value, negative slope and moderate decline), "Improvers" (18.6%, intercept = 256, slope = 50, moderate mean value, positive slope and moderate growth) and "Non - Adherers" (27.6%, intercept = 176, slope = -31, low mean value, negative slope and slight decline). The comorbidities associated with OSA and the apnea-hypopnea index (AHI), which reflects the objective severity of the disease, did not differ significantly among the subgroups. However, "Improvers" showed higher levels of daytime sleepiness (8.1 ± 6.0 vs. 12.1 ± 7.0 vs. 8.0 ± 6.1 in SWIFT, p = 0.01) , reduced daytime function (4.6 ± 1.6 vs. 3.8 ± 1.6 vs. 4.2 ± 1.8 in QSQ daytime symptoms, p = 0.02) and characteristics of positive coping style (1.8 ± 0.5 vs. 1.9 ± 0.5 vs. 1.7 ± 0.5 in SCSQ positive coping index, p = 0.02). Negative emotion was more pronounced in patients with "Non-Adherers" (12.9 ± 3.8 vs. 13.7 ± 3.3 vs. 14.6 ± 3.5, p = 0.02 in the HADS depression dimension; 9.0 ± 6.1 vs. 9.8 ± 5.1 vs. 11.5 ± 6.3, p = 0.01 with Negative Affectivity in DS14, and 9.3 ± 6.1 vs. 10.3 ± 5.1 vs. 11.7 ± 6.5, p = 0.01 with Social Inhibition in DS14).

Conclusions: Overall, our study demonstrated that CPAP therapy may present distinct trajectories of adherence over time in addition to the traditional binary classification. Self-reported sleep health issues (diurnal sleepiness and daytime dysfunction) as well as psychological characteristics (negative emotions and coping style) were predictors of different adherence subtypes in OSA patients. Understanding CPAP use profiles and their predictors enables the identification of those who may require additional intervention to improve adherence and further enhance the therapeutic effect in OSA patients.

Impact of a sleep intervention program on anxiety and depression in patients with chronic musculoskeletal pain (CMP)

S. Romero-Peralta[1,2], G. Hernando Benito[1,3], E. Solano Pérez[1], C. Coso[1], L. Silgado Martínez[1], J.F. Masa Jiménez[4], P. Resano Barrio[1], M. Castillo García[1], E. Viejo Ayuso[1], L. Álvarez Balado[1], R. Mediano Andrés[1], O. Mediano[1,3,5]

[1]Guadalajara Universitary Hospital, Sleep Unit, Pneumology Service, Guadalajara, Spain, [2]Sleep Research Institute, Madrid, Spain, [3]Alcalá de Henares University, Alcalá de Henares, Madrid, Spain, [4]Hospital San Pedro de Alcántara, Cáceres, Spain, [5]Centro de Investigación Biomédica en Red de Enfermedades Respiratorias (CIBERES), Madrid, Spain

Introduction: Chronic musculoskeletal pain (CMP) has an impact on sleep quality, making it difficult to manage. Sleep disturbances contribute to the appearance of potentially modifiable disorders, such as anxiety or depression, and reinforce the negative impact of pain. Restoring quality sleep could lead to better pain control. Our objective was to evaluate the efficacy of a sleep intervention to improve the state of anxiety and depression in patients with CMD (NCT03646084). Financed by CIBER-ES18PI03 and the Spanish Sleep Society.

Materials and methods: Multicenter, randomized and controlled trial. 50 patients with CMP were recruited. 21 patients were assigned to the SCIP intervention group (Sleep and Circadian Intervention Program) and 28 patients were assigned to the control group. Demographic data, personal history, pain characteristics (NRS, EQ-5D-5L), consumption of analgesics (opioids and adjuvants) and quality of life questionnaires (SF36, EQ-5D-5L) and anxiety and depression were collected in both (HADS, PASS-20) at the baseline visit and at 6-month follow-up. In the SCIP group, polysomnography and sleep questionnaires (Epworth, Pittsburgh, ISI, FOSQ) were performed. In those with sleep disorders, specific treatment was indicated. Generalized estimating equation models were used for statistical analysis.

Results: The baseline comparison of SCIP vs. non-SCIP did not show significant differences in any of the clinical variables evaluated in the questionnaires used at baseline, except in the usual activities of the EQ-5D (Table 1). We found an effect of the intervention with a statistically significant decrease in the level of anxiety measured by both the PASS 20 (decrease of 10.7 points; p=0.031) and the HADS (decrease of 3.8 points; p=0.015) (Table 2).No effect was observed on the pain scale (NRS, EQ-5D-5L) between both treatment groups or on quality of life (SF36).

Conclusions: Intervening in the sleep disorders that patients with CMD present could reduce anxiety and depression levels and help improve pain control.

Impacts of conservative treatment on the clinical manifestations of obstructive sleep apnea – systematic review and meta-analysis

I. Costa[1], M. Cunha[2], M. Bussi[2], A. Cassettari[2], E. Zancanella[3], M. Bagarollo[4]
[1]University of Campinas, Department of Otorhinolaryngology and Department of Human Development and Rehabilitation, Campinas, Brazil, [2]University of Campinas, Department of Otorhinolaryngology, Campinas, Brazil, [3]University of Campinas, Brazil, Department of Otorhinolaryngology, Campinas, Brazil, [4]University of Campinas, Department of Human Development and Rehabilitation, Campinas, Brazil

Introduction: Characterized as airway closure during sleep, obstructive sleep apnea syndrome OSAS is a chronic disease with high populational prevalence. Treatment is multidisciplinary and varies according of each case. Continuous positive airway pressure (CPAP), oral appliances and surgery are the primary therapeutic options. Non invasive conservative treatments as sleep hygiene, positional therapy, physical exercises and weight loss aim to reduce the aggravation of the disease while being complementary to the invasive primary treatment.
Objective: Analyze the impact of non invasive conservative therapies on the clinical manifestations of OSAS compared to other interventions.
Method: This is a systematic review with meta-analysis. The searches were performed without filters by period neither publication nor language. Randomized clinical trials in subjects over 18 years of age diagnosed with untreated OSAS were included. Responses to the non invasive conservative treatment were compared to the responses of the primary intervention. Primary outcomes were assessed with the Epworth Sleepiness Scale and/or FOSQ.
Results: A total of 8 studies were included in the review. The heterogeneity of the effect was estimated at 89.77%. Six studies compared the conservative treatment with CPAP, one with oral appliances, and one with oropharyngeal exercises. Using the Epworth Sleepiness Scale measurements, the standardized difference of the estimated means based on the random effects model was 0.457 (95% CI [1.082 to 0.169]) and the mean result did not significantly differ from zero (z = 1, 43, p = 0.153).
Conclusion: The primary treatments for OSAS are mostly CPAP, oral appliances and surgeries. This study demonstrated that non-invasive conservative treatment, such as sleep hygiene resulted to be as effective as the invasive ones. Further studies may be done to confirm whether conservative non-invasive therapies can be used as the primary treatment or else as a complementary one.
Keywords: OSAS, conservative treatment, CPAP, sleep hygiene.

Inclusion of patients and advocates as authors in medical publications: progress over the past decade

J. Fallon[1], J. Gudeman[2], J. Fetting[1], S. Harper[1], M. Horsnell[3], T. Johnson[1], E. Wehner[1]
[1]The Curry Rockefeller Group, LLC, Tarrytown, United States, [2]Avadel Pharmaceuticals, Chesterfield, United States, [3]Patient Author, Project Sleep's Rising Voices of Narcolepsy, Los Angeles, United States

Introduction: Patients can provide unique insights into the health conditions with which they live, and they bring their perspective to the information being shared. Involving the patient voice in medical publications is becoming increasingly important. The objective of this analysis was to assess the inclusion of patient and patient advocate authors on peer-reviewed publications and published scientific congress abstracts to gain insight regarding progress made in the inclusion of patients and patient advocates as authors on medical publications.

Materials and methods: An EMBASE search was conducted using the terms: patient author OR patient advocate in the affiliation (2012–2022). Articles were categorized by publication type, therapeutic area, and inclusion of a coauthor with a pharmaceutical industry affiliation. A single publication could be included in multiple categories. Data were summarized using descriptive statistics.

Results: A total of 14,521,245 publications were identified (2012–2022), of which 453 had a patient or advocate author. More than half of these 453 publications were published in the past 3 years (2020−2022). There were few publications with patient/advocate authors during the years 2012−2015 (range, 6−13/year), with an annual trend for increasing numbers of publications with a patient/advocate author from 2016 (n=27) to 2022 (n=108). Most common publication types with patients/advocates included as authors were conference abstracts (n=96), reviews (n=69), surveys (n=55), guideline papers (n=51), and clinical trial publications (n=48). Other publication types with >10 publications were phase 3 studies (n=22), workshop proceedings (n=19), patient perspectives (n=17), commentaries (n=15), phase 2 studies (n=15), consensus statements (n=13), editorials (n=12), interviews (n=10), qualitative studies (n=10), and retrospective cohorts (n=10). The predominant therapeutic area in which patients/advocates were authors was oncology (n=249; 55.0%); others with >10 publications with patient/advocate authorship were neurology (n=41), general medicine (n=24), rheumatology (n=17), hematology (n=16), rare disease (n=13), and urology (n=13). Relatively few publications with patient/advocate authorship included a coauthor with a pharmaceutical company affiliation (n=68; 15.0%).

Conclusions: Beginning in 2016, patient/patient advocate authorship has steadily increased in alignment with current best practices; however, their involvement remains <0.005% (453/>14M) of published literature during the same time period. Further efforts are needed to incorporate this initiative into standard practice across the therapeutic spectrum.

Influence of sleep quality on the quality of life of older adults aged ≥ 65 years who had SARS-CoV-2 infection and who did not

L.H. Gonzaga[1], C. Aguiar[1], M.C.S. Freitas[1], C.M. Guimarães[1], M. Freitas[1], K.M. Almondes[2], C. Dias[1], C. Salles[1,3,4]
[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]Federal University of Rio Grande do Norte, Natal, Brazil, [3]Federal University of Bahia, University Hospital Professor Edgard Santos, Salvador, Brazil, [4]Jorge Amado University Center, Salvador, Brazil

Introduction: According to the Centers for Disease Control and Prevention, older adults account for 53% of hospitalizations for COVID-19. Insomnia, anxiety, and depression occurred respectively in 48%, 38%, and 38% of individuals who had COVID-19, impacting the quality of their lives. Although there is an expectation that SARS-CoV-2 infection could negatively impact the quality of sleep and, by extension, the quality of life of older adults, it is important to consider that divergent results have emerged in the scientific literature. Some studies did not find significant evidence of changes in the quality of sleep and life among older adults who had the infection compared to those who were not infected. The objective of this study was to evaluate the influence of sleep quality on the quality of life of older adults aged 65 years or older who had SARS-CoV-2 infection and who did not.
Materials and methods: This is a cross-sectional study with data collection online or by telephone call due to the social distancing imposed by the SARS-CoV-2 pandemic. Inclusion criteria: older adults aged $\geq$ 65 years who had SARS-CoV-2 infection, ability to understand the questions asked, had internet and/or telephone access, and who had been socially isolated during the pandemic. Exclusion criteria: bedridden or wheelchair users and older adults who did not fully answer any of the questionnaires. Instruments: sociodemographic questionnaire, Pittsburgh Sleep Quality Index, WHOQOL-BREF and WHOQOL-OLD quality of life questionnaires. This study is part of a more extensive study that defined the first stage the evaluation of older adults aged 65 years or over.
Results: The total sample comprised 101 participants, 13.9% (n=14) of whom had COVID-19. Within this group: mean age was 70.71 $\pm$ 4.23 years; self-declared white 71.4% (n=10); female 64.3% (n=9). Participants who had COVID-19 had a mean of 6.17 $\pm$ 0.61 hours of sleep per night, while those who did not have COVID-19 had a mean of 6.77 $\pm$ 1.48 hours (p=0.012). The mean Pittsburgh Index between those who had COVID-19 and those who did not have COVID-19 was (7.14 $\pm$ 3.00 vs 6.64 $\pm$ 3.67), respectively. When comparing the means of the WHOQOL-BREF between the group that had COVID-19 and the one that did not, statistical significance was also not observed (18.91 $\pm$ 3.00 vs 18.83 $\pm$ 2.88; p=0.925).
Conclusions: This study did not observe an association between sleep quality and quality of life of older adults who had SARS-CoV-2 infection; however, there was an association between hours of sleep per night and SARS-CoV-2, demonstrating the need for more studies that explore these themes in the scientific literature.

Influence of training load intensity on young soccer players' sleep patterns

B. Laerte Lopes Ribeiro[1], A. Bruno de Morais Ferreira[1], I. Medeiros da Silva[1], A. Luis Mortatti[1]
[1]Federal University of Rio Grande do Norte, Physical Education, Natal, Brazil

Introduction: During the sports training process, there is different training load orientation that can cause an increased need for sleep to athletes. Therefore, the goal of this study was to verify if the acute load of soccer training, in young athletes, carried out during a week of intensification are enough to modify the sleep pattern of young football players.

Materials and Methods: Fifteen young football players (age: 15.90 ± 0.63 years; body mass: 67.82 ± 6.34 kg; weight: 1.73 ± 0.08 m; body mass index: 22.62 ± 1.16) were evaluated during a two-week of training period with different workloads. External training load (ETL) measurements were performed using the PlayerLoad method, while the rating of perceived exertion (using the CR-10 scale) value was multiplied by the match duration to measure the internal training load (ITL) Sleep variables included total time in bed (TTB), total sleep time (TST), sleep latency (SL), wake after sleep onset (WASO), and sleep efficiency (SE), and all variables were assessed daily, using wrist actigraphy (GT3-X). The CET, ITL, and Sleep data were analyzed in a paired manner, comparing the data between corresponding days of each week. For example, the data from Monday of week 1 was compared with Monday of week 2, and so forth.

Results: Regarding ETL, significant differences were found on Mondays (p = 0.036), Wednesdays (p = 0.001), and Fridays (p = 0.018). There were significant differences in ITL were observed on Mondays (p = 0.003) and Wednesdays (p = 0.001), consistently with higher loads in the second week for both variables. In relation to sleep variables, there were significant differences in SE between Tuesdays (p = 0.002) and Thursdays (p = 0.046). Similar results were found for TST, with differences between Tuesdays (p = 0.034), with the increasement of 80 minutes, and Thursdays (p = 0.004), there was an increase of 86 minutes. The results showed a higher SE and TST in the second week of training, in subsequent days of training loads intensification.

Conclusions: Increase in the workload was sufficient to promote a bigger necessity to sleep, resulting in an increase of TST and SE in subsequent days of training intensification.

Moderate pre-sleep alcohol has a negative impact on next-day PVT performance

M. Carskadon[1], C. Gredvig-Ardito[1], D. Barker[1], J. McGeary[2]
[1]Alpert Medical School of Brown University, Psychiatry and Human Behavior, Providence, United States, [2]Providence VA Medical Center, Psychiatry and Human Behavior, Providence, United States

Introduction: Few reports have examined how pre-sleep alcohol affects next-day performance; nor have studies looked across three consecutive nights/days under controlled conditions and when given adequate sleep opportunity. Our goal is to identify whether alcohol intake targeting .08g% 1 hr before sleep of ~8 h will affect PVT performance on subsequent days, with the hypothesis that morning performance will be negatively affected, as has been seen after a single night of alcohol, especially when subjects drank in a social setting on there own without experimental constraints.

Materials and methods: 25 healthy adults (13F; age range 22-57 y) completed the full study, including at-home sleep on a fixed schedule of 8-9 hr and two 3-night in-lab PSG sessions spaced ≥3 days apart. Sessions were counterbalanced for alcoholic or nonalcoholic beverage administered in 3 drinks over 45 minutes ending 1 hr before bedtime. Alcohol was targeted to .08g% and breath alcohol levels were consistently lower than .08 g% by bedtime and .00 at rise time. All participants were atThe 10-min Psychomotor Vigilance Task (PVT, Ambulatory Monitoring, Inc.) was given each evening (**PM-Lab**) 1.5 hr before drinking and in the morning (**AM-Lab**) 50 min after waking and after a light breakfast. The PVT was performed again at home or work twice each day within 1.5-h windows occurring on average ~4h after waking (**AM-Home**) and on average ~8h after waking (**PM-Home**). The number of lapses >500ms and three reaction time (RT) variables were assessed: median RT, RRT (1/RT), FRT (10% fastest RT). Linear mixed effects models were used to account for nesting of assessments within alcohol/control condition and days.

Results: A main effect of alcohol on number of Lapses showed significantly more lapses for the alcohol vs. nonalcohol trials; a similar main effect of alcohol was present for the three RT variables. A meaningful difference was apparent for each day and for the **AM-Lab**, **AM-Home**, and **PM-Home** trials as well for Lapses, with a trend for worse performance on consecutive days. All RT variables showed slowing with alcohol for the second and third days. As for test condition, Median RT, RRT, and FRT each showed significant slowing on the **AM-Lab** and **AM-Home** trials following nights with alcohol.

Conclusions: Pre-sleep alcohol at a moderate level of Breath Alcohol before sleep for three consecutive nights showed a significant overall negative impact of alcohol; in terms of days, the negatvie impact of alcohol was greater each day. The alcohol effect was apparent for PVT tests that occurred 50 minutes and about 4 hours after waking. These findings demonstrate no blunting of the next-day impairment due to alcohol across study days. These detrimental effects of alcohol on PVT persisted several hours after waking. These data indicate that even with sufficient time allocated to sleep, pre-sleep alcohol intake at even a moderate amount poses a significant challenge to vigilance performance in the daytime and may pose a risk for individuals whose occupations require rapid response to visual stimuli.

Obstructive sleep apnea in non-IPF fibrotic ILD patients: who, how and what should we offer?

C. Gouveia Cardoso[1,2], C. Valente[1], M. Serino[1], I. Rodrigues[3], A. Carvalho[3], R. Santos[4], D. Coelho[1,4,2], A. Terras Alexandre[1], N. Melo[1], H. Novais Bastos[1,4,2], P. Caetano Mota[1,2,4], A. Morais[1,2,4], M. Drummond[2,5]
[1]Centro Hospitalar Universitário de São João, Pulmonology, Porto, Portugal, [2]Faculdade de Medicina da Universidade do Porto, Porto, Portugal, [3]Centro Hospitalar Universitário de São João, Radiology, Porto, Portugal, [4]Instituto Investigação e Inovação em Saúde, University of Porto, Porto, Portugal, [5]Sleep and Non-Invasive Ventilation Unit, Centro Hospitalar e Universitário de São João, Porto, Portugal

Introduction: Obstructive sleep apnea (OSA) is a frequent disease, caused by recurrent episodes of airway collapse during sleep. A high prevalence of OSA in interstitial lung disease (ILD) has been showed, being particularly high in patients with idiopathic pulmonary fibrosis (IPF). Other non-IPF ILD arise from a combination of inflammatory and self-sustained fibrotic processes, presenting a clinical course similar to IPF. Given that, the authors designed and performed this study aiming to assess the prevalence and predictors of development of OSA, as well as adherence and impact of positive airway pressure (PAP) therapy on quality of life in a non-IPF fibrotic ILD population.

Material and Methods: Prospective study in non-IPF fibrotic ILD patients diagnosed between january 2020 and december 2021 at a tertiary university hospital.
Patients without previous OSA diagnosis and with stable ILD were included and a polysomnographic study was proposed. Comparisons were made between patients with and without OSA, and a multivariate logistic regression model was used to identify independent predictors of OSA. Patients under PAP therapy were analysed after three months of treatment, assessing adherence, correction of respiratory events and nocturnal hypoxemia (considered if sleep time with SpO2 less than 90% (T90) was superior to 20%), and changes in symptoms and quality of life through the SF-36 questionnaire.

Results: Among the 50 patients included (mean age 67.8 ± 8.3 years; 50% male), 76% (n=38) were diagnosed with OSA (52.6% mild, 34.2% moderate, and 13.2% severe). Most patients (52%) presented with fibrotic hypersensitivity pneumonitis.
OSA patients showed significantly lower TLC (p=0.033), lower awake SpO2 (p=0.023) and tended to have higher FEV1/FVC ratio (p=0.079). No significant differences concerning sex, age, smoking status, comorbidities, body mass index (BMI), Epworth sleepiness scale (ESS), DLCO measures, UIP pattern in HRCT and extent of fibrosis were noted between groups. OSA patients presented greater oxygen desaturation index (ODI) (p<.001) and lower nocturnal minimum SpO2 (p<.001). Eight patients diagnosed with OSA presented nocturnal hypoxemia.
In a multivariate logistic regression model, adjusted for age, BMI, SpO2, FEV1/FVC ratio, TLC and ESS, both SpO2 (OR=0.46, p=0.016) and TLC (OR=0.95, p=0.026) were associated with higher OSA risk.
Among patients receiving PAP therapy (n=12), after three months, 91.7% were well controlled (AHI≤5 events/h) and 66.7% had adequate adherence. PAP therapy corrected nocturnal hypoxemia in all patients.
ESS scores significantly decreased (p=0.006), and emotional well-being tended to improve (p=0.068) after three months of PAP therapy according to the SF-36 questionnaire. Perception of cough, dyspnea, and other health domains evaluated in SF-36 also improved, although not statistically significant.

Conclusion: In our study we showed a high prevalence of OSA in a population with non-IPF fibrotic ILD. OSA patients presented greater ODI and lower nocturnal minimum SpO2; low SpO2 and TLC were independent predictors of higher OSA risk. PAP therapy could enhance quality of life and correct nocturnal hypoxemia. Thus, the authors believe that there should be a low threshold for OSA suspicion, as well as for initiating PAP therapy, in non-IPF ILD patients.

Performance of screening instruments for obstructive sleep apnea in adults according to gender: Berlin, Stop-Bang and Epworth Sleepiness Scale

P.H. Godoy[1], L.Y.Y. Franco[1], M.d.R.R. Nóbrega[1], I.R. Silva[1], F.B.C.G. Ribeiro[1], L. Joffily[1], M. Rocha[1], D.d.S.B. Alves[2], D.V. Silva[1]
[1]Sleep Laboratory of the Federal University of the State of Rio de Janeiro, Rio de Janeiro, Brazil,
[2]Federal University of the State of Rio de Janeiro, Department of Quantitative Methods, Rio de Janeiro, Brazil

Introduction: Obstructive sleep apnea (OSA) is a condition that increasingly needs to be diagnosed in clinical practice. OSA screening may present different characteristics between genders. This study aimed to evaluate the screening of obstructive sleep apnea using the Berlin Questionnaire and STOP-Bang, and the Epworth Sleepiness Scale, in adults, and compare according to male and female gender.

Materials and Methods: This is a cross-sectional study, with prospective allocation, carried out at the Sleep Laboratory of the Federal University of the State of Rio de Janeiro, with data collection between February 2020 and January 2022. Individuals aged 18 years or older were included. Information collected included data on gender, age, the Berlin (BQ), STOP-Bang (SBQ) questionnaires and Epworth Sleepiness Scale (ESS), and overnight polysomnography (PSG). The diagnostic criteria for OSA was according to the International Classification of Sleep Disorders – Third Edition. Sensitivity, specificity, predictive value, likelihood ratio and accuracy were estimated for each screening instrument, according to sex, with PSG as the gold standard.

Results: The sample consisted of 321 individuals, of which 179 were female. The median age in the sample was 50 years, with 53 years for females and 46 years for males. The prevalence of OSA was 79% in the general sample, 88% in males and 72% in females. Analysis of screening instruments showed better sensitivity, accuracy and positive likelihood value for SBQ in the sample. The sensitivity and accuracy of this instrument were highlighted, particularly, in males, 92% and 85%, respectively. In females, sensitivity was 80% and accuracy was 74%. The BQ was the second best screening instrument for the sample, especially for females, which revealed greater sensitivity than the SBQ (BQ= 84%), similar accuracy (74%), but a lower positive likelihood value (BQ= 1.64 and SBQ= 2.00). The BQ accuracy for females was higher than for males, 74% and 41%, respectively. ESS was the instrument with the worst performance, both for the sample and for the genders, with no relevant differences. All instruments showed a positive predictive value equal to or greater than 81%, being higher for males. Such values were expected due to the high prevalence of OSA in the sample and higher in males.

Conclusions: In general, it is possible to consider that the SBQ showed better performance for OSA screening, both for the sample and for both genders. However, differences were observed between genders. The best results for the SBQ occurred, particularly, in males, while the BQ showed greater sensitivity and accuracy for females. The ESS did not prove to be a good screening instrument for OSA, either for the sample or for any of the genders.

Physiotherapists' perceptions and attitudes about sleep: a compilation and comparison of survey data from three countries

C. Siengsukon[1], A. Al-Sharman[2], M. Aldughmi[3], C. Frange[4]
[1]University of Kansas Medical Center, Kansas City, United States, [2]University of Sharjah, Sharjah, United Arab Emirates, [3]University of Jordan, Amman, Jordan, [4]Universidade Federal de São Paulo, São Paulo, Brazil

Introduction: Sleep is critical for optimal health and wellbeing as well as for recovery after injury or illness. Assessing and addressing sleep issues is beginning to be recognized as part of physiotherapist's (PT) role as health care providers. Online surveys were conducted in three countries (United States, Jordan, Brazil) to determine physiotherapists' attitudes and perception of assessing patients' sleep, providing sleep education, and need for physiotherapist education on sleep-related topics. The purpose of this secondary analysis was to compile and compare PTs education, perceptions, and attitudes regarding sleep across these three countries.

Materials and Methods: This is a secondary analysis of data from three survey studies conducted in the United States, Jordan, and Brazil. Means and standard deviations were calculated for continuous variables, and frequency distributions were calculated for categorical data. Fischer's Exact Tests were used to assess group differences, and alpha was set at < 0.05. If there were group differences on the omnibus test, post-hoc analyses were conducted to determine between group differences with Bonferroni correction, and alpha was set at $< .017$.

Results: Seventy-six PTs were included in analysis in the US study (83% female, age 41.99 ± 10.94), 87 PTs in the Jordan study (57% female; age 28.13 ± 4.44), and 164 PTs in the Brazil study (82% female; age 36.03 ± 7.93). Over 90% of participants from all three countries agreed that sleep is important for people's health and PTs should ask their patients about their sleep quality and sleep habits. However, the majority of respondents did not receive education about sleep in PT school (64-79%) or as continuing education/advanced degrees (65-93%). In addition, half or less than half of participants routinely assess their patients' sleep (26-56%), routinely education their patients about the importance of sleep (21-43%), or how to improve their sleep quality (18-59%). There were between group differences on survey items pertaining to attitudes about sleep, education received about sleep, if sleep is routinely assessed, and education about sleep provided to patients.

Conclusions: Despite recognizing the importance of sleep for health and recovery, PTs are not receiving education about sleep and are not providing education to their patients' about sleep. Equipping PTs around the globe to be active members of the health care team to address sleep issues is a critical opportunity to enhance sleep health worldwide and mitigate health consequences of poor sleep. Between country differences may be due to cultural, educational, professional, and scope of practice difference, which warrants further exploration.

Population-based sleep apnea screening practice: experience and process

G. Pei[1], O. Qiong[1], G. Shan[2], Y. Hu[2], M. Lao[1], Y. Xu[1], L. Wang[1], J. Tan[1], B. Lu[1]
[1]Department of Sleep Center, Guangdong Provincial People's Hospital, Guangdong Academy of Medical Sciences, Guangdong Provincial Geriatrics Institute, Guangzhou, China, [2]Department of Epidemiology and Biostatistics, Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences, School of Basic Medicine, Peking Union Medical College, Beijing, China

Introduction: Owing to the lack of clear guidelines, the significance of obstructive sleep apnea screening in healthy community people is unclear. Obstructive sleep apnea has a high prevalence and low diagnostic and treatment rates. This study aimed to screen for obstructive sleep apnea in a healthy community population and provide a basis for its screening.

Materials and methods: Permanent residents from five communities in the coastal and mountainous areas of South China were selected. The screening process included demographic and sleep questionnaire surveys, and an obstructive sleep apnea screening. To compare the prevalence and risk factors of obstructive sleep apnea in different areas and investigate the distribution of sleep quality and daytime sleepiness among community residents, a Type IV wearable intelligent sleep monitor was used for screening.

Results: A total of 3650 participants completed all studies, with a mean age of 53.81±12.71 years. In addition, 4318 participants completed the obstructive sleep apnea screening within 30 days, and the objective screening speed was 200 people per day. The recovery rate of the screening equipment was 99.37% (4291/4318), the screening success rate was 89.63% (3846/4291), and the rejection rate was 2.7% (120/4438). The prevalence of high-risk obstructive sleep apnea screened using the Stop Bang questionnaire was 42.8% (1563/3650) and that screened using the device was 30.7% (1119/3650). The prevalence of obstructive sleep apnea screened using the Stop Bang questionnaire was higher than that screened using the device (p<0.01). Further analysis of sleep quality and daytime sleepiness showed that 47.6% (1736/3650) of the community population had good sleep quality and 6.6% (240/3650) had daytime sleepiness. Age, sex, body mass index, neck circumference, and hypertension were risk factors for obstructive sleep apnea in the community population.

Conclusions: The use of objective type IV sleep detection equipment to screen a large sample population in the community in a short time is feasible. The prevalence of high-risk obstructive sleep apnea screened using the Stop Bang questionnaire was higher than that screened using the objective screening device. Age, sex, body mass index, neck circumference, and hypertension are risk factors for obstructive sleep apnea in healthy community dwellers in South China.

Predicting implicit suicidality and the daily presence and frequency of suicidal thoughts from initial sleep disturbance

J. Jones[1], E. Cheney[1], A. Fryar[1], C. Chugg[1], O. Crawford[1], D. Kay[1]
[1]Brigham Young University, Psychology, Provo, United States

Introduction: Sleep disturbances such as irregular sleeping patterns, poor subjective sleep quality, and poor sleep efficiency have been linked extensively to depressive symptoms, and through them, suicidal ideation. Researchers are beginning to look at these relationships on a day-to-day level, but, as of yet, not in conjunction with implicit measures of suicidality. In our exploration of sleep disturbances and daily suicidal ideation, we looked to further examine these relationships while addressing implicit suicidality.

Materials and Methods: Fifty-nine participants with and without suicidality completed 10-21 days of sleep diaries (M=15) asking about the presence of suicidal thoughts during the day, the frequency of such thoughts, and the thoughts' severity and duration. The Death/Suicide Implicit Association Task (S-IAT) captured implicit suicidality on the second to last day of the study while sleep disturbance was assessed at the beginning using the full PROMIS-Sleep Disturbance scale (PROMIS-SD). Correlation analyses tested the relationships between the implicit suicidality, sleep disturbance, and suicidal ideation presence and frequency. A simple linear regression predicted the S-IAT score using the PROMIS-SD total score. Two multilevel logistic regressions were used to predict whether or not someone had daily suicidal ideations along with the frequency from the PROMIS-SD total score, holding day constant.

Results: Analyses revealed that greater sleep disturbances, as measured by the PROMIS Sleep Disturbance total score, were significantly correlated with the suicide/death implicit association task final score ($r=0.24$, $p<.001$), and the number, duration, and severity of suicidal ideations ($r = 0.40$, $r = 0.40$, $r = 0.39$, $p<.001$). The PROMIS-SD significantly predicted positive S-IAT scores, or stronger associations between 'Me-Death' and 'Not Me-Life' pairings, although the effect was not very large ($\beta=0.004$, $p<.001$, 95%CI[0.003, 0.005]). There was significant clustering by participant for whether or not participants had suicidal thoughts (ICC=0.55) and the number of suicidal ideations they experienced (ICC=0.46). In the multilevel regression model predicting implicit suicidality, sleep disturbance was not significant ($\beta=.0032$, $p=.15$). In the multilevel logistic regression predicting whether or not someone had suicidal ideations, sleep disturbance was predictive ($\beta=0.10$, $p<.001$, 95%CI[0.05,0.15]) while day was not ($p=.16$). In the multilevel logistic regression predicting number of suicidal ideations, sleep disturbance was predictive ($\beta=0.11$, $p<.001$, 95% CI[0.05,0.17]) while day was not ($p=.11$). Overall, the presence or absence of daily suicidal thoughts as well as the frequency were predicted by the level of sleep disturbances individuals reported.

Conclusions: This study followed up on previous research looking at night-day relationships between sleep disturbances and suicidal ideation. The findings are consistent that poorer sleep quality predicts the presence of suicidal thoughts and increases in the number of suicidal thoughts each day. Clinically, addressing sleep disturbances could potentially be a method of reducing the presence and number of suicidal thoughts that individuals experience.

Reduced depression risk in adults undergoing surgical intervention for Obstructive Sleep Apnea: 2-year follow-up cohort

C. Maciel de Oliveira[1], E. Abidi[1], S. Marques[1], M. Abdelwahab[1], R. Capasso[1]
[1]School of Medicine, Stanford University, Division of Sleep Surgery, Department of Otolaryngology–Head and Neck Surgery, Stanford, United States

Introduction: The relationship between Obstructive Sleep Apnea (OSA) with mental health has garnered significant attention, with emerging evidence suggesting this condition is an independent risk factor for depression and cognitive impairment. We seek to investigate the relationship between OSA and depression while also considering the role of surgical intervention as a potential mitigating factor.
Materials and Methods: We evaluated a comprehensive dataset available at Stanford Health Center (SHC), from 2010 to 2023, to explore patient demographics, medical histories, and outcomes. This study focused on patients aged from 18 to 65 years with a documented history of OSA, indicated by the presence of two or more relevant medical codes according to International Classification of Diseases (ICD-9 and ICD-10). The selection of ICD codes used to define depression was based on the Elixhauser criteria. Additionally, these patients had at least two prior sleep studies on record, identified by Current Procedure Terminology codes (CPT codes). The cohort was divided into two groups: one comprising patients who had undergone OSA-related surgery (n=877), and the other consisting of patients who had not undergone surgery (n=2850). To evaluate the incidence of depression, we excluded individuals with a history of this disease at baseline and required a minimum of two years of accessible follow-up data. To reduce potential bias and ensure the homogeneity of the cohorts, we aplied propensity score matching (PSM) considering demographics, ICD codes, CPT codes, drug codes for adjustments. Logistic regression for adjusted hazard ratios was used as a tool for analyzing the relationship between independent variables and the incidence of depression, while controlling for confounding factors.Time-to-event analysis was done for newly diagnoses of depression and survival analysis was employed.
Results: At baseline, the surgery group was younger (40.3 ±12.7 years vs 44.4 ± 13.3 years) and had a higher representation of males (71% vs 58%) ($p<0.05$). Regarding depression incidence, we observed an 11% occurrence within the surgical group versus 18% in the non-surgical group. There was a significant diference between groups when performed survival analysis [HR=0.63 (CI 95% 0.51 - 0.78), $p<0.05$]. Even after adjusting for age and sex, a reduced risk of developing depression as an outcome in the surgical cohort was observed [HR=0.67 (IC 95% 0.52 - 0.87), $p<0.05$]. Additionally, following propensity score matching (PSM), a statistically significant difference persisted [HR = 0.49 (CI 95% 0.3 - 0.8), $p<0.05$].
Conclusion: Over a minimum 2 years follow-up cohort, our study underscores a substantial link between OSA-related surgery and a diminished risk of developing depression overtime, even when adjusted for age and sex differences. This association persisted as well as through PSM analysis.

Serum calcium metabolism components and cytokines in vitiligo patients following phototherapy: a descriptive overview regarding sleep and circadian regulation

E.M.S. Xerfan[1], A.S. Facina[2], M.L. Andersen[3], S. Tufik[3], J. Tomimori[2]
[1]Universidade Federal de São Paulo, Programa de Pós-Graduação em Medicina Translacional, São Paulo, Brazil, [2]Universidade Federal de São Paulo, Departamento de Dermatologia, São Paulo, Brazil, [3]Universidade Federal de São Paulo, Departamento de Psicobiologia, São Paulo, Brazil

Introduction: Vitiligo is an autoimmune skin disease that comprehends multifactorial triggers. Phototherapy ultraviolet B (UVB) is the gold standard treatment, with immunomodulatory and immunosuppressive effect. It modulates circadian rhythm, acting in immune, hormonal and metabolic pathways that may be associated with vitiligo pathogenesis. Pro-inflammatory cytokines, including interleukin (IL)-1, IL-6 and TNF-γ, and the anti-inflammatory cytokines IL-4 and IL-10 are immune substrates with circadian influence, namely somnogenic cytokines; and may be regulated by phototherapy. This descriptive analysis aimed to compare serum levels of parathyroid hormone (PTH), calcium, vitamin D 1.25(OH)$_2$D and 25(OH)D, and 6 inflammatory cytokines [interferon-y (IFN-y), IL-4, IL-6, IL-10, IL-17A, and tumoral necrosis factor-α (TNF-α)], before and after 6 months of phototherapy in vitiligo patients; and compare the scores of a sleep questionnaire, the Pittsburgh Sleep Quality Index (PSQI) in the subjects.

Materials and methods: Following ethical guidelines, blood samples and PSQI were collected from 5 patients with vitiligo, and reassessed after 6 months of phototherapy. The PSQI was reapplied in 3 subjects. It was used the Milliplex® MAP Human Cytokine Kit to measure serum cytokines.

Results: This sample comprised 4 female and 1 male individuals with age ranging from 21 to 70 years-old. After UVB-NB all presented skin repigmentation and increased levels of PTH, vitamin D 1.25(OH)$_2$D and 25(OH)D. Serum calcium and cytokine levels varied; only TNF-α reduced in all patients. All PSQI scores before phototherapy were over 5 (1 score>10), indicating poor sleep. Regarding PSQI results of the 3 patients after treatment, the final scores were reduced in 2 individuals and increased in 1 volunteer. Two main pathways in this analysis may be interconnected with sleep, the metabolic via (calcium metabolism) and the immunological pathway (cytokines). Vitiligo improvement was observed in parallel with increased levels of vitamin D and PTH, and better subjective sleep after UVB treatment. Phototherapy can regulate the vitamin D metabolism, and the increase of this immunomodulatory substrate in this sample could be associated with better sleep and clinical improvement of vitiligo.

Conclusions: It was described that phototherapy may influence the melatoninergic via, which is related to sleep regulation. As melatonin has anti-inflammatory properties, it may contribute to the clinical improvement of vitiligo. The phototherapy may act on calcium metabolism, increasing vitamin D, and on circadian cytokines, influencing sleep. It was reported that the decreased levels of 25(OH)D can be related to cytokine imbalance. The pro-inflammatory TNF-α plays a central role in the vitiligo immunopathogenesis, and in the disease progression. It is a cytokine with important circadian participation, and its reduction in all patients after phototherapy calls attention to the importance of being investigated regarding sleep and vitiligo course. Higher and sufficient levels of 25(OH)D and cytokine regulation can be reinforced by phototherapy. This can be associated with the improvement of inflammatory and autoimmune diseases, such as vitiligo; and in turn may be related with better sleep quality. The interaction between vitiligo, phototherapy, immune cytokines, vitamin D and sleep is complex and worthy of investigation.

Sleep and COVID-19: A bibliometric analysis of the publication output during the pandemic

I.P.A. Leite[1,2], Y.M. Luciano[2], N. Tomita[2], S. Tufik[2,3], G.N. Pires[2,3]
[1]Centro Universitário de João Pessoa (UNIPÊ), Graduação em Psicologia, João Pessoa, Brazil, [2]Universidade Federal de São Paulo, Departamento de Psicobiologia, São Paulo, Brazil, [3]Sleep Institute, São Paulo, Brazil

Introduction: Since the beginning of the COVID-19 pandemic, a condition of infodemic has been observed, characterized by the remarkable growth in the publication output in a short time period. While the increased number of published articles was an immediate response to the urge of generating knowledge and evidence about COVID-19, much of it might have been due to the need for researchers to keep publishing (according to the publish or perish paradigm). This has also affected Sleep Medicine, and important changes in the publication profile have been perceived, including an overall reduced methodological quality and the rise of more speculative articles. This study aimed to quantify and characterize the publication output of articles related to COVID-19 within the field of Sleep Medicine, considering the first two years of the pandemic (2020 and 2021).
Materials and Methods: This is a meta-epidemiological systematic review. Two independent searches were performed at Web of Science. The first covered the complete publication output about COVID-19 and sleep during 2020 and 2021 (COVID-19 dataset). The second encompassed 2,000 randomly selected publications about Sleep Medicine, unrelated to COVID-19 (non-COVID-19 dataset). Titles and abstracts were evaluated by two reviewers and discrepancies were solved by a third reviewer. The inclusion criteria included being directly related to Sleep Medicine in at least one of three possible aspects (population, intervention/exposition, or outcome). Automated data from the Web of Science were extracted and compared between data collections.
Results: The COVID-19 dataset comprised 5,470 articles, and 1,864 (34.07%) of them were considered eligible. Among the 15 best-ranked journals, 8 were primarily related to Sleep and Chronobiology. The journals that included more articles were Sleep (n=168, 9.01%) and Sleep Medicine (n=147, 7.89%). Regarding the publication types, 1222 were original articles (65.56%), 103 were reviews (5.53%), 349 were meeting abstracts (18.72%), and 190 were other types of theoretical articles (10.19%). Concerning the non-COVID-19 dataset, 742 out of 2000 articles (37.10%) were included. Among the 15 best-ranked journals, 6 were primarily related to Sleep and Chronobiology. The journals that included more articles in this dataset were the Journal of Clinical Sleep Medicine (n=44, 5.93%) and the Journal of Sleep Research (n=28, 3.77%). Regarding publication types, 573 were original articles (77.22%), 65 were reviews (8.76%), 41 were meeting abstracts (5.53%) and the 63 were other types of theoretical articles (8.49%). The proportion of reviews and theoretical articles was significantly higher among the COVID-19 collection ($X2=82.45$; $p<0.001$).
Conclusions: These results confirm that the publication profile of sleep-related research was modified during the pandemic. Sleep-related journals contributed more to the overall publication output during the pandemic, being also more represented in the top-15 journal list. The increased proportion of reviews in the COVID-19 dataset corroborates the observation that research became more speculative during the pandemic. These results demonstrate how the publication profile in Sleep Medicine adapts to emergent contexts such as the COVID-19 pandemic.

Sleep habits of patients with congenital cardiac problems: survey at preconception care interview

Y. Oka[1], E. Kuribayashi[2], R. Katsuta[3], S. Koide[2], N. Takata[4], T. Higaki[2]
[1]Ehime University, Center for Sleep Medicine, Ehime, Japan, [2]Ehime University Graduate School of Medicine, Ehime, Japan, [3]Ehime University Hospital, Ehime, Japan, [4]University of Human Environments Matsuyama School of Nursing, Ehime, Japan

Introduction: Patients with congenital cardiac problems may need to consider their risk of pregnancy after adolescence. Preconception care plays an important role in assisting the patients to think about the partnership and future pregnancy under their medical condition. Having a healthy lifestyle is also beneficial among these patients, but importance of good sleep habits has not been emphasized in this context. The aim of the study was to elucidate sleep habit of young patients with congenital cardiac problems.

Materials and Methods: Ninety patients who regularly consult pediatric outpatient clinic at Ehime University Hospital were invited for preconception care interview. Patients were interviewed by expert midwives about their daily life under their health condition and concern about partnership or having a baby in the future. Sleep habit was analyzed for bedtime and waketime on weekdays and weekends, and subjective feelings about their sleep. Fifty seven patients (mean age 20.4 SD 7.4, 55 females) who answered full for the sleep habit parameters were included in the analysis.

Results: Bedtime was earlier on weekdays (23:12 SD 1:23) than on weekends (23:29 SD 1:31). Waketime was earlier on weekdays (6:47 SD 1:02) than on weekends (8:30 SD 1:36). Estimated sleep duration was longer on weekends (9:01 SD 1:55 hours) than on weekdays (7:34 SD 1:12 hours). Difference of sleep duration between weekend and weekday was 1:26 SD 1:45 hours. Patients complained of difficulty initiating sleep in 17%, nocturnal awakenings in 40% and unrefreshed sleep in 9%. Restriction of exercise due to the cardiac problems was indicated in 33% of the patients. Concerns about future partnership and pregnancy was expressed in 16% of patients, but they were not related to sleep problems.

Conclusions: Sleep problems among patients with congenital cardiac problems were identified. Additional survey with large number of patients is needed to elucidate the relationship among sleep problems, anxiety to their disease condition and future pregnancy.

Sleep medicine tweet-by-tweet, an electronic platform for collaborative medical education

R. Liu[1,2], R. Thomas[3,4], E. Heckman[3,4], M. Mak[5,6,7,2]
[1]Markham Stouffville Hospital, Sleep Medicine and Neurology, Markham, Canada, [2]McMaster University, Medicine, Hamilton, Canada, [3]Harvard University, Boston, United States, [4]Beth Israel Deaconess Medical Center, Pulmonology and Sleep Medicine, Boston, United States, [5]University of Toronto, Psychiatry, Toronto, Canada, [6]Centre for Addiction and Mental Health, Toronto, Canada, [7]Western University, Psychiatry, London, Canada

Introduction: Twitter is a novel and accessible platform for the dissemination of medical education, and it is used by many medical practitioners (1). Many physicians have used Twitter as a means of meeting continuing medical education needs. This can manifest as Twitter-based Journal Clubs, curated conference data and webinars (2).

Materials and methods: I have created a Sleep Medicine Medical Education Twitter account @SleepyNeuroDoc to share complex cases in all areas of sleep medicine, including sleep-disordered breathing, movement disorders in sleep, circadian rhythm disorders and nocturnal epilepsy. I share notable images of polysomnogram outputs, home sleep apnea tests, compliance data, neuro-imaging, electroencephalogram, cardiopulmonary coupling and more. This digital education platform allows rapid circulation of unique cases and promotes in-depth scholarly discussion, with no geographical limit. Polls are conducted for complex topics to facilitate knowledge exchange and consumer engagement. This educational twitter is followed by the entire spectrum of professions within the sleep medicine care team, including physicians, allied health, and researchers. To date, there are 42 cases posted.

Results: We conducted online questionnaires with consumers of this Twitter account, and the results so far indicate greater practitioner comfort with the management of various sleep medicine conditions. Some consumers report having changed their approach to practice.

Conclusions: Our work suggests that this unique use of a social medical platform is beneficial for continuing medical education and knowledge exchange in the field of Sleep Medicine.

References: 1. Chretien KC, Azar J, Kind T. Physicians on Twitter. JAMA. 2011;305(6):566-568.
2. Thamman R, Gulati M, Narang A, et al. Twitter-based learning for continuing medical education? Eur Heart J. 2020;41(46):4376-4379.

Sleep paralysis in medical students of a Venezuelan university

O. Medina-Ortiz[1,2,3,4], C. Cárdenas[5], R. Montes-Callejas[1], P. Guerrero-Contreras[1], L. Parra-Sánchez[4], M. Parra-Sánchez[4]
[1]Santander University, Medicine, Cúcuta, Colombia, [2]Simon Bolivar University, Psychology, Cúcuta, Colombia, [3]Venezuelan Academic of Sleep Medicine, San Cristóbal, Venezuela, [4]The Andes University, Medicine, San Cristóbal, Venezuela, [5]Venezuelan Academic of Sleep Medicine, Caracas, Venezuela

Introduction: Sleep paralysis is a brief and recurrent event, characterized by being aware of an involuntary immobilization immediately at the beginning or end of sleep and that subsides spontaneously or by tactile, visual or verbal stimulation. It is accompanied by anxiety or often terrifying hallucinations. In general population the prevalence oscillates between 0.3 and 40%, but in medical students it tends to be higher when they are subjected to stress and exam periods. The aim of this study was to determine the knowledge about sleep paralysis, prevalence and characteristics with which it manifests itself, in a group of medical students.

Materials and methods: Observational, descriptive, cross-sectional study. Medical students from the Universidad of the Andes, in San Cristóbal, Venezuela, were invited to participate. A sleep paralysis questionnaire was applied that collects data on general knowledge, prevalence, time of onset, form of remission, and triggering factors.

Results: The total sample was made up of 436 students (65.6% female), with an average age of 24.43 years (SD:2.9; min:19 / max:37). 94.3% stated that they knew what sleep paralysis is and 60.3% had experienced the cardinal symptoms of sleep paralysis at some time in their lives. Within this last group, the female sex (65.8%), fourth year students (26.2%), those over 25 years of age (51%) and those with a high grade point average (55% / P=0.053) predominated. . Students with sleep paralysis reported having presented visual (61.2%) and auditory (50.6%) hallucinations, which occurred during a period of exams, homework (67.7%) and sleep debt (63.5%).

Conclusions: The prevalence of sleep paralysis in medical students is high, prevailing in those who are in the middle years of their studies and with better academic averages, implying that it is related to greater responsibility, self-demand and fewer hours of sleep. , since, in the fourth year they must not only study but also go to night shifts and interact with patients. Information on sleep hygiene and stress coping strategies could somehow improve this condition.

Sleep pattern and strategies of runners in BR135 Brazil Ultramarathon

N.V.S. Daniel[1], D.T. da Cunha[1], S. Tufik[2], T. Belli[3], A.M. Esteves[1]
[1]Universidade Estadual de Campinas - UNICAMP, Faculdade de Ciências Aplicadas - FCA, UNICAMP, Limeira - SP, Brazil, [2]Universidade Federal de São Paulo - UNIFESP, Departamento de Psicobiologia, São Paulo, Brazil, [3]Universidade Estadual de Campinas - UNICAMP, Faculdade de Educação Física - FEF UNICAMP, Campinas - SP, Brazil

Introduction: In recent years, the population of ultramarathons races have increased, and so has research at these events. During this race, athletes face many physiological challenges, such as sleep deprivation. It is noted that many ultramarathoners do not sleep during the race, however, only one other study has evaluated how athletes sleep before, during and after an ultramarathon race. Considering the lack of data, the objective of the study was to evaluate the sleep pattern of athletes before, during and after an ultramarathon, in addition to their strategies.
Materials and methods: 13 male athletes who participated in Brazil 135 Ultramarathon were evaluated, and covered 135km (n=4) or 217km (n=9). The athletes had a mean of 45.3 (±10.8) years old and 5.2 (±4.6) years of ultramarathon experience. They completed a sleep diary, with information of the bed and wake up time, the subjective quality of sleep and the number of awakenings, for a week before and after the race, and reported their sleep strategies before and during the race.
Results: Athletes who ran 135 km finished the event between 27.8-33.2h, while athletes who ran 217 km completed the race between 36.4-51.8h. In the week pre-competition, the average of total sleep time (TST) ranged from 7.1-8.3 hours, with an average sleep latency ranged from 33.7-49.8 minutes. On the night before the race, only one athlete did not wake up during the night, however, most reported that had a "good" sleep (n=10). The majority had not defined a sleep strategy before (n=9) and during (n=7) the race. Two athletes trained during the night to get used to running at that time, one chose not to change his sleeping routine and another decided to go to bed earlier than usual. Another athlete had defined to sleep 2h more than usual, but unexpected demands at work messed up the plan. Eight athletes slept during the ultramarathon, with two sleeping less than 1h, and the others sleeping between 1-4,5h. Six athletes slept in the car, one slept on the sidewalk and one on a public bench. Twelve athletes experienced symptoms of sleep deprivation, with drowsiness (n=5), loss of balance (n=4) and hallucinations (n=4) being the most reported, followed by difficulty keeping their eyes open (n=3), blurred vision (n=3) and transient amnesia (n=2). Many athletes did not sleep well after the race, with four waking up frequently with muscle pain, one having a restless sleep and one took a long time to sleep. In the week following the test, the mean TST ranged from 7.8-8.7h, with mean latency ranging from 27.4-45.9min. More than 80% reported awakenings on the first and second night post race, and on the second, third and fourth night after the race, four athletes had "regular" sleep.
Conclusions: Most athletes do not define sleep strategies for before and during the competition, but although many do not intend to sleep during the race, sleep pressure can lead them to this, due to symptoms of sleep deprivation.

Sleep quality assessment in patients with pulmonary hypertension

M.F. Dourado[1], C.M. Guimarães[2], N.C.N. Araújo[1], C.A. Ribeiro[2], R. Galtieri[3], C.N.D. Nogueira[1], C. Salles[4]

[1]Federal University of Bahia, University Hospital Professor Edgard Santos, Salvador, Brazil, [2]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [3]Federal University of Bahia, Post Graduate Program in Interactive Processes of Organs and Systems, Salvador, Brazil, [4]Bahiana School of Medicine and Public Health, Federal University of Bahia, Jorge Amado University Center, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil

Introduction: Pulmonary hypertension (PH) is a clinical syndrome defined by a mean pulmonary artery pressure greater than or equal to 20 mmHg, measured by right heart catheterization. Changes in circulatory dynamics resulting from underlying pathophysiological processes influence the quality of sleep in patients with PH. The Pittsburgh Sleep Quality Index (PSQI) is a validated tool for evaluating the previous month's sleep quality and possible disorders.

Objective: to evaluate the quality of sleep in patients with PH.

Materials and Methods: This is a cross-sectional study with 40 patients followed in an outpatient clinic of PH in Salvador, Bahia, Brazil, with an established diagnosis of PH through invasive measurement of mean pulmonary arterial pressure (mPAP) by right-chamber catheterization (mPAP >20mmHG). The Pittsburgh Sleep Quality Index (PSQI) was applied.

Results: The sample of this study comprised 40 patients, with a mean age of 55 (44-69.5) years. Ninety percent (n=36) of the individuals declared themselves non-white. The female sex was the most frequent, representing 70% (n=28) of the patients. Sixty percent (n=24) were retired; 52.5% (n=21) presented hypertension; the mean BMI was 29.7 (23.7-36.9), and the mean waist circumference was 100.7$\pm$18.5 cm. According to the PSQI results, 85% (n=34) of the patients had a poor sleep index or clinical sleep disorder. Regarding the Pittsburgh Sleep Quality Index: 42.5% (n=17) of patients could not sleep within 30 minutes three or more times a week; 55% (n=22) awoke in the middle of the night or early morning three or more times a week; 60% (n=24) had to get up at night to go to the bathroom three or more times a week; 47.5% (n=19) coughed or snored loudly at least once or twice a week; 40% (n=16) experienced pain during sleep at least once or twice a week. Among those who shared a room or the same bed with someone (n=29): a total of 48.3% (n=14) snored loudly at least once a week; 24.1% (n=7) had long pauses in breathing while sleeping at least once a week. Right heart chambers were dilated in 62.5% (n=25) of the participants. Severe dyspnea was observed in 36.1% (n=13) of the patients.

Conclusion: This study showed that most patients with PH have poor sleep quality or even have clinical sleep disorders. Patients with pulmonary hypertension are submitted to a series of medical therapies; however, sleep quality is still poorly studied in this population, which can significantly impact the quality of life and survival.

Spectral analysis of heart rate variability (HRV) in long COVID during the nocturnal sleep period – a pilot study

F.M. Coelho[1,2], R. Dang[1], S. Daniel[1], J. Ayres[1], V. Jacobson[1], H.K. Meier-Ewert[3], M. Haack[1], J.M. Mullington[1]
[1]Beth Israel Deaconess Medical Center (BIDMC) - Harvard Medical School, Neurology, Boston, United States, [2]Universidade Federal de Sao Paulo - UNIFESP, Neurology, Sao Paulo, Brazil, [3]Boston University, Boston Medical Center, Boston, United States

Background: Long COVID is a syndrome with debilitating symptoms, which can last for weeks and months, not only after severe illness requiring hospitalization, but also following mild/moderate illness. COVID patients acutely ill frequently report sleep disturbances and describe persistent nonrestorative sleep as one of the most debilitating symptoms of the illness. In addition, they also report symptoms consistent with autonomic dysfunction, including dizziness. Aging and obstructive sleep apnea patients frequently experience sleep disturbance and simultaneously present with difficulty with autonomic modulation. We are currently enrolling participants in a study of sleep in Long COVID. The current presentation represents a first look at sleep period heart rate variability (HRV), as an autonomic marker in patients with Long COVID and healthy controls.
Objective: We investigated the spectral analysis of HRV in Long COVID and age and sex matched controls during the nocturnal sleep period.
Methods: We studied 15 Long COVID, and 15 healthy volunteers, matched by age and sex. An overnight 8 hour PSG was carried out in the Clinical Research Center. HRV signals were collected from ECG recordings by Remlogic and Natus NeuroWorks. Data were transformed into European data format and imported into LabChart for offline analysis. Waveform measurement was used to detect and analyze the ECG data from the sleep period. R-wave detection and automated; waveforms were identified with stipulated detection settings personalized for each individual recording. HRV was assessed using beat-to-beat intervals (RRI) unbiased linear windowed tachogram; and Lomb-Scargle periodogram algorithm was run to generate the power spectrum analysis. The magnitude of equivalent to RRI was quantified by calculating the power spectral density for the signal at Low Frequency (LF) (0.04–0.15 Hz) and High Frequency (HF) (0.15–0.4 Hz). Normalized units ("nu") of the HF spectral powers [HFnu = HF/ (LF + HF)] were displayed. The normalized LF [LFnu = LF/ (LF + HF)] and the LF: HF ratio shows equivalent information about sympathovagal balance.
Results: Patients included in the Long COVID group had an index date of infection between 10-38 months prior to their sleep study (average 22 months). In the Long COVID group: 9 (60%) females; aged 41.4±2.9 years old; 93% vaccinated; 33% had been hospitalized during the acute phase. Fifty percent of Long COVID patients presented with insomnia disorder and 33% fulfilled criteria for hypersomnia (DSM-V criteria). The insomnia severity index (ISI) was 12.8±1.7 in the Long COVID group, indicative for subthreshold insomnia, the Epworth sleepiness scale was 7.43±1.03, below a clinically relevant score of 10. There were no differences in spectral analysis of HRV between long COVID patients and healthy controls, respectively: HFnu 47.80±13.16 vs. 45.97±18.51 (p=0.12), LFnu 53.69±13.88 vs. 55.40±19.00 (p=0.32), and LF/HF 1.29±0.70 vs. 1.65±1.21 (p=0.35).
Conclusions: The initial analysis of HRV did not demonstrate differences between Long COVID patients and healthy matched controls during the night. We are continuing to enroll participants in this ongoing study and aim to present a larger cohort including PSG data, at the meeting.

Status of education, research opportunities and clinical care in sleep medicine across developing countries. A multinational questionnaire-based analysis

S. Gonçalves[1], G. Labarca[1], M. Noorani[1], S. Saber[1], D. Garcia-Borreguero[2]
[1]European University of Madrid, Madrid, Spain, [2]Fundación Instituto Del Sueño, Madrid, Spain

Introduction: Sleep medicine is a new specialty worldwide. Sleep disorders are a major public health burden, and their prevalence has increased globally. However, few papers have adressed sleep medicine overview in developing countries. With this project, we aimed to assess the status of sleep medicine in developing countries according to three domains - Medical education, Research and Clinical care.

Materials and Methods: We conducted a multinational, survey based, prospective, cross-sectional study aimed to determine the status of three domains in developing countries within Africa, Asia, and Latin America. The study survey was made available online in 5 languages. We included the United Nation and Global Burden of Disease (GBD) indexing to determine inclusion of countries. Developed countries or high GBD index were excluded. Responses were pooled per-country and descriptive results were reported as median [Interquartile range, IQR] and proportions. In additional analysis, we conducted nonparametric test and chi-square comparison by geographical region and countries with above or below median GBD.

Results: A total of 176 from 41 countries were included in analysis. We found <50% of respoundants reporting sleep education available at undergraduate, post-graduate, diplomate, or CME (continuing medical education) focused on Sleep Medicine. Similarly, 41% reported a local sleep meeting and 22% any local clinical guideline. Clinical care showed differences between medical consult, obstructive sleep apnea exam and therapies (50-60% access) and other sleep disorders (<50% access). In additional analysis, Africa reported lowest levels of courses in sleep medicine and lowest access to attended polysomnography (p=0.028), similarly to countries with low GBD index (p=0.024).

Discussion: As sleep medicine continues to develop as a subspecialty, it is necessary that developing countries improves the access to:

- undergraduate and graduate medical courses
- development of profesional certification
- increase the access to sleep-related exams
- provide more research opportunities focused on sleep medicine

There is an association between the income index of the country with the development of sleep medicine, we identified this source of disparity, especially in countries from Africa

Conclusions: Among developing countries in Latin America, Asia and Africa, current educational, research and profesional opportunities in developing countries is scant, and further effort to improve sleep medicine is needed.

Acknowledgements: We would like to thank the International Master in Sleep Medicine coordinators and the European University of Madrid for all the support during this project.

References:

- Averbuch M, Paez S, Pedemont M, et al. Current status of Latin American sleep societies. Sleep Sci. 2011; 4(1):34-36.
- Bahammam AS. Sleep medicine in Saudi Arabia: Current problems and future challenges. Ann Thorac Med. 2011 Jan;6(1):3-10. doi: 10.4103/1817-1737.74269. PMID: 21264164; PMCID: PMC3023868.
- Chang JR, Akemokwe FM, Marangu DM, Chisunkha B, Irekpita E, Obasikene G, et al. Obstructive Sleep Apnea Awareness among Primary Care Physicians in Africa. Ann Am Thorac Soc. 2020 Jan;17(1):98-106. doi: 10.1513/AnnalsATS.201903-218OC. PMID: 31580702.

Subjective sleep quality and sleepiness dynamics on a group of military submariners: before, during and after a mission

C. Fernandes[1,2], C. Reis[3,4]
[1]Centro de Medicina Naval, Marinha Portuguesa, Lisbon, Portugal, [2]National School of Public Health, Nova University Lisbon, Lisbon, Portugal, [3]Universidade Católica Portuguesa, Católica Research Centre for Psychological, Family and Social Wellbeing, Lisbon, Portugal, [4]Instituto de Medicina Molecular João Lobo Antunes, Faculdade de Medicina, Universidade de Lisboa, Lisbon, Portugal

Introduction: Military missions frequently imply circadian disruption due to atypical work schedules, aggravated by high stress and workload. In submariners, low environmental light intensity, isolation, and physical confinement, further limit the exposure to zeitgebers, establishing a greater circadian challenge. We aimed to assess the effect of the mission on subjective sleep quality and sleepiness, and their recovery.

Materials and Methods: Thirty submariners who underwent a three-week mission were enrolled. Questionnaires were applied at three timepoints: baseline (before the mission), at the end of the mission and after recovery (four weeks later). Subjective sleep quality was assessed through the Jenkins Sleep Scale (JSS), subjective sleepiness with the Epworth Sleepiness Scale (ESS). Fatigue (Fatigue Severity Scale-FSS), anxiety and depressive symptoms (Hospital Anxiety and Depression Scale-HADS-21), chronotype, age, cohabitation, caffeine, alcohol and tobacco consumptions, years of experience on active duty and submarines, work satisfaction and sleep duration (diary) during the mission were also collected. Mean subjective sleep quality, sleepiness, fatigue, depression, and anxiety were compared in the three periods using T-test for paired samples and Wilcoxon test. Multiple linear and logistical regressions were conducted with subjective sleep quality at the end of the mission as the dependent variable. SPSSv28 was used for statistical analysis. Statistical significance was set at p<0.05.

Results: Subjects were mostly male (90%), mean age of 35.6 years, most were caffeine consumers (93.3%) and almost half tobacco users (46.7%). Most had a quite long career, both in active duty (16.27±5.13 years) and in submarines (6.77±5.60 years) and work satisfaction was high (86.7%). Average daily sleep duration during the mission was 361.81±51.04 minutes. At the end of the mission, mean JSS score was 2.23±1.12, with 16.7% of the subjects having a score ≥4, whereas mean ESS score was 10.10±4.31, with 50% of the subjects having a score >10. There was a significant decrease in subjective sleep quality and increase in subjective sleepiness at the end of the mission when compared with baseline (JSS mean 1.72±0,99 vs 2.23±1.14, p=0.008; ESS mean 8.20±2.8 vs 10.10±4.31, p=0.007). However, after the four-week recovery period, there were no differences between the subjective sleep quality and subjective sleepiness scores when compared with baseline (p=0.817 and p=0.565, respectively). Fatigue and depressive symptoms scores did not vary significantly between the three moments of evaluation. Anxiety symptoms were higher at baseline and lower after the recovery period, with a statistically significant difference between these two timepoints (p=0.023). On bivariate analysis only, subjective sleep quality during the mission was correlated with average daily sleep duration during the mission (p=0.044). However, there were no significant associations on multivariate analysis.

Conclusions: The mission had a detrimental effect on the subjective sleep quality and daytime sleepiness. However, after a four-week recovery period, there was a return to baseline, indicating a good recuperation. Interestingly, fatigue and depressive symptoms scores did not vary significantly in relation to the mission. Anxiety symptoms scores were lower after the recovery period and higher at baseline, possibly reflecting mission anticipatory stress.

The causal associations of altered inflammation proteins with sleep duration, insomnia, and daytime sleepiness

Y. Zhang[1], W. Zhao[2], K. Liu[3], Z. Chen[3], Q. Fei[2], M. Yi[3]
[1]Yuam Zhang, Department of Respiratory Medicine, Xiangya Hospital, Changsha, China, [2]Central South University, Department of Respiratory Medicine, Xiangya Hospital, Changsha, China, [3]Central South University, School of Life Sciences, Changsha, China

Introduction: Growing evidence linked inflammation with sleep. This study aimed to evaluate the associations and causal effects between sleep traits, including insomnia, excessive daytime sleepiness (EDS) and sleep durations (short:<7h; normal:7-9h; long:≥9h), and levels of C-reactive protein(CRP), tumor necrosis factor-alpha(TNF-α) and interleukins.
Materials and Methods: Standard procedures of meta-analysis were applied to estimate the expression differences for each protein in compared groups. Then, a two-sample Mendelian Randomization (MR) analysis was performed to explore their causal relationships with published GWAS summary statistics. The inverse-variance weighting (IVW) was used as the primary method followed by several complementary approaches as sensitivity analysis.
Results: A total of 44 publications with 51879 participants were included in meta-analysis. Our results showed that the levels of CRP, IL-1β, IL-6, and TNF-α were higher from 0.36 to 0.58(after standardization) in insomnia compared to controls, while there was no significant difference between participants with EDS and controls. Besides, there is a U/J-shaped expression of CRP and IL-6 with sleep durations. In MR analysis, the primary results demonstrated the causal effects of CRP on sleep duration (estimate:0.017; 95% CI, [0.003, 0.031]) and short sleep duration (estimate: -0.006; 95% CI, [-0.011, -0.001]). Also, IL-6 was found to be associated with long sleep duration (estimate: 0.006; 95% CI, [0.000, 0.013]). These results were consistent in the sensitivity analysis.
Conclusions: There is high inflammatory profile in insomnia and extremes of sleep duration, and elevated CRP and IL-6 have causal effects on longer sleep duration. Further studies can focus on related upstream and downstream mechanisms.

The correlations between nocturnal epilepsy and sleep states, a literature review

M. Alcântara Tavares[1], L. Elias Araujo dos Santos[1], G. Nobre Nogueira[1], F. Duque de Paiva Giudice Junior[1], C. Pimenta do Nascimento[1], L.E. Lucena Cardoso[1], R. Fagundes da Rosa[1], G. Gerson[1]
[1]Universidade Federal do Ceará, Faculdade de Medicina, Fortaleza, Brazil

Introduction: Epilepsy is a very common brain disease among the world's population and can present with a wide variety of etiologies, some of which occur exclusively at night, since the sleep phases have different effects on the neuronal circuitry. However, due to being a relatively young discipline and the complexity of neurophysiological relations, the understanding of how the important bidirectional relationship between nocturnal epilepsies and sleep status occurs is still insufficient. This review aims to clarify the correlation between the different etiologies of nocturnal epilepsy and sleep state through electroencephalogram (EEG) findings and clinical manifestations.

Materials and Methods: The method established was a research conducted on the PubMed database, using the MeSH Major Topic advanced research tool, with the terms "Sleep" and "Epilepsy", combined with an "AND" operator, searching through articles published between 2018 and 2023. After such filters were applied, 6 articles were chosen and systematically reviewed.

Results: A bidirectional relationship exists between sleep and epilepsy, where seizures disrupt sleep and various factors, including antiepileptic drugs and sleep disorders, worsen seizure control by fragmenting sleep, moreover, sleep disturbances can impact cognitive function in patients with epilepsy due to changes in sleep quality and architecture. Interictal epileptiform discharges are most active during slow-wave sleep and decrease during REM sleep, which inhibits seizures compared to wakefulness and non-REM sleep, furthermore, sleep-related epilepsy syndromes, such as ESES and CSWS, manifest with seizures and continuous spike waves during NREM sleep. Different epilepsies show specific patterns related to sleep stages, with nocturnal seizures being more common during NREM sleep, also, in patients with idiopathic generalized epilepsy, a shift to NREM sleep may cause the expression of IGE. Furthermore, sleep modulation by GABAergic inhibition and neuromodulators like adenosine, melatonin, serotonin, and histamine can have anti-seizure effects.

Conclusions: According to the reviewed articles, there's an important and bidirectional relationship between sleep quality and nocturnal epilepsy. This is evident in the link between sleep disorders and an increased frequency and severity of seizures. Whilst antiepileptic drugs can effectively reduce seizures during sleep, they often produce a range of side effects that diminish patient quality of life. Therefore, there is a need for further research into alternative drugs that can effectively manage epilepsy without negative impacts on patient well-being. Thus, aiming at a better treatment of epilepsy, professionals should take into account the health of patients' sleep including any sleep-related symptoms, when assessing and treating epilepsy. By adopting a comprehensive approach that addresses sleep quality, clinicians may be better equipped to improve outcomes for their patients with epilepsy.

The impact of total sleep deprivation, sleep restriction, and sleep disruption on sleepiness, fatigue, and pain under controlled experimental conditions

F.M. Coelho[1,2], R. Dang[1], J. Devine[1], M. Haack[1], J.M. Mullington[1]
[1]Beth Israel Deaconess Medical Center (BIDMC) - Harvard Medical School, Neurology, Boston, United States, [2]Universidade Federal de Sao Paulo - UNIFESP, Neurology, Sao Paulo, Brazil

Background: Sleep loss can be a consequence of total sleep deprivation, sleep restriction, and/or sleep disruption. In order to investigate the effects of sleep loss on cognition, mood, pain, and autonomic, neuroendocrine, and immune function, we have performed a series of highly controlled experiments to manipulate sleep and investigate the accumulation of a sleep deficit and the return to normal following recovery sleep.

Objective: to compare the impact of total sleep deprivation, sleep restriction, and sleep disruption on sleepiness, fatigue, and spontaneous pain.

Methods: We analyzed data from 89 healthy participants from three loss protocols carried out in the controlled environment of the Clinical Research Center. Each participant in all three studies received a new unique ID. Participants in the control sleep condition of all protocols were combined to a single control group. The protocol for all groups (sleep deprivation, sleep restriction, sleep disruption, control sleep) consisted of an adaptation/baseline day with an 8 hours sleep opportunity, followed by 3 sleep manipulation days, and ended with a single night of recovery sleep with an 8-hour sleep opportunity. In the total sleep deprivation condition, participants were kept awake across three days and nights (totaling 88 hour of continuous wakefulness). In the sleep restriction condition, participants had a sleep opportunity of 4 hours from 3am to 7am for three consecutive nights. In the sleep disruption condition, participants had a sleep opportunity of 4 hours from 12am to 5pm, but in addition, sleep was disrupted by 40 minute-awakenings every hour throughout the scheduled sleep period. Daytime ratings of sleepiness, fatigue, and pain were obtained through computerized visual analog scales at 9:00 am, 1:00 pm, 5:00 pm, and 9:00 pm every day of the protocols and aggregated across each day.

Results: We analyzed the data of 17 participants from sleep deprivation group (35.3% female; age 37±1.16 yeas), 18 participants from sleep restriction group (55.6% female; 29.4±2.1 years), 22 participants from sleep disruption group (54.5% female; 27.90±1.29 years), and 32 control sleep participant (43.8% female; age 32.0±1.6 years). Sleepiness, fatigue, and pain ratings were higher in participants undergoing sleep deprivation, restriction, or disruption than compared to control participants (p<0.01). Participants in the total sleep deprivation had the highest sleepiness (p<0.01), fatigue (p<0.01), and pain (p=0.03) scores compared to sleep restriction and sleep disruption. Compared to the baseline, there was a cumulative effect across the three consecutive nights of sleep manipulation for sleepiness (p<0.01) and fatigue (p<0.01), but not for pain (p=0.10). Following a single night of recovery sleep sleepiness, fatigue, and pain scores were not different from baseline scores (all p>0.10).

Conclusions: As expected, compared to baseline scores, sleepiness and fatigue progressively worsened across the three days of all sleep manipulation protocols. Sleep deprivation had a greater impact on sleepiness, fatigue, and pain compared to sleep restriction or sleep disruption. In addition, participants felt significantly more sleepy when undergoing sleep disruption than sleep restriction, and this effect was still evident after a single night of recovery sleep.

Transfixation of the tonsillar locus: a complication during orotracheal intubation to perform obstructive sleep apnea surgery

M.F.B. Cardoso[1], R.M. Kageyama[1], M.H.R. Kim[1], C.H.L. Martins[1], H.d.S. Nunes[1], F.C.C.d. Santos[1], H.C.F. Pinto[1], P.P.V.d.C. Cintra[1], J.A. Pinto[1]
[1]Nucleus of Otolaryngology, Head and Neck Surgery and Sleep Medicine, Otolaryngology and Sleep Medicine, São Paulo, Brazil

Introduction: Patients with Obstructive Sleep Apnea Syndrome (OSAS) tend to have a difficult airway for OTI. According to perioperative management manuals for patients with OSAS, approximately 66% patients with difficult airways have OSAS. The most common complications of OTI include subglottic stenosis, tracheoesophageal fistulas, necrosis of the dorsum of the tongue, tracheal stenosis, laryngeal granuloma, traumatic lesions of the larynx and vocal alterations, iatrogenic lesions of the upper airway. In a systematic review carried out comparing the use of video laryngoscopy and direct laryngoscopy in patients who required OTI, the following outcomes were described: intubation failure, hypoxia, airway complications, laryngeal trauma, odynophagia and hoarseness. The use of a videolaryngoscope decreases the chance of complications during OTI in patients with difficult airways. There is some important factors that can influence the final outcome such as the choice of the appropriate laryngoscope blade in view of the patient's anatomy, the preparation of the team and anticipation for a difficult airway, and the experience of the physician who will perform the procedure.

Materials and Methods: Demonstrate a case of complication during orotracheal intubation (OTI) performed using a videolaryngoscope. Analysis of the event and literature review on possible complications during OTI.

Results: Patient, J.N., 42 years old, attended at an Otorhinolaryngology outpatient clinic, with complaint of snoring and daytime sleepiness. On physical examination rhinopathy, grade II palatine tonsils and lingual tonsil hypertrophy were observed. Patient had a Body Mass Index of 27.3Kg/m. A polysomnography exam was requested, with Apnea-Hypopnea Index of 43.8 per hour, oxyhemoglobin saturation of 82.4% and intense and deep snoring. After clinical treatment and evaluation, the surgical indication of Uvulopalatopharyngoplasty was chosen.

Immediately before anesthetic induction, it was verified that the patient had a difficult airway and a videolaryngoscope was requested. After performing the OTI procedure, when placing a mouth gag to start the surgical procedure, a large amount of blood was identified in the oral cavity with transfixation of the tonsillar locus. A second attempt at OTI was performed, which ended with the tube remaining in the previous location, with progressive worsening of the edema and bleeding. The third attempt at OTI was successful, allowing evaluation of the tonsillar space, that presented laceration and significant edema. Hemostasis was performed with vicryl 3.0, and decided to suspend the surgical procedure due to potential risks. Hydrocortisone was administered and waited more than 1 hour for safe extubation. The patient remained hospitalized until the following day for monitorization and angiotomography of the carotid arteries, with a result within normal limits. The patient was discharged the next day without complaints and is being followed up on an outpatient basis.

Conclusions: Orotracheal intubation is a procedure that aims at definitive control of the airway, and has its risks of complications that, if not identified, can harm the patient's life. The experience of the professional and appropriate technique in order to analyze and define possible difficulties at the time of the procedure are extremely important.

Variability across Sleep Centres in Europe: a follow-up study

H. Gretarsdottir[1], K.A. Olafsdottir[1], S. Sigurdardottir[1], K. Hoelke[1], T. Siilak[1], L. Korostovtseva[2], E.S. Arnardottir[1]
[1]Reykjavik University, Sleep Institute, School of Technology, Reykjavik, Iceland, [2]Federal Almazov Medical Research Centre, St Petersburg, Russian Federation

Introduction: The Sleep Revolution aims to improve the diagnosis and assessment of sleep-disordered breathing and related comorbidities. Standardizing the recording and scoring of sleep is essential for consistent and accurate diagnosis, research comparability, and effective communication in the field of sleep medicine. In 2015, a questionnaire by Arnardóttir et al., sent to representatives of the Assembly of National Sleep Scientists (ANSS) of the European Sleep Research Society (ESRS), demonstrated substantial variability in the recording and scoring of respiratory events during sleep across Europe. With recent advances in technology, updates to scoring guidelines, as well as the COVID-19 pandemic, there is reason to re-assess this variability. The aim of the current study was to report the results from a modified follow-up questionnaire. The updated questionnaire included questions to further assess variability in the recording and scoring of sleep, as well as changes in protocols following the COVID-19 pandemic.

Materials and Methods: We developed an online questionnaire with the use of REDCap (Research Electronic Data Capture) that was sent to the 31 representatives of the European national sleep societies that are currently members of the ANSS. The questionnaire included the original questions with slight alterations as well as 48 additional questions formulated to assess the recording and scoring of sleep studies beyond respiratory events, as well as changes in sleep centres following the COVID-19 outbreak. We analysed the responses and compared them to the findings of Arnardottir et al. (2015).

Results: Preliminary findings indicate that, despite some changes in scoring guidelines and technological advances, variability in sleep study recording and scoring across different sleep centres persists. The study also identified COVID-19-related changes in sleep centres which have continued post-COVID, such as increased use of at-home sleep apnoea testing and telemedicine. These changes, along with the differences in the implementation of technology between sleep centres, emphasize the need for further refinement of scoring guidelines and continuous education for sleep technicians to improve the consistency and reliability of sleep study results.

Conclusions: Due to persisting variability, further standardization of the recording and scoring of sleep in Europe remains critical.

Parasomnia

A comparison of treatments tried by patients with sleep related painful erections with recommended treatments from a meta-analysis

S. McNeillis[1], O. Yildrim[1], D. Ralph[2]
[1]University College London Hospitals, Sleep Unit, London, United Kingdom, [2]University College London Hospitals, Urology and Andrology, London, United Kingdom

Introduction: Sleep related painful erections (SRPE) is a rare parasomnia, with unknown aetiology. A meta-analysis conducted by Abdessater et al in 2019 stated that the causes were originally thought to be due to increased beta adrenergic activity and later thought to be due to neurological dysfunction at a local level involving the ischiocavernous and bulbocavernous muscles. One case was due to a thoracic ependymoma and two cases due to obstructive sleep apnoea. Treating the ependymoma and obstructive sleep apnoea alleviated the symptoms of SRPE. Johnson et al 2022 showed that SRPE can cause sleep disruption as demonstrated by polysomnographic studies which demonstrate a reduced sleep efficiency, total sleep time and increased wake after sleep onset time. Abdessater revealed that treatments for SRPE were mostly medications, based on aetiological theories as described above. Treatments that have been tried and abandoned are benzodiazepines, opiates, beta blockers, antidepressants, anti androgens.
Treatments that were thought to be successful were phosphdiaesterase type 5 inhibitors, cinatipride, clozapine and baclofen. In this paper, we aimed to ascertain what has been used by patients with sleep related painful erections. Unfortunately, SRPE is a rare condition and it is difficult to recruit patients in sufficient numbers
Materials and Methods: A global facebook group was created by patients who suffer from SRPE in 2017. The group consisted of 91 patients at the time of the survey. We reviewed the treatments tried and stated by the facebook group. Treatments were divided based on whether these were medications or non-medication treatments.
Results: Overall the group tried 26 medications and 14 non-medication treatments.
Of the treatments recommended in Abdessater's paper only baclofen and tadalafil were tried by the facebook group. No patients tried cinatipride or clozapine. Many of the medication which were not thought to be effective were tried by the patients, including benzodiazepines and antidepressants.
Non medication treatments varied vastly. These were CPAP alone or with oxygen, food supplements, vitamin supplements to bedroom adjustments such as new mattresses or massage chairs. Unusual treatments included pudendal nerve injections and implantation of pudendal nerve stimulators.
Conclusions: Sleep related painful erection is a debilitating sleep disorder causing long term sleep disruption and pain at night. It is poorly studied due to the rarity of the condition. Patients are trialling various treatments some which currently have little scientific evidence and may even lead to harm. Collaboration is needed globally to understand and evaluate the aetiology and therefore advise more effective treatments.

Development, assessment and application of home ambulatory sleep polysomnography in sleep-related motor behaviors

G. Mainieri[1], F. Mignani[2], G. Loddo[3], L. Baldelli[1], A. Montini[4], F. Cotichelli[4], S. Mondini[2], F. Provini[1]
[1]IRCCS Istituto delle Scienze Neurologiche di Bologna, Department of Biomedical and NeuroMotor Sciences, University of Bologna, Bologna, Italy, [2]IRCCS Istituto delle Scienze Neurologiche di Bologna, Bologna, Italy, [3]Department of Primary Care, Azienda AUSL di Bologna, Bologna, Italy, [4]Department of Biomedical and NeuroMotor Sciences, University of Bologna, Bologna, Italy

Introduction: For most sleep behavior disorders, in-laboratory polysomnography (PSG) is currently the diagnostic gold standard. However, a need for more practical diagnostic tools has been underlined. In the study of nocturnal behaviors, video analysis along with EEG evaluation is still essential to perform a correct diagnosis. The aim of our study is to describe the experience of Bologna Sleep Centre in the evaluation of sleep-related behavior disorders by means of home-based video ambulatory recording.

Materials and Methods: We analyzed consecutive home-based video ambulatory recordings from April 2016 to February 2023 of patients afferent for different suspected sleep-related motor behaviors including REM and NREM parasomnias, sleep-related epilepsy, psychogenic non-epileptic seizures. Based on the clinical suspicion, patients underwent either a 48 hours monitoring with complete EEG montage (NREM parasomnias/epilepsy) or a 24 hours monitoring with sleep montage (RBD patients). The patients were equipped in the sleep lab by expert sleep technicians, who also provided the instructions to carry on with the recording in the home setting.

Results: We included 260 consecutive patients, for a totality of 407 home-based video ambulatory recordings. Overall, 83.5% of recordings were diagnostic (either confirming or excluding the clinical suspicion), while 16.5% of recordings were not diagnostic (insufficient evidence to confirm a diagnosis or technical problems). An accurate technical evaluation of quality of polygraphic tracings on the first 50 recordings disclosed artifacts in 8% of channels.

Conclusions: Home-based PSG tracings provided a good diagnostic accuracy and displayed limited technical issues, which do not significantly interfere with the diagnostic capacity. The recording in the patient's natural environment might increase the likelihood to capture the habitual episodes. Home-based PSG showed a good quality, with lack of artifacts in 92% of channels. In conclusion, home-based recordings seem a promising approach with lesser costs and faster waiting time than in-lab PSG.

The impact of hypnosis on the severity of sleepwalking episodes: preliminary data

C. Blanchette-Carrière[1,2], J. Montplaisir[3,2], A. Desautels[4,2], A. Zadra[1,2]
[1]Université de Montréal, Psychology, Montreal, Canada, [2]Center for Advanced Research in Sleep Medicine, Montreal, Canada, [3]Université de Montréal, Psychiatry and addiction, Montreal, Canada, [4]Université de Montréal, Neurosciences, Montreal, Canada

Introduction: Sleepwalking is one of the most prevalent and dramatic instances of NREM parasomnias. Descriptive studies and case reports have reported on the efficacy of various treatments in adult sleepwalkers (Stallman & Kohler, 2016) and a majority of sleepwalkers treated with hypnosis report positive long-term improvements. Many of these reports, however, contain vague or nonexistent descriptions of treatment protocols and much the data is descriptive and retrospective in nature. Thus, empirical data guiding the use of hypnosis in sleepwalkers are lacking and no objective information exists on its possible mechanisms of action. We thus aimed to assess the frequency and severity of sleepwalking episodes before and after a standardized 4-week hypnosis treatment protocol.

Materials and Methods: 13 adults (5 men, 8 women) with a mean age of 35 years and an ICSD-based diagnosis of sleepwalking underwent overnight polysomnography to rule out the presence of other major sleep disorders. Patients then completed a baseline clinical assessment that included the severity on a 3-point scale, weekly frequency and behaviors related to their episodes. Four weeks later, patients entered a standard hypnosis-based treatment protocol consisting of four 45-minute hypnosis sessions conducted at one-week intervals. Each of the sessions included a standardized procedure of hypnotic induction and relaxation as well as suggestions addressing sleepwalking behaviour modification. One week following the last treatment session, patients completed the same clinical assessment as at baseline.

Results: When compared to sleepwalkers' baseline values, post treatment assessments revealed a significantly lower episode severity (1.1 ± 0.3 vs 2.2 ± 0.7; $t_{(12)} = 5.11$, $P < 0.001$) but no significant pre- (3.1 ± 2.2) to post-treatment (2.2 ± 2.0) difference was found for episode frequency ($t_{(12)} = 1.29$, $P = 0.11$). Seven of the 13 patients (54%) reported dangerous behaviours for themselves or their bed partner during their episodes prior to treatment, while no potentially injurious behavior was reported after treatment ($\chi^2_1 = 7.04$, $P = 0.008$).

Conclusions: Our preliminary results suggest that while not significantly reducing actual somnambulistic events, the use of hypnosis in the treatment of adult sleepwalking results in a significant reduction in episode severity as well as in the occurrence of potentially injurious behaviors related to sleepwalking. In addition to testing a larger patient sample, the next steps in this research project include collecting longer term follow-up data and the investigation of mechanisms through which hypnosis may exert its therapeutic effects in adult sleepwalkers.

Pediatric

0155 polygraphic recordings with non-invasive monitoring in hospitalized children under 3 months for suspected apnea

D. Zenteno[1,2], G. Torres[2], C. Sanchez[1], J. Flores[1], R. Gutierrez[1], M.J. Elso[3,4]
[1]Universidad de Concepcion, Pediatrics, Concepcion, Chile, [2]Hospital Guillermo Grant Benavente, Pediatrics, Concepcion, Chile, [3]Hospital Guillermo Grant Benavente, Neurologia, Concepcion, Chile, [4]Universidad de Concepcion, Especialidades Medicas, Concepcion, Chile

Introduction: Apneas in young infants constitute a challenge for health teams and have great etiological diversity; Objective sleep studies can contribute to its diagnosis and allow establishing severity, determining subsequent therapeutic behaviors. Polygraphy can be performed on patients monitored for risk, hospitalized in basic units, neonatal or pediatric intensive care.
Materials and Methods: Describe and analyze the results of polygraphic recordings (PR) in children under 3 months hospitalized and monitored for suspected apnea.
Results: Cross-sectional study.Children under 3 months of age hospitalized with suspected apnea between December 2011 to June2023, in whom simultaneous was performed polygraphy, and non-invasive monitoring,. Demographic variables, diagnoses, and polygraphic variables were recorded; apnea hypopnea index (AHI), central apnea index (CAI), obstructive apnea index (OAI) and mixed and obstructive apnea index (MOAHI), average saturation, minimum saturation, desaturation index ≤80% (ID≤80), saturation (SpO2) < 90% for more than 5% and percentage of periodic breathing.
As altered criteria were considered: AHI≥5/h, ID80≥1/h, IAC≥1/h with SpO2≤80%, average SpO2<93% and SpO2≤90% for more than 5% of the validated recording time. Descriptive statistics were performed, quantitative data expressed in median and interquartile range (IQR), categorical data expressed in frequency and percentage. Analysis of normality with the Kolmogorov-Smirnov test. The association between demographic and polygraphic variables was evaluated according to diagnosis with the Levene and Kruskal Wallis test and according to prematurity with the Wilcoxon test. The association between demographic and quantitative polygraphic variables was analyzed with Spearman's rho. Analysis performed with RStudio, considering statistical significance p<0.05. RESULTS:155 studies were analysed. Age 41.0 days (IQR 22.0-59.0), gestational age (GA) 38 weeks (IQR 32.0-42.0), males 63.9% and history of prematurity 52.3%. Main diagnoses: BRUE risk (58.1%), apnea of prematurity (27.1%), hypotonic syndrome (7.1%), laryngomalacia (3.9%) and craniofacial malformations (3.9%). 21.9% of PR were altered, mainly according to criteria AHÍ≥5/h 44.1% and SpO2<90% for more than ≥5% 20.6%. He highlighted that those with craniofacial alterations had a higher OAI (p = 0.0001) and higher MOAHI (p <0.0001); Additionally, those with larigomalacia had a higher ID≤80 (p=0.0034). Higher periodic respiration (%) (p=0.0005) and lower minimum saturation (p=0.0009) were observed in premature infants than in term infants.
Conclusions: The main reason for PR in this group was BRUE risk. Craniofacial malformations are associated with higher obstructive and mixed index; and laryngomalacia had significantly lower saturations. Those with a history of prematurity had more periodic respiration and alterations in minimum saturation.

Alertness is inversely associated with hyperactivity in elementary school students

Y. Ueda[1], H. Wada[1], K. Onuki[1], Q. Zhu[1], M. Miyakawa[1], S. Sato[1], Y. Kameda[1], H. Nakano[2], T. Tanigawa[1]
[1]Juntendo University Graduate School of Medicine, Public Health, Tokyo, Japan, [2]Sleep Disorders Centre, National Hospital Organization Fukuoka National Hospital, Fukuoka City, Japan

Introduction: Impairment in sleep health is observed in Attention Deficit Hyperactivity Disorder (ADHD) and is associated with an increased prevalence of hyperactivity. Sleep health impairment is associated with alertness, assessed by a psychomotor vigilance test (PVT). These previous studies suggested that PVT-defined alertness is associated with hyperactivity. However, the association between PVT metrics and hyperactivity in school-aged children remains unclear. The present study aims to investigate the association between PVT metrics and hyperactivity.

Materials and methods: We conducted a cross-sectional study on 2,078 students from grades 1 to 6 in six elementary schools in Tokyo. Their parents completed a questionnaire-based survey. In addition, the participants conducted the Strengths and Difficulties Questionnaire (SDQ), a brief child behavior screening tool, to assess their children's hyperactivity. Hyperactivity was defined as SDQ ≥7 and borderline hyperactivity ≥6. Alertness was evaluated with the PVT metrics, including (1) Median reaction time (ms), (2) Lapses 355 (reaction time > 355 ms). PVT metrics included quartiles of median RT, and three categories of lapses (0 to <6 [reference] vs. 6 to <12 vs. 12 and over). Univariate and multivariate logistic regression analyses were used to investigate the association between hyperactivity (SDQ ≥6 and ≥7) and the variables of poor PVT metrics, referenced to the fastest quartile of the median RT and lapse 355 between 0 and 5.

Results: A total of 2,055 children (mean (SD) of age; 9.0 (1.7) years, 52.5% boys) were analyzed in this study. Of them, 386 children (18.8%) and 233 (11.3%) are considered to suffer from borderline hyperactivity and hyperactivity, respectively. Multivariable adjusted odds ratios and 95% confidence intervals for borderline hyperactivity (SDQ ≥6) according to the quartile of the median RT were 1.89 (1.36-2.63) in the slowest quartile of median RT compared with the shortest fastest. Similar associations were observed in the association between hyperactivity (SDQ ≥7) and median RT. Likewise, multivariable adjusted odds ratio and 95% confidence interval for borderline hyperactivity (SDQ ≥6) and hyperactivity (SDQ ≥7) according to the lapse categories were 1.77 (1.19-2.63) and 1.85 (1.13-3.01), respectively in the group of ≥12 lapses compared with the reference group.

Conclusions: Our findings indicate that alertness is inversely associated with hyperactivity, suggesting that sleep insufficiency may cause hyperactivity in elementary school students.

Association between Sleep Apnoea-Specific Hypoxic Burden and blood pressure in children with OSA

C.T. Au[1,2], N.T.K. Yuen[2], I. Narang[1,3], K.C.C. Chan[2], A.M. Li[2]
[1]The Hospital for Sick Children, Research Institute, Translational Medicine, Toronto, Canada, [2]The Chinese University of Hong Kong, Department of Paediatrics, Hong Kong, Hong Kong, SAR of China, [3]The Hospital for Sick Children, The Division of Respiratory Medicine, Department of Paediatrics, Toronto, Canada

Introduction: In adults, the sleep apnoea-specific hypoxic burden (SASHB) is a better predictor of cardiovascular diseases and all-cause mortality when compared to the apnoea hypopnoea index (AHI). There are currently no relevant paediatric data in the literature. This study aimed to examine the association between SASHB and 24-hour ambulatory blood pressure (ABP) outcomes in children with obstructive sleep apnoea (OSA). We hypothesised that SASHB better correlated with ABP parameters when compared to AHI.

Materials and Methods: This was a secondary analysis of a randomised controlled trial (RCT) that examined the effect of AT on blood pressure in prepubertal non-obese children with OSA. The RCT randomised 137 children with AHI ≥3 events/hour and tonsil size of ≥ grade I. 68 were allocated to the early AT group while 69 were allocated to the watchful waiting (WW) group. In the end, 62 from the early AT group and 47 from the WW group completed the study. All participants underwent overnight polysomnography and 24-hour ambulatory blood pressure monitoring before and 9 months after the intervention. $SASHB_{obm}$ was derived from the pulse-oximetry tracing and was defined as the total area bounded by the baseline saturation level and the desaturation curve triggered by an obstructive or mixed apnoea or hypopnoea per hour of sleep. Pearson correlation coefficients and a linear mixed model were used to test the association.

Results: Valid oximetry data of 57 participants (age: 7.9y ±1.3, 72% male) from the early AT group and 39 (age: 8.2y ±1.4, 77% male) from the WW group were analysed. The mean (±SD) of $SASHB_{obm}$ was 79%min/h (±121.6) and the median (IQR) was 32.2%min/h (12.0 to 78.4). Log-$SASHB_{obm}$ highly correlated with log-OAHI (R^2=0.78). After adjusting for age, sex, and BMI z score and accounting for repeated measures, log-OAHI was significantly associated with both daytime (p = 0.049) and nighttime diastolic BP z score (p = 0.014), whereas log-$SASHB_{obm}$ was significantly associated with nighttime diastolic BP z score only (p = 0.043). However, neither the change in $SASHB_{obm}$ nor the change in OAHI after the intervention was associated with the changes in any ABP parameters (all r <0.2, all p >0.05). Within the early AT group, higher log-$SASHB_{obm}$ at baseline was associated with a greater reduction in nighttime diastolic BP z score (r = -0.284, p = 0.033), whereas baseline log-OAHI was not (r = -0.221, p = 0.098).

Conclusions: This is the first study examining the association between $SASHB_{obm}$ and 24-ABP parameters in children with OSA. $SASHB_{obm}$ was highly correlated with OAHI in this paediatric cohort, so both indices had similar correlations with the BP outcomes. Further studies are needed to explore whether a different definition of hypoxic burden is needed specifically for paediatric OSA to make it a more relevant marker of clinical outcomes.

Behavioral prevention and treatment for bedtime problems and night wakings in children aged 0-5 years: a systematic review and meta-analysis of randomized controlled trials

X. Xiao[1], J. Lin[1], Y. Jiang[1], G. Wang[1], H. Wang[1], R. Su[1], Y. Deng[2], X. Qiu[3], C. Li[4], Q. Lin[1], F. Jiang[1,5,6]
[1]National Children's Medical Center, Shanghai Children's Medical Center, School of Medicine, Shanghai Jiao Tong University, Department of Developmental and Behavioral Pediatrics, Pediatric Translational Medicine Institute, Shanghai, China, [2]National Children's Medical Center, Shanghai Children's Medical Center, School of Medicine, Shanghai Jiao Tong University, Department of Neurology, Shanghai, China, [3]Shanghai Jiao Tong University, School of Medicine, Shanghai, China, [4]Shanghai Mental Health Center, Shanghai, China, [5]Xinhua Hospital, School of Medicine, Shanghai Jiao Tong University, Shanghai, China, MOE-Shanghai Key Laboratory of Children's Environmental Health, Shanghai, China, [6]Shanghai Center for Brain Science and Brain-Inspired Technology, Shanghai, China

Introduction：
Bedtime problems and night wakings are highly prevalent among infants, toddlers, and preschoolers, affecting their physical, mental, and neurobehavioral development, as well as the well-being of other family members. Behavioral interventions have consistently shown promise as effective strategies for preventing and treating these sleep problems but their effectiveness for children aged 0-5 years remains uncertain, particularly regarding the specific optimal age range for intervention, and the durability of effects. This uncertainty stems from limitations observed in existing randomized controlled trials (RCTs), including small sample sizes, variations in participant selection and follow-up schedules. Although several systematic reviews and meta-analyses have been conducted, most of them have combined prevention and treatment studies, with low research quality and a limited focus primarily on infants. Consequently, it is challenging to draw comprehensive conclusions about the impact among children aged 0-5 years, preventing the provision of high-quality evidence-based recommendations. Therefore, our primary objectives were to investigate the individual impact of sleep behavioral prevention and treatment interventions on sleep outcomes in children aged 0-5 years, and to examine potential differences in these effects among different age groups and their long-term sustainability.

Materials and Methods:
We performed this review according to the PRISMA guidelines, and the protocol was registered with PROSPERO (CRD42023410622). We searched seven databases including MEDLINE, Embase, PsycINFO, Scopus, Web of Science, CINAHL Complete, and Cochrane Library, from their inception up to Aug 30th, 2023. The primary outcomes were the number of night wakings (NWs), wake time after sleep onset (WASO), and sleep onset latency (SOL). The secondary outcome was maternal emotion assessed by Edinburgh Postnatal Depression Scale (EPDS). Follow-up period was divided into immediate-term (≤1 month), short-term (1-3 months), medium-term (3-12 months), and long-term (≥12 months) for subgroup analysis.

Results:
Of the 7083 publications searched,18 trials were finally included in meta-analysis. We found that behavioral treatment exhibited a small to moderate effect, with the Hedges g for NWs:-0.43 [95%CI-0.86,-0.00,N=9,n=1221, WASO:0.36[-0.49,-0.23],N=8,n=1029, SOL: -0.19[-0.31; -0.07],N=8,n=1168, and only the immediate effects were observed when subgroup analysis was conducted. There was only one study (n=171) with long-term follow-up, which found a moderate treatment effect on SOL. No significant preventive effect of behavioral intervention on the three outcomes in overall analysis and subgroup analysis. The pooled results from the EPDS data did not demonstrate any prevention or treatment effect.

Conclusions:
Behavioral interventions have shown small to moderate effectiveness in treating night waking and bedtime problems, particularly within the first month of intervention. The effectiveness of preventive interventions was not observed, further research is needed to establish conclusive results in this regard. More research is needed to confirm the lasting impact of behavioral interventions beyond the initial one-month follow-up. The effectiveness of sleep behavioral interventions on maternal depression remains unclear.

Children with sleep enuresis: does alarm, desmopressin, or combined treatment impact their sleep profile?

L. Azevedo Soster ISRTP[1], S.N. Fagundes[2], A. Lebl[2], R. Cardoso Alves[3], V. Koch[2], K. Spruyt[4]
[1]Children´s Institute - University of Sao Paulo Medical School, Pediatric Sleep Laboratory and Outpatient Clinic, São Paulo, Brazil, [2]University of São Paulo, Pediatrics, São Paulo, Brazil, [3]Fleury Medicina e Saúde, Clinica Neurophysiology, São Paulo, Brazil, [4]Université Paris Cité, NeuroDiderot INSERM, Paris, France

Introduction: Sleep enuresis (SE) is one of the most common sleep disturbances in childhood. Its pathophysiology is complex, leading to many treatment modalities, to date: alarm and/or desmopressin. All those modalities, mainly alarm, may also interfere with sleep patterns. This study aimed to analyze the effect of treatment on sleep macrostructure.

Materials and Methods: Seventy-five children were recruited, all enuretic (59 M and 16 F, mean age: 9.49 ± 2.62 S.D. years). All subjects underwent clinical evaluation followed by a full night polysomnographic recording. Psychiatric, neurological, respiratory, and renal diseases were excluded. They were randomized into three treatment groups: alarm, desmopressin, or combined therapies. After treatment all clinical and polysomnographic evaluation was carried out again.

Results: Patients did not differ for age and apnea-hypopnea index (mean AHI: 1.34 ± 1.54SD). Sleep architecture in children with SE pre and post treatment, showed a decrease in awakening (mean: 16.37 ± 8.16 SD vs 11.63 ± 8.2SD, p=0.04, respectively), and an increase in arousals (9.61 ± 7.82 SD vs 18.34 ± 10.9 SD p=0.0001). Also an increase in N2 sleep percentage ($223.36 \pm 29,18$ SD vs $177,89 \pm 37,77$ SD p=0,00001) and decrease in N3 sleep percentage ($96,50 \pm 25,15$ SD vs $117,90 \pm 28,95$ SD p=0,0003) was found. As the use of alarm, by definition, includes awakening during the night, we split treatment groups with and without the use of an alarm: the main differences were in the awakening index (alarm users $16,70 \pm 10,77$ SD p= 0,02 vs non-alarm users $13,60 \pm 13,15$ SD p=0,79) arousal index (alarm users: $9,83 \pm 19,23$ SD p=0,00008 vs non-alarm users $8,55 \pm 16,00$ SD p=0,008) and N2 (alarm users $221,62 \pm 175,89$ SD p=0,00001 vs non-alarm users $222,91 \pm 176,62$ SD p=0,004) and N3 sleep (alarm users $97,98 \pm 119,40$ SD p=0,00600 vs non-alarm users $98,64 \pm 120,02$ SD p=0,11101).

Conclusions: The findings of this study indicate that fragmented sleep can be a consequence of enuresis treatment. As a consequence, children switch from one sleep problem (deep sleep) to the other, fragmented sleep.

Clinical decision support for primary care pediatric OSA detection

S.M. Honaker[1], R.W. Grout[2], J. Hillstrom[2], S.M. Downs[3], E. Mendonca[4]
[1]Indiana University School of Medicine, Indianapolis, United States, [2]Eskenazi Health, Indianapolis, United States, [3]Wake Forest University, Winston Salem, United States, [4]Cincinnati Children's Hospital Medical Center, Cincinnati, United States

Introduction: Despite guidelines for evidence-based care, many children with OSA remain undetected. Clinical decision support is a helpful tool to support healthcare providers in OSA screening and care and may be particularly impactful in busy primary care settings. In our previous work, we demonstrated the efficacy of a decision support tool in OSA detection in pediatric primary care. However, the decision support tool was not integrated into widely used electronic health records (EHR), limiting more widespread adoption. We have thus developed a novel clinical decision support tool to identify pediatric OSA within the Epic EHR. The study objective is to present the clinical decision support and preliminary outcomes from it use in nine primary care clinics.

Materials and Methods: In the decision support system, all parents of children ages 2-13 attending one of nine primary care clinics respond to a single gateway question about snoring. For snoring children, parents respond to six additional questions assessing OSA symptoms and the EHR generates a risk profile including prior medical history (e.g., weight status, previous diagnoses). For children who screen positive for OSA, their primary care provider (PCP) receives a Best Practice Advisory (BPA) identifying the child's risk, recommending further evaluation for potential OSA, and facilitating actions that the PCP might wish to take, such as referral for a polysomnogram or to a specialist or a trial of a nasal corticosteroid. Outcomes from the use of the decision support tool are derived from the reporting tool in the Epic EHR.

Results: The decision support system was launched in June 2023 in nine primary care clinics and preliminary data are pending. At the time of the meeting, we anticipate presenting data from more than 150 children who were screened for snoring. In addition to describing the sample, which will consist of children 2-13 years old primarily from underserved racial/ethnic backgrounds, data presented will include rates of snoring, additional symptoms and risk factors, rates of a positive OSA screen, and provider actions in response to the BPA alert (e.g., referral, prescription, no action). We further plan to update the abstract prior to the publication.

Conclusions: Computer decision support is a promising tool for OSA detection in primary care, and adoption can be facilitated by creating such a system in a frequently-used EHR such as Epic. It is important to evaluate its use and efficacy in identifying children with OSA so that they can receive the benefits of treatment.

Closed-loop auditory stimulation enhances total slow wave activity and proportionally shortens sleep duration in a young cohort

G. Garcia Molina[1,2], A. Myers[1], B. Peterson[1], B. Riedner[1], G. Tononi[1], S. Jones[1]
[1]University of Wisconsin-Madison, Psychiatry, Madison, United States, [2]Sleep Number, Sleep Number Labs, San Jose, United States

Introduction: Recent research has reported cognitive, metabolic, and sleep restoration benefits resulting from the enhancement of sleep slow-waves using auditory stimulation delivered in a closed-loop manner. Slow-wave sleep and performance in various cognitive domains were positively impacted by auditory stimulation in healthy young and older adults, as well as in patients with mild cognitive impairment. However, this approach was not attempted in a younger ($\le$ 18-year-old) population; particularly under an in-home, ecologically valid design compared to in-lab conditions.
Methods: Seventeen volunteers (10F/7M; mean age: 16.1 yrs. old; age range: 12 to 18 yrs. old) participated in an IRB-approved single-blind, and cross-over study. Two conditions STIM (auditory stimulation ON) and SHAM (auditory stimulation at zero-volume) were applied. Each participant used a self-applied, sleep-wearable device, for in-home use. The device uses a single EEG signal whose active electrode is on FPz referenced to M2. The EEG is processed in real-time and stored for offline analysis. An embedded algorithm performs real-time sleep staging (Kappa: 0.65), detects slow-wave sleep with 84% sensitivity (87% precision) and delivers auditory stimulation as 50 millisecond-long tones separated by a constant one-second inter-tone interval. The volume (range 30 to 60 dB-SPL) is dynamically modulated such that louder tones are delivered when sleep is deeper. After each sleep session, participants completed twice a day (morning and evening) a questionnaire to report their sleep quality, sleepiness (KSS), and performed tasks to quantify vigilance (PVT) and working memory (N-BACK).
Mean sleep architecture factors, total and mean slow wave activity (SWA which is the EEG power in the 0.5 to 4 Hz frequency band) during NREM sleep, sleepiness level, and cognitive performance metrics were compared between STIM and SHAM conditions at a group level. Multiple comparisons were adjusted using the Benjamini–Hochberg false discovery rate method.
Results: Participants in the study collected data from 5.00 SHAM (std. dev. 4.53) and 4.53 STIM (std. dev. 1.28) sleep sessions. Total SWA and mean SWA during NREM sleep were significantly higher in the STIM condition (+7.38 %, p=0.01 and +7.57%, p=0.02 respectively).
Total SWA enhancement in 11 participants in the STIM condition was in the 3.06% to 46.2 % range. The SWA deficit in the STIM condition in the remaining 6 participants was in the -0.4% to -9.3%. Trending results (p<0.1) in the STIM condition, seemingly due to the limited sample, included an improvement in the number of correct morning-NBACK responses (+1.05 correct; p=0.07), a shortening of the latency from sleep onset to N2 sleep (4.78 minutes faster; p=0.09), and a shortening of sleep duration (11.1 minutes shorter; p=0.09).
The correlation between total SWA enhancement and the shortening of sleep duration (Pearson correlation: -0.83; p<1e-4) suggested a significant decrease in sleep duration proportional to total SWA enhancement.
Conclusions: This research provides evidence of significant total SWA enhancement due to auditory stimulation in a younger (12 to 18 years old) population. Sleep duration significantly decreases proportionally to the enhancement effect. Additional research is necessary to verify the potential benefits of this intervention on working memory performance.

Comparison and correlation of sleep parameters between preschoolers and public and private school children

G. Ismério de Oliveira;[1], A.M.J. de Lima;[2], M.M.A. dos Santos[1], D. Maria[3], L.M. Studart-Pereira[1]
[1]Universidade Federal de Pernambuco, Fonoaudiologia, Recife, Brazil, [2]Universidade Federal Rural de Pernambuco, Morfologia e Fisiologia, Recife, Brazil, [3]Universidade Federal de Pernambuco, Fisioterapia, Recife, Brazil

Introduction: Childhood is a period characterized by intense changes and neuromotor development, in which sleep plays an essential role in brain development and plasticity. Children with sleep disorders may experience problems with behavior (e.g., aggressiveness, hyperactivity, and impulsiveness), motor performance (e.g., static balance), mood, as well as cognitive dysfunctions (e.g., learning, attention, and memory consolidation).
Objective: The objective of this study was to compare sleep quality between preschoolers and children attending public and private schools.
Methods: This cross-sectional study was conducted in schools of a municipality in Northeastern Brazil and included 180 children of both sexes, aged 4 to 10 years. Sleep disorders were identified using the Child Sleep Disorder Scale (CSDS), sleep behavior was assessed using the Child Sleep Habits Questionnaire (CSHQ), and the impact on children's lives was assessed using OSA-18. The results were presented as mean, standard deviation, and percentage. Pearson's test was used to evaluate associations between two categorical variables, the Mann-Whitney test was used to compare teaching systems, and Spearman's test was used to analyze correlations. The statistical significance level was set at $p<0.05$. The research was approved by the Research Ethics Committee (no. 5.266.351).
Results: The majority of children were classified as "having sleep disorders" according to CSDS (76.1%) and CSHQ (99.4%). The means and medians were consistently higher among public school children compared to private school children on all scales ($p<0.001$). OSA-18 assessed the impact on children's lives as mostly mild (68.3%), followed by moderate (26.7%) and severe (5.0%). Teaching systems were significantly associated with CSDS ($p<0.001$) and OSA-18 results ($p<0.001$). The percentage of children with sleep disorders according to CSDS was higher in public schools than in private schools (86.7% vs. 58.2%). OSA-18 identified a higher proportion of children with a mild impact in private schools compared to public schools (95.5% vs. 52.2%), while the proportion of children with a moderate impact was higher among public school children (39.8% vs. 4.5%). Positive correlations were observed between CSDS and OSA-18 scores (0.815; $p<0.001$), CSDS and CSHQ scores (0.642; $p<0.001$), and CSHQ and OSA-18 scores (0.594; $p<0.001$).
Conclusions: The study population showed significant indications of sleep disorders. Public school children were at a greater risk of sleep disorders, and their quality of life seemed to be more affected.
Acknowledgment: This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001
Keywords: Sleep Wake Disorders; Child; Sleep Habits.

Comparison of weekday-weekend differences in factors associated with school-age child sleep duration in the US and Singapore

T.B. Koa[1], Y. Hu[1], J.C. Lo[1]
[1]National University of Singapore, Centre for Sleep and Cognition, Yong Loo Lin School of Medicine, Singapore, Singapore

Introduction: Considering the sub-optimal developmental outcomes of short sleep in school-age children, it is important to understand the factors associated with short sleep in this age group, particularly socio-environmental factors that can be modified in future interventions. We previously found differential school- and parent-related factors of short sleep for weekdays and weekends in school-age children in Singapore: short sleep was associated with early school start time and poor sleep hygiene on weekdays, but lower sleep priority and shorter sleep duration in parents on weekends. Here, we investigated whether these factors were similar in a US sample.

Materials and Methods: Through an online survey, 402 parents with a child aged 7-12 y (251 from Singapore and 151 from the US) reported their child's sleep patterns and various school- and parent-related factors: school start time, parents' own sleep patterns, sleep hygiene (e.g. pre-bedtime electronic device use and parent-set bedtime), and sleep priority (the amount of sleep parents were willing to let their children to trade for other activities).

Results: On weekdays, 64.5% of children in Singapore and 49.0% in the US slept less than the minimum recommended duration of 9 hours. On weekends, these decreased to 19.5% in Singapore and 25.2% in the US. Adjusting for age, children in Singapore had significantly shorter average sleep durations than children in the US on weekdays (8.37 h vs 8.83 h, $p <.001$), but not on weekends (9.45 h vs 9.42 h, $p = .84$). Furthermore, parents in Singapore reported shorter weekday and weekend sleep durations ($ps < .001$), enforced stricter sleep hygiene on weekdays ($p < .001$) and prioritised their children's sleep more on weekdays ($p < .001$) than parents in the US, while no such difference was found between the countries on weekends ($ps ≥ .05$). In both Singapore and the US, poorer sleep hygiene and earlier school start times were significantly associated with shorter sleep durations in children on weekdays ($ps ≤ .05$), but not weekends ($ps ≥ .25$). Lower sleep priority was associated with shorter sleep durations only on weekdays in the US ($p = .03$), and on weekends in Singapore ($p = .001$). Parents' sleep durations were associated with shorter sleep durations in children only on weekdays in the US (paternal: $p =.04$), and on weekends in Singapore (both parents: $ps ≤ .002$).

Conclusions: The present study suggests that while some short sleep factors, such as sleep hygiene and school start time, may be generalisable across countries, other factors, such as sleep priority and parents' own sleep pattern, may be culture-specific. It may thus be crucial to consider the cultural context when trying to design and implement effective sleep interventions.

Consumption of exogenous melatonin among US children

L. Hartstein[1], M. Garrison[2], D. Lewin[3], J. Boergers[4], M. LeBourgeois[1]
[1]University of Colorado Boulder, Boulder, United States, [2]Purdue University, West Lafayette, United States, [3]Sleep Health and Wellness Center, Santa Barbara, United States, [4]Alpert Medical School of Brown University, Providence, United States

Introduction: In 2017-2018, 1.3% of US children and adolescents surveyed consumed melatonin in the last 30 days. It is expected that the prevalence has grown greater, with sales of melatonin more than doubling between 2017 and 2020 and incidences of melatonin ingestion reported to poison control increasing 530% from 2012 to 2021. In the United States, melatonin is regulated as a dietary supplement and no prescription is needed to obtain it. This is of particular concern as the amount of melatonin present in over-the-counter supplements can very drastically. Yet, little is known about the current prevalence of parent-administered exogenous melatonin in US children, as well as the dosing, timing, frequency, and duration of use.

Materials and methods: Parents of 993 children aged 1.0-13.9 years (53.3% female) completed a brief online questionnaire on their child's sleep practices, including details of any melatonin use in the past 30 days. Data collection took place between January and April 2023. Data were analyzed separately by age group: 1-4 years (pre-school), 5-9 years (school-aged), and 10-13 years (pre-teen).

Results: The prevalence of recent melatonin use was significantly higher for school-aged children (18.4%) and pre-teens (19.4%) than preschool-aged children (5.6%; $p < 0.01$). Across age groups, children were most frequently given melatonin on average either one (28.0%) or seven (24.8%) days per week. Melatonin dosing increased significantly across age groups, from a median of 0.5 mg to 2.0 mg, whereas timing of administration was consistent across age groups (Mdn = 30.0 min). The median length of preschoolers' current melatonin use was 12.0 months, which increased to 18.0 months for school-aged children, and 21.0 months for pre-teens. The most common form of melatonin that children consumed was gummy (64.3%).

Conclusions: Our data indicate that consumption of exogenous melatonin is highly prevalent among US children, with some parents giving melatonin to their child starting at an early age. Additionally, parents report giving their children melatonin over an extended period of time, despite limited research on the long-term safety of melatonin use in children. Future work will examine the factors underlying parents' decisions to provide melatonin to their children.

Daylight saving time and sleep in children 4-24 months of age

M. Lucchini[1], S. Thakur[1], T. Anders[2], M. Kahn[3], N. Barnett[1]
[1]Nanit Lab, New York, United States, [2]Brown University, Warren Alpert Medical School, Rhode Island, United States, [3]Tel Aviv University, School of Psychological Sciences, Tel Aviv, Israel

Introduction: Currently, most US states adopt a biannual time change between Standard Time (ST) and Daylight Saving Time (DST). In the past several years abolishing the time change has been the subject of public debate. The AASM has issued a statement in favor of abolishing the time change, recommending permanent ST, because of the negative impact of time change on sleep and overall health, and the knowledge that ST better matches the body's internal clock. In spite of extensive research and heated discussions on this subject, there has been a paucity of work focusing on the impact of time change in infancy. Only one study has examined the effect of the start of DST on infants' sleep, reporting a shift in sleep midpoint (SMP) and a decrease in total sleep time (TST). However, this study relied on parental reports of infant sleep, which are subject to recall bias. In this study we report on the effect of the start of DST on infants' sleep utilizing objective sleep metrics.
Methods: Participants were 389 children ages 4-24 months (0.1±5.1), who regularly used the Nanit camera monitor. TST, SMP, and number of night-wakings were collected for 5 nights preceding the time change (March 6-10, 2023) and 5 nights during the following week (March 12-17, 2023). Wilcoxon rank sum tests were used to compare sleep metrics before and after the time change.
Results: After the time change, there was a significant increase in TST (+10.5 min Monday, $p < 0.001$; +5.5 min Tuesday, $p < 0.001$; +4.3 min Friday, $p < 0.01$). When stratified by age, the 4-6 and 7-12 month groups had an average increase of 10 min for Monday, Tuesday and Friday, while the 13-24 months group had a 6 min increase on Monday, followed by a 7.5 min decrease on Tuesday and a 15 min decrease on Friday. Furthermore, there was a significant shift to a later SMP for the entire week after the time change (+10.2 min Sunday, $p < 0.001$; +9.9 min Monday, $p < 0.001$; +5.0 min Tuesday, $p < 0.001$; +8.04 min Wednesday, $p < 0.001$; +9.4 min Thursday, $p < 0.001$; +12.1 min Friday, $p < 0.001$). When stratified by age, the 4-6 months infants had the biggest shift on Sunday (+11.7min) followed by a gradual decrease, reachinga +3.2 min difference on Thursday. In contrast, children aged 7-24 months maintained a consistent shift of about +12 mins in SMP throughout the duration of the week following the time change.
Conclusion: These preliminary results suggest that infants' response to sudden time changes might be moderated by infants' age, with an increase in TST for younger infants and a decrease for older infants. In addition, we found a shift to a later SMP, which previous research has found to be associated with negative health outcomes. Thus, more research is needed to determine the magnitude, developmental trajectories and potential consequences of these changes.

Daytime sleep duration in early life as an indicator for cognitive development at school age: a prospective cohort study

J. Lin[1], Y. Jiang[1], X. Xiao[1], Q. Zhu[1], Q. Lin[1], F. Jiang[1,2,3]
[1]National Children's Medical Center, Shanghai Children's Medical Center, School of Medicine, Shanghai Jiao Tong University, Department of Developmental and Behavioral Pediatrics, Pediatric Translational Medicine Institute, Shanghai, China, [2]Xinhua Hospital, School of Medicine, Shanghai Jiao Tong University, MOE-Shanghai Key Laboratory of Children's Environmental Health, Shanghai, China, [3]Shanghai Center for Brain Science and Brain-Inspired Technology, Shanghai, China

Introduction: Daytime sleep experiences rapid change in early life. Considering its potential relationship with learning and memory, we hypothesized that daytime sleep duration (DSD) might be an important indicator of childhood cognitive development. Therefore, the current study is conducted to serve the following two purposes. Firstly, to characterize the trajectories of children's DSD from 42 days after birth to 6 years old based on a prospective cohort with ten intensive follow-ups. Additionally, to determine whether the early-life DSD could be an indicator for cognitive development and each of its dimensions at school age.

Materials and methods: A total of 262 mothers with their newborns in the Shanghai Sleep Birth Cohort Study (SSBCS) were included in the study. Ten follow-ups for children were conducted at the ages of 42 days, 3, 6, 9, 12, 18, and 24 months, and 3, 4, and 6 years. Children's sleep parameters were assessed using parent-reported questionnaires at each follow-up point. Cognitive development was assessed with the Wechsler Intelligence Scale for Children, 4th edition (WISC-IV) at 6-year-old.

Results: Two DSD trajectories in early childhood were identified (i.e., "typical DSD", 66.7%; and "infancy excessive DSD", 33.3%), and children with the "infancy excessive DSD" trajectory had much longer DSD in the first 18 month. Compared with "typical DSD" group, children with "infancy excessive DSD" had a lower score on Cognitive Proficiency Index (Coef. =-4.75, 95% CI [-8.88, -0.62], P =0.025), especially on working memory dimension (Coef. =-5.90, 95% CI [-9.96, -1.83], P =0.005). After adjusting for confounding factors, DSD trajectories were still significantly associated with working memory (Coef. =-4.35, 95% CI [-8.33, -0.37], P =0.032). No significant difference was found between the two DSD trajectory groups in other domains of cognitive development.

Conclusions: Infancy's excessive DSD may be an early indicator of poor cognitive development for children of school age, especially working memory. The findings will raise concerns about the cognitive development of infants with excessive DSD.

Effect of adenotonsillectomy on the sleep apnoea-specific pulse rate response in children with Obstructive Sleep Apnoea

C.T. Au[1,2], N.T.K. Yuen[2], I. Narang[1,3], K.C.C. Chan[2], A.M. Li[2]
[1]The Hospital for Sick Children, Research Institute, Translational Medicine, Toronto, Canada, [2]The Chinese University of Hong Kong, Department of Paediatrics, Hong Kong, Hong Kong, SAR of China, [3]The Hospital for Sick Children, The Division of Respiratory Medicine, Department of Paediatrics, Toronto, Canada

Introduction: An elevated sleep apnoea-pulse rate response is associated with an increased risk of cardiovascular morbidity and mortality in adults with OSA. This study aimed to examine the effect of adenotonsillectomy (AT) on the sleep apnoea-specific pulse rate response in prepubertal children with OSA. We hypothesised that the pulse rate response to obstructive apnoeas and hypopnoeas (ΔHR_{ob}) could be reduced after AT.

Materials and Methods: This was a secondary analysis of a randomised controlled trial (RCT) that examined the effect of AT on blood pressure in prepubertal non-obese children with OSA. The RCT randomised 137 children with AHI ≥3 events/hour and tonsil size of ≥ grade I. 68 were allocated to the early AT group while 69 were allocated to the watchful waiting (WW) group. In the end, 62 from the early AT group and 47 from the WW group completed the study. All participants underwent overnight polysomnography and 24-hour ambulatory blood pressure monitoring before and 9 months after the intervention. The primary outcome of this secondary analysis was ΔHR_{ob} which was derived from the pulse-oximetry sensor and was defined as the mean of all obstructive apnoeas and hypopnoeas-specific pulse rate responses, i.e. the difference between a maximum pulse rate during a subject-specific search window and an event-related minimum pulse rate. Repeated measures ANOVA was used to test the treatment effect (visit*group) on the study outcomes.

Results: Valid pulse rate data of 56 participants (age: 7.9y ±1.3, 71% male) from the early AT group and 42 (8.4y ±1.5, 79% male) from the WW group were analysed. A significant reduction in ΔHR_{ob} (from 17.7 BPM ± 4.0 to 15.4 BPM ± 4.0, p = 0.002) was observed in the early AT group, whereas no significant change was observed in the WW group (from 17.9 BPM ± 4.0 to 18.1 BPM ± 4.1, p =0.92) [p(visit*group) = 0.044]. Further analysis for REM and NREM sleep separately revealed that the treatment effect was only significant for ΔHR_{ob} in NREM sleep [early AT: from 19.0 BPM ± 4.4 to 16.1 BPM ± 4.4; WW: from 18.8 BPM ± 4.7 to 19.9 BPM ± 4.6, p(visit*group) = 0.005] but not in REM sleep [early AT: from 15.9 BPM ± 3.7 to 14.8 BPM ± 4.5; WW: from 15.7 BPM ± 4.2 to 14.7 BPM ± 4.3, p(visit*group) = 0.60]. The change in ΔHR_{ob} did not significantly correlate with the change in obstructive apnoea hypopnoea index (r = 0.002, p = 0.98) or the changes in ambulatory blood pressure parameters (all r <0.15, p >0.2).

Conclusions: This is the first study examining the treatment effect of AT on the sleep-apnoea pulse rate response in children. AT significantly reduced ΔHR_{ob} in prepubertal non-obese children with OSA, implicating a possible improvement in cardiovascular health. Further studies are needed to examine whether the change in ΔHR_{ob} is associated with future improvements in clinical outcomes.

Effect of pediatric adenotonsillectomy on sleep-related breathing disorder as measured by Pediatric Sleep Questionnaire (PSQ) scores and serum highly sensitive C-reactive protein (hsCRP) levels

A. Kanodia[1], S. Kishore[1]
[1]Asian Institute of Gastrenterology, ENT and Sleep surgery, Hyderabad, India

Introduction: A sleep study for a child suspected of having sleep-related breathing disorder (SRBD) is a resource-intensive task. The sleep-related breathing disorder-pediatric sleep questionnaire (SRBD-PSQ) is the most sensitive and specific out of the available SRBD questionnaires, assessing a child in three domains: snoring, daytime sleepiness, and hyperactive behavior. Also, there are serum biomarkers like highly sensitive C-reactive protein (hs-CRP), which is a marker of an inflammatory state. It is also a proven marker of sleep breathing pathology. We ascertained if correction of pediatric SRBDs by performing surgery (adenotonsillectomy plus correction of any nasal pathology) results in improvement of PSQ scores and hs-CRP levels.

Methodology: We recruited children with SRBD after receiving informed written consent from the parent (and children if >12 years of age). Parental refusal to participate in the study (or the child's refusal in some cases), active infection in the child, any contraindication to giving general anesthesia to the child, any history of chronic drug use, or any chronic medical condition for which the child was taking steroids or other immunomodulators led to the child's exclusion from the study.

The children underwent an oral cavity examination by the senior investigator to evaluate the grade of tonsillar enlargement, flexible nasopharyngoscopy to check the grade of adenoid enlargement, and otoscopy to look for any middle ear effusion. The children who had adenotonsillar enlargement were offered adenotonsillectomy along with correction of any other minor pathology like septal correction, inferior turbinoplasty, concha bullosa correction, etc., aimed at correcting the static obstructions.

They filled out the SRBD-PSQ questionnaire prior to surgery. Serum hs-CRP levels were measured. The children underwent surgical correction of the airway (primarily adenotonsillectomy). SRBD-PSQ scores and serum hs-CRP levels were measured again two weeks postoperatively.

The pre-operative scores on the SRBD-PSQ questionnaire and hsCRP levels were compared with the respective post-operative values using the Wilcoxon signed rank test. A P-value of <0.05 was considered significant. SPSS version 27.0 (IBM, USA) was used for statistical analysis.

Results: We could recruit 78 children (53 males), with a median age of 7 years and a median BMI of 15.9. Grade III or IV enlargement was seen in 96% of the children; grade III or IV tonsillar enlargement was seen in 73% of the children.

Pre-operative median (Iqr) SRBD-PSQ score and hs-CRP value were 7.5 (5) and 2.11 (3.1), respectively. Post-operative median (Iqr) SRBD-PSQ score and hs-CRP value were 3.5 (3) and 1.1 (0.8), respectively. The difference in both parameters was found to be statistically significant (p<0.05).

Conclusion: SRBD-PSQ scores and hs-CRP both decrease post adenotonsillectomy in children suffering from sleep-related breathing disorder.

Acknowledgements: None.

Effect of the home environment on sleep problems in children with developmental disorders and their siblings

H. Kolli[1], N. Rahaman[2], M. Ramagopal[3]
[1]Hospital for Special Surgery, Orthopedic Surgery, New York, United States, [2]Rownan University School of Osteopathic Medicine, Medicine, Stratford, United States, [3]Rutgers-Robert Wood Johnson Medical School, Pediatrics, New Brunswick, United States

Introduction: Children with developmental disorders have problems that affect their sleep quality (Schreck & Mulick, 2000), which in turn can decrease school performance and increase family stress (Matusoka et al., 2014; Wiggs, 2001). While family stress and sociodemographic influences are deemed significant factors affecting children's sleep and health (Peltz et al., 2019), there is limited research into how environmental confusion (noise, crowding, home traffic pattern) affects sleep in children with developmental disorders as well as in their siblings. This study aims to understand the interaction of three variables (i.e., home environmental stress, developmental disorders, and sleep problems) in children. We hypothesize that children with developmental disorders will be more affected by the home environment and have greater sleep problems than their siblings.

Materials and methods: Fifty-nine families were recruited from the sleep clinic at the Child Health Institute of New Jersey. Each family 'study unit' consisted of two children: the subject who was the child being seen in sleep clinic and a sibling, closest in age to the subject, but was not being seen in the sleep clinic. The age range of the subjects were 4-17 years and that of their siblings between 2-17 years. Caregivers completed three questionnaires (home environmental disorganization scale (CHAOS), pediatric sleep questionnaire, and sibling sleep questionnaire).

Results: Of the subjects, 51.7% identified as male and 48.3% identified as female. Of the siblings, 53.1% were male and 46.9% were female. Racial and ethnic demographics showed an even distribution of Caucasian, African American, Mixed, and Latino/Hispanic subjects. Categorizations revealed 32.2% of the subjects and 24.6% of the siblings to have neurodevelopmental disorders. Correlations were examined between CHAOS, sleep problems, and developmental disorders for both children of each family. Chi-squared analyses found a significant relationship between CHAOS and sibling developmental disorder ($p=0.040$), but no significant correlations were found for the subjects. Moreover, point-biserial correlations between sleep problems and developmental disorders revealed a significant positive correlation for both the subjects ($r(56)=0.28$, $p=0.036$) and their siblings ($r(55)=0.27$, $p=0.046$). Chi-squared analyses between sleep problems and a decrease in school performance also showed significant findings for the siblings ($p=0.040$) but not for the subjects.

Conclusions: While the study established a positive correlation between developmental disorders and sleep problems in both groups of children, other factors such as home disorganization and school performance only seemed to affect the siblings. These results are of novel importance since the parents deemed even siblings with developmental disorders to have less health concerns that did not warrant medical attention. These results point for more attention to be paid to the siblings of children with sleep problems since they are more affected by home disorganization.

Effects of partner involvement in nighttime child care on child and maternal sleep: a path model analysis of relationship satisfaction and maternal competence about child sleep

J. Song[1], E. Jang[1], S. Kyung[1], E. Ko[1], S. Shin[1], S. Chung[2], L. Astbury[3], B. Bei[4,3], S. Suh[1]
[1]Sungshin University, Department of Psychology, Seoul, Korea, Republic of, [2]University of Ulsan College of Medicine, Asan Medical Center, Department of Psychiatry, Seoul, Korea, Republic of, [3]Monash University, Nursing and Health Sciences, School of Psychological Sciences, Turner Institute for Brain and Mental Health, Faculty of Medicine, Victoria, Australia, [4]Royal Women's Hospital, Centre for Women's Mental Health, Victoria, Australia

Introduction: Supportive co-parenting between couples has been shown to have positive effect on couple relationship, child development, and parents' and child's sleep. The purpose of this study was to investigate the influence of partner involvement in nighttime childcare on both the child's and mothers' sleep, relationship satisfaction, and maternal competence about child's sleep.

Materials and Methods: An online survey was conducted with 290 mothers of children (50.7% male) aged 6 to 36 ($M+/-SD$ = 22.7+/-8.6) months in Korea. Participants' average age was 34.8 years (SD = 4.1). Participants responded to questions about partner's involvement in nighttime childcare. The Brief Infant Sleep Questionnaire-Revised (BISQ-R) questionnaire was used to collect children's sleep onset latency (SOL), wake time after sleep onset (WASO), and maternal competence in managing children's sleep. Marital adjustment was collected using the Dyadic Adjustment Scale-4 items (DAS-4), in addition to the Insomnia Severity Index (ISI) to measure insomnia severity.

Results: Among the sample, 74.8% (n = 217) of participants responded that their partner participation in nighttime childcare was for less than 25% of the time. Higher levels of partner participation in nighttime childcare were associated with higher relationship satisfaction (r = .17, p < .01). Higher DAS scores were associated with shorter child SOL and WASO (rs = -.22~-.23, ps < .001), lower severity of maternal insomnia (r = -.30, p < .001), and higher maternal competence in managing children's sleep (r = .19, p < .01). Path analysis was conducted to examine the effect of partner involvement in nighttime childcare on children's and mothers' sleep, mediated by relationship satisfaction and maternal competence in managing their children's sleep. The model indicated a good fit [χ^2 = 175.32 (df = 85, p < .001), CFI = .95, TLI = .94, RMSEA = .06 (.05~.07), SRMR = 0.04]. The direct effects of partner involvement on children's and mothers' sleep were non-significant. However, the direct pathways from partner involvement to relationship satisfaction (β = .18, p < .01), from relationship satisfaction to maternal competence (β = .22, p < .01), from maternal competence to child's sleep (β = −.54, p < .001), and from child's sleep to maternal insomnia (β = .54, p < .01) were significant. Relationship satisfaction mediated the relationships between partner involvement and child's (β = −.09, p < .05) and mother's sleep (β = −.05, p < .05).

Conclusions: Overall, partner nighttime childcare involvement was low in the sample in South Korea. Results of this study indicated that relationship satisfaction was an important factor to consider for partner's supportive involvement in nighttime childcare, which in turn affected maternal competence of managing child's sleep. This relationship was subsequently associated with better child and mother's sleep. Future studies exploring partners' supportive nighttime childcare between the couple should be considered as an important variable that directly affects the sleep of children and mothers.

Corresponding Author: Sooyeon Suh (alysuh@sungshin.ac.kr)

Evening screen time, sleep and diurnal-type in adolescents

A. Allen Gomes[1,2,3], I. Marques[4], D. Olilveira[4], A.S. Moreira[4], B. Duarte[4], L. Pires[1,2]
[1]University of Coimbra, Faculty of Psychology and Sciences of Education, Coimbra, Portugal, [2]University of Coimbra, Centre for Research in Neuropsychology and Cognitive-Behavioural Intervention, Coimbra, Portugal, [3]University of Coimbra, Chronopsychology and Cognitive Systems Lab (ChronCog), Coimbra, Portugal, [4]University of Coimbra, FPCEUC, Coimbra, Portugal

Introduction: Mirroring a previously presented work on pre-and primary school children (Marques et al., 2022, cf. https://doi.org/10.1016/j.sleep.2022.05.222), we additionally conducted a study on adolescents, aiming at (1) examining the associations between evening screen use, diurnal type/morningness-eveningness and sleep-wake patterns; (2) compare sleep and psychological symptoms, according to adolescent diurnal type [DT]; (3) investigate whether evening screen time would be a significant predictor of sleep variables when controlling for DT, age and sex as other potential predictors.

Materials and methods: Participants were 1035 adolescents, 57.3% female, 12-19 years old (M=14.51 yr-old, SD=0.50), 7th to the 12th school grades. Sleep patterns, DT, psychological symptoms, and evening screen use were obtained through self-reported sleep-wake questions (Gomes et al., 2011), the BaSIQS (Gomes et al., 2015), the Portuguese versions of the Composite Scale on Morningness [CSM] (Smith et al., 2009) and of Strengths and Difficulties Questionnaire [SDQ] (Goodman, 1997), and a set of questions assessing evening (i.e., after dinner) time screen use (Gomes et al., 2018) – relevant variables were evening screen use time/duration, frequency (nights/week), how long before bedtime does the adolescent stop using screens, type of use (passive…active). Four DT groups were defined according to CSM quartile values in girls and boys (morning-types [MT]; intermediate-morning; intermediate-evening; evening-types [ET]).

Results: Almost all adolescents (98.3%) displayed evening screen use, and the great majority (81.9%) all/nearly all nights (6-7 nights/week). Estimated screen evening time averaged 2hr11min/night (SD=1hr20min), and decreased significantly across DT groups from ET (M=2hr40min, SD=1hr28min) to MT (M=1hr37min, SD=1hr01min), p < 0.0001. Significant decreases from ET to MT groups were also found for the frequency (nights/week) and type of use (passive-active), p < 0.001. Only 9.5% interrupted screen usage up to one hour prior to bedtime. Psychological symptoms (SDQ scales and overall difficulties scores) increased significantly, and prosocial behaviour decreased, from MT to ET groups. The evening screen use variables (duration, and/or frequency, and/or type of use) were significantly (p<.001) correlated with later sleep-wake schedules - excepting for school days rise time -, longer sleep latency, shorter sleep durations, lower sleep quality, and higher overall psychological difficulties score. In multiple hierarchical regression analyses, evening screen time remained a significant predictor of several sleep variables (mid-sleep point, time in bed, and sleep length - both on school nights and on weekend nights; weekly frequency of enough sleep), after controlling for sex, age, and diurnal type [CSM score].

Conclusions: A widespread use of evening screen use was found in adolescents. From MT to ET groups, the frequency, duration, and active use of evening screen usage, increase. However, when controlling for diurnal type, evening screen time per se still predicts later sleep-wake schedules and lower sleep durations, emerging as an independent predictor of adolescents' sleep patterns regardless of whether they are morning-, intermediate- or evening-types.

Improved sleep with weighted blankets: a longitudinal intervention study in children with Attention-Deficit/Hyperactivity Disorder

M. Lönn[1,2], P. Svedberg[1], J. Nygren[1], H. Jarbin[3,4], I. Larsson[1]
[1]School of Health and Welfare, Halmstad University, Department of Health and Care, Halmstad, Sweden, [2]Region Halland, Psychiatry Halland, Halmstad, Sweden, [3]Region Halland, Department of Child and Adolescent Psychiatry, Halmstad, Sweden, [4]Child and Adolescent Psychiatry, Lund University, Faculty of Medicine, Department of Clinical Sciences Lund, Lund, Sweden

Introduction: Using weighted blankets to address sleep problems among children with Attention-Deficit/Hyperactivity Disorder (ADHD) could complement pharmacological treatment in clinical practice. A cross-over RCT showed an effect of weighted blankets (WB) vs. control blankets (CB) on objectively measured sleep and parent-reported sleep problems (Lönn et al., 2023). However, evidence of long-term benefits is scarce, and additional research with longer follow-up time is warranted. This study aimed to evaluate changes in sleep when using weighted blankets among children with ADHD and sleep problems.

Materials and Methods: A longitudinal intervention design was chosen to evaluate children's sleep during a 16-week sleep intervention with WB. Data was collected during baseline, a cross-over phase (4+4 weeks), and an open-label phase (8 weeks). Children (n= 71) choosing to continue the trial with the WB when entering the open-label phase were included.

Outcomes were measured with the parent-reported Children's Sleep Habits Questionnaire (CSHQ total score), the child-reported Insomnia Severity Index (ISI), and actigraphy (Motionware 1.2.47 Camntech) including Sleep Onset Latency (SOL), Wake After Sleep Onset (WASO), Total Sleep Time (TST), and Sleep Efficiency (SE). Bedtime, wake-up time, and age were added as exploratory variables to explain changes in TST.

Data was analyzed with mixed effect models, Spearman correlation and linear regression.

Results: Mixed effect models, including children (n=71) mean age 9.49 (sd 2.25, range 6-14) entering the open-label phase, showed that CSHQ decreased by -5.07 (p=0.000), and ISI decreased by -3.40 (p=0.000) from baseline to 16-week follow-up.

Mixed effect models showed decreased TST by -11.2 min from baseline to 16-week follow-up (p=0.006). SOL, WASO, and SE did not change during the intervention (p>0.05).

Exploratory analysis using mixed effect models on bedtime showed that bedtime was delayed with +13 min from baseline to 16-week follow-up (p=0.000). The wake-up time was not changed (p=0.874). Correlation analyses showed weak non-statistical significant relationships between TST and sleep problems (CSHQ) and TST and insomnia severity (ISI) at baseline (CSHQ: r=-0.15; ISI: r=0.15) and 16-week follow-up (CSHQ: r=-0.20; ISI: r=-0.06). TST and bedtime showed a strong correlation at baseline (r=-0.61, p=0.000) and 16-week follow-up (r=-0.65, p=0.000). TST and wake-up time showed a weak non-statistical significant relationship at baseline (r=-0.15) and 16-week follow-up (r=-0.16). Linear regression on baseline measurements showed that TST decreased with -13.9 min (p=0.000) and bedtime was delayed with 21 min (p=0.000) by increasing age.

Conclusions: Parent-reported sleep problems and child-reported insomnia severity decreased during the 16-week sleep intervention with weighted blankets for children with ADHD. The objective measures with actigraphy showed that total sleep time decreased during the 16-week intervention. Total sleep time was not found to be associated with parent- or child-reported outcomes but was associated with bedtime and age. These findings need to be further investigated to understand essential factors in sleep changes for implementing weighted blankets in clinical practice.

Insomnia in children with neurodevelopmental disorders: do parent or child factors affect the use of medications?

J. Patel[1], N. Ali[2], P. Corkum[2], S. Weiss[1]
[1]University of Toronto, Toronto, Canada, [2]Dalhousie University, Halifax, Canada

Introduction: Pediatric insomnia is one of the most common disorders in children, especially in children with neurodevelopment disorders (NDD). Up to 90% of children with NDD have insomnia or insomnia symptoms. Although non-pharmacological treatments for insomnia in children with NDD are considered first-line, there are barriers to providing these treatments. As such, pharmacological treatments are often provided despite lack of evidence for effectiveness. This study was conducted to evaluate if there are differences in child factors, parent characteristics, or demographic factors between children with NDD who are taking medications for treatment of insomnia versus those who do not.

Materials and methods: Cross sectional study which included parents/guardians of 172 children with NDDs. Participants 4-12 years of age were included in this study who were enrolled in the *Better Nights Betters Days for Children with Neurodevelopmental Disorders (BNBD-NDD)* randomized controlled trial (RCT). Variables included in the analysis were derived from the baseline RCT data including age, sex, diagnostic groups, household income, education level, and results of questionnaires evaluating behavioural insomnia, child behaviour, parenting style, and parental fatigue.

Results: Parents/guardians of 172 children with NDD were included. 91 (53%) were on medication for insomnia and 81 (47%) were not. 76% of children on medication were on monotherapy, 21% percent on two medications, 3% on three medications. The most used sleep medication was melatonin (n=67), followed by clonidine (n=14). There were no differences between the medication and no medication groups in any of the factors analyzed including, diagnostic groups, household income, education level, severity of sleep problem, level of behavioural and emotional problems, parenting behaviour, or parental fatigue.

Conclusions: Over half of the BNBD RCT participants were on medications to help them sleep. Of those taking medications for sleep, most participants are on monotherapy with melatonin. In participants with NDD and insomnia, there is no difference between those using sleep medications and not using sleep medications in age, sex, diagnosis, parent characteristics, or demographic factors. These results are surprising given that one would expect that there would be differences. Next steps will be to see if the intervention differently impacts outcomes by medication status.

Is there room for in-hospital cardiorespiratory polygraphy sleep studies in children? – A real life practice

A. Fonseca[1], D. Ferreira[1], I. Carvalho[2]
[1]Centro Hospitalar Vila Nova de Gaia e Espinho, Pulmonology, Vila Nova de Gaia, Portugal, [2]Centro Hospitalar Vila Nova de Gaia e Espinho, Paediatric, Vila Nova de Gaia, Portugal

Introduction: In-laboratory polysomnography (PSG) is regarded as the reference standard in diagnosing obstructive sleep apnea (OSA) in children with symptoms of sleep-disordered breathing. However, PSG is a costly, labour-intensive procedure and with a long waiting list in many health facilities. Therefore, at-home respiratory polygraphy is widely used as a substitute for PSG in adults. In paediatric, technical challenges, as to obtain an adequate nasal airflow signal limits the usefulness of the method. In-hospital cardiorespiratory polygraphy sleep studies (IHCRPG) may be an alternative to a selective group of paediatric patients. We aimed to examine the quality of IHCRPG in children.
Materials and methods: Retrospective analysis of IHCRPG performed in children between 2017 and 2022 in a tertiary hospital. Demographic characteristics of patients, IHCRPG parameters, sensors' failure and final result are described.
Results: A total of 45 IHCRPG were performed, corresponding to 42 children. The selected children had no comorbidities and some cases were discussed previously in a multidisciplinary meeting. There was a female predominance (n=23; 54,8%), with a mean age of 7±2,4 years old. More than half of patients (58,5%) had a body mass index (BMI) percentile of 85% or above and 26,2% a percentile of 50%. Regarding symptoms, most of patients presented with snoring (95,2%), 59,5% had apneas reported by the parents and 6 patients had other symptoms reported, such as agitated sleep, headache and hyperactivity. Concerning management, all patients underwent nasal corticosteroid therapy before IHCRPG, 37,8% had tonsillectomy before IHCRPG, 26,7% after IHCRPG and 35,6% didn't need surgery. Regarding test quality, there was any failure in airflow signal in 53,3% of the tests, 37,8% in oxygen saturation sensor and 6,7% in respiratory effort signals, tough IHCRPG result was inconclusive only in 24,4% of the exams and only 5 patients performed a PSG posteriorly. From those with a conclusive result, it was possible to diagnose mild OSA in 31,4% of the children, moderate in 2,9% and severe in 5,7% of the children.
Conclusions: Although more than a half of exams had airflow signal failure, only about a quarter of IHCRPG were of inadequate quality and inconclusive. IHCRPG may provide valuable data in the evaluation of a selective group of paediatric patients, though one has to be aware of the limitations of the method, especially when the nasal airflow signal is missing.

Late night screen usage and screentime addiction as shared determinants of insomnia, adiposity, obesity and mental well-being in 11–14-year-olds

E.L. Gale[1], J.E. Cecil[1], A.J. Williams[1]
[1]University of St Andrews, School of Medicine, St Andrews, United Kingdom

Introduction: In Europe, 20% of adolescents are classified as overweight or obese, and 69% of adolescents do not meet recommended sleep guidelines; 49% have poor sleep quality. Among teenagers' poor sleep and adiposity have been found to be associated. The aim of this study was to identify modifiable shared determinants of poor sleep and increased adiposity.

Materials and Methods: A cross-sectional study of 11–14-year-olds was conducted. Objective sleep timing variables were measured using actigraphy (ActiGraph-GT3X) over seven nights. Sleep quality, sleep habits and insomnia symptoms were also assessed. Body fat percentage (BF%) was measured via bioelectrical impedance and body mass index percentile (BMIp) was used as an index of obesity. Validated self-assessed questionnaires were used to assess well-being, chronotype and four dimensions of screentime (timing of screentime (late night and early morning phone use), quantity of screentime (weekday and weekend), location of screentime (use of phone in bed, phone in the bedroom overnight, using phone as an alarm) and screentime addiction (video gaming, social media and mobile phone addiction)). Hierarchical regression analysis was performed to examine the association between the tested variables and the four dimensions of screentime using three blocks. Model one was adjusted for demographics (age, gender, ethnicity, socioeconomic status, puberty). Model two was adjusted for demographics and mental well-being (depression, anxiety, stress). Model three was adjusted for demographics, mental well-being and a screentime dimension.

Results: Sixty-two adolescents (29M/33F, 12.2±1.13yrs, BMIp 60.3±32.1, BF% 22.3±11.5) completed the study. Significant bivariate correlations were identified between all four screentime dimensions and sleep onset variability, sleep habits, insomnia symptoms, BMIp, BF%, depression, anxiety and stress. Hierarchical regression (model 2) indicated that mental well-being was significantly associated with increased insomnia (R^2=.600, F=9.92, p<0.001), increased sleep onset variability (R^2=.576, F=9.10, p<0.001), poorer sleep habits (R^2=.690, F=14.74, p<0.001), increased BMIp (R^2=.459, F=5.612, p<0.001) and increased BF% (R^2=.549, F=8.056, p<0.001). Screentime addiction (model 3) was significantly associated with increased insomnia (R^2=.893, F=37.76, p<0.001), increased sleep onset variability (R^2=.727, F=13.57, p<0.001), poorer sleep habits (R^2=.724, F=11.95, p<0.001), increased BMIp (R^2=.737, F=12.75, p<0.001) and increased BF% (R^2=.835, F=22.92, p<0.001). Timing of screentime was significantly associated with increased insomnia (R^2=.856, F=30.35, p<0.001), increased sleep onset variability (R^2=.772, F=17.31, p<0.001), poorer sleep habits (R^2=.737, F=13.40, p<0.001), increased BMIp (R^2=.679, F=10.78, p<0.001) and increased BF% (R^2=.810, F=21.72, p<0.001). Quantity of screentime was significantly associated with increased insomnia (R^2=.749, F=15.22, p<0.001), increased sleep onset variability (R^2=.752, F=13.81, p<0.001), poorer sleep habits (R^2=.724, F=13.40, p<0.001), increased BMIp (R^2=.559, F=6.47, p<0.001) and increased BF% (R^2=.703, F=12.06, p<0.001). Location of screentime was significantly associated with increased insomnia (R^2=.830, F=22.22, p<0.001), increased sleep onset variability (R^2=.733, F=12.48, p<0.001), poorer sleep habits (R^2=.724, F=11.93, p<0.001), increased BMIp (R^2=.620, F=7.43, p<0.001) and increased BF% (R^2=.813, F=19.71, p<0.001).

Conclusions: Reducing screentime addiction, late night and early morning screentime usage and bedroom screen usage could help improve sleep and well-being and reduce obesity in adolescents. This change in screentime practice could be used as a target for a health-promoting intervention.

Maternal values are associated with how mothers feel about their infants' sleep, but not infants sleep quality

S. Berger[1], M. Benish-Weisman[2], N. Barnett[3], S. Thakur[3], M. Lucchini[3]
[1]City University of New York, Psychology, New York, United States, [2]The Hebrew University of Jerusalem, Paul Baerwald School of Social Work and Social Welfare, Jerusalem, Israel, [3]Nanit, New York, United States

Values are abstract concepts that play a crucial role in shaping behavior and influencing how individuals assess themselves and others. Parents' values shape opportunities for preschoolers' play and shape how parents work together to manage parenting responsibilities. However, there is no work on how parents' values impact parenting practices and decisions during infancy. To address this gap in the literature, we chose a meaningful context to parents of infants—sleep. Specifically, the relation between mothers' values, their infants' sleep, and their own cognitions about infant sleep.

1425 mothers from 32 countries with a child 3- to 18-months old (mean=8.85 mos) participated in an online survey. Criteria for participation was using *Nanit*, a home video baby monitoring system that uses computer vision technology to calculate nightly summary sleep characteristics (e.g., *quality* of night sleep, *parent visits*, *nightwakings*).

Mothers completed the *Maternal Cognitions on Infant Sleep Questionnaire (MCISQ),* with 5 subscales on beliefs about setting *limits* around infants' sleep, *anger* at infants' demands related to sleep, *doubts* about parenting competence, beliefs in the importance of *feeding* to soothe the infant during the night, and concerns about the infant's *safety* in the crib at night; and the *Portrait Values Questionnaire (PVQ),* with 10 subscales related to personal vs. social foci and openness to change vs. tradition. Latent profile analysis identified a three-profile (*growth self-focused, other-focused infant-led, other-focused structured)* model of mothers' value endorsements as the best fit. Value profiles did not predict infant sleep characteristics (efficiency or wakings) or parental visits. However, value profile did predict maternal cognitions around infants' sleep. A series of one-way analyses of variance (ANOVA) with profile as a between-subjects factor revealed main effects of profile on *anger* at infants' demands related to sleep and concerns about infants' *safety* in the crib. Post-hoc Bonferroni tests demonstrated that the *other-focused infant-led* profile scored higher on the *anger* and *safety* subscales than the *other-focused structured* profile. Moreover, maternal cognitions about sleep were correlated with sleep metrics. The greater the maternal concern about infants' sleep, the more disrupted infants' sleep with more night wakings, more maternal visits, and worse overall quality of sleep.

This study may be the first to link mothers' value systems to the context of infant sleep. The three profiles comprising this random sample reflect typical western value systems and infants had typical sleep patterns, regardless of mother profile. However, how mothers felt about providing that care and the impact of infant sleep on their lives did vary across value profiles. Mothers valuing infant-led interactions may experience more anger and safety concerns because they relinquish more control than other profiles. These findings have implications for predicting how new mothers may cope during the early months of parenthood as they adjust to their new role and sleep deprivation. Future research should examine whether different profiles may be more directly related to infant sleep by explicitly including mothers diagnosed with or at risk for mental health problems.

Multi-channel frontal EEG – validation on manual sleep staging in a pediatric cohort

S. Sigurdardottir[1], H. Pitkänen[2,3], H. Korkalainen[2,3], S. Kainulainen[2,3], M. Serwatko[1], K.A. Olafsdottir[1], S.Þ. Sigurðardóttir[4,5], M. Clausen[6,7], P. Somaskandhan[8], B.G. Stražišar[9,10], T. Leppänen[2,3,8], E.S. Arnardóttir[1,11]

[1]Reykjavik University Sleep Institute, School of Technology, Reykjavik, Iceland, [2]University of Eastern Finland, Department of Technical Physics, Kuopio, Finland, [3]Kuopio University Hospital, Diagnostic Imaging Center, Kuopio, Finland, [4]Landspitali - The National University Hospital of Iceland, Department of Immunology, Reykjavík, Iceland, [5]University of Iceland, Faculty of Medicine, Reykjavík, Iceland, [6]Landspitali – The National University Hospital of Iceland, The Children´s Hospital, Reykjavík, Iceland, [7]Landspitali – The National University Hospital of Iceland, Department of Allergy, Reykjavík, Iceland, [8]The University of Queensland, School of Electrical Engineering and Computer Science, Brisbane, Australia, [9]Centre for Paediatric Sleep Disorders, General Hospital Celje, Paediatric Department, Celje, Slovenia, [10]University of Maribor, Medical Faculty, Maribor, Slovenia, [11]The National University Hospital of Iceland, Internal Medicine Services, Reykjavík, Iceland

Introduction: Polysomnography (PSG) is the only internationally recognized method to diagnose pediatric obstructive sleep apnea (OSA), however, it suffers from high costs and limited availability. Therefore, simpler, and more cost-effective diagnostic tools for the pediatric population are urgently needed. One possible solution could be a self-applicable frontal electroencephalogram (EEG) recording setup.

The aim of the study was to validate the manual scoring of a frontal EEG recorded with the Self-Applied Somnography (SAS, Nox Medical, Reykjavik, Iceland) against ambulatory PSG in a pediatric cohort.

Materials and Methods: One night PSG and the frontal EEG were simultaneously recorded for 102 participants aged from 10–13 years. The PSG and the frontal EEG were scored according to the latest American Academy of Sleep Medicine pediatric rules with two modifications: frontal EEG was low-pass filtered with 0.5 Hz and the delta wave peak-to-peak amplitude of 45 µV was used for deep sleep detection. Sleep stage annotations were compared in an epoch-by-epoch manner using Cohen's kappa (κ) using three different models: the three-stage (wake/NREM (non-rapid eye movement)/REM), the four-stage (wake/N1+N2/N3/REM) and the five-stage model (wake/N1/N2/N3/REM). The inter-scorer agreements were also assessed (n=10). The relationship between common sleep variables was explored using bivariate analysis and an intraclass correlation coefficient (ICC).

Results: The Cohen's κ was 0.85 for the three-stage model, 0.73 for the four-stage model, and 0.70 for the five-stage model. The correlation between the sleep variables (total sleep time, sleep efficiency, arousal index, and sleep onset latency) calculated from PSG and frontal EEG was strong or very strong (ICC range 0.87–0.99). The inter-rater agreement was κ=0.78 for the PSG and κ=0.70 for the frontal EEG.

Conclusions: Manual sleep staging from the frontal EEG is comparable to the standard PSG setup in a pediatric cohort and thus enables reliable estimation of total sleep time and sleep architecture.

Neurodevelopmental disorders and insomnia: outcome of sleep-practitioner intervention on sleep, wellbeing and medication prescribing

H. Elphick[1], J. Reynolds[1]
[1]Sheffield Children's NHS Trust, Sleep, Sheffield, United Kingdom

Introduction: Over 80% children with neurodevelopmental diagnoses have sleep difficulties, including bedtime resistance, night-time awakenings and shortened sleep duration (McDonald 2019). The impact on the wellbeing of the child and family can be considerable. Behavioural interventions can be highly effective (Elphick 2019) but many children in the UK are prescribed melatonin due to inconsistent access to trained sleep practitioners.The study aimed to support children with neurodevelopmental problems to develop long-term strategies for promoting sleep, in turn improving the health and well-being of the child and family and to reduce drug prescriptions where not needed.
Materials and Methods: A longitudinal randomised case control study with delayed intervention in the control arm was carried out with children aged 4-11 years with a neurodevelopmental condition who had been taking melatonin for at least 12 months for severe sleep disturbance. Each child's parents/carers received support from a trained sleep practitioner for 8 weeks. Melatonin was actively weaned or stopped. Evaluation of sleep and wellbeing parameters was completed at 3 time-points.
Results: 32 participants were recruited and randomised; 20 completed the intervention and evaluation at all 3 timepoints. From baseline to final evaluation, time to settle to sleep improved from 137.9 to 81.7 minutes ($p < 0.05$); mean total CSHQ score improved from 55.8/99 to 46.7/99 ($p < 0.05$); mean total wellbeing scores improved from 18.8/30 to 13.8/30 (child - $p < 0.05$); and from 22.1/45 to 17.9/45 (parent - $p < 0.05$); mean quality of life score (CHU 9D) improved from 18.8/45 to 13.8/45 ($p < 0.05$); mean total SDQ score improved from 22.3/40 to 19/40 ($p = 0.052$). 42% participants stopped melatonin and a further 35% reduced the dose. Cost savings for melatonin prescriptions was equivalent to £5,937.48/year for the 26 patients analysed ($p < 0.05$).
Conclusions: We suggest that, even in a complex group of children, a non-pharmacological approach to sleep support delivers an effective, sustainable alternative to melatonin prescribing.

Neuropsychological assessment in children with Obstructive Sleep Apnea

A.d.S. Ramos[1], A.E. Fernandes[2], L.M. Alves[1]
[1]Universidade Federal de Minas Gerais, Speech Therapy, Belo Horizonte, Brazil, [2]Universidade Federal de Minas Gerais, Pediatric, Belo Horizonte, Brazil

Introduction: Pediatric obstructive sleep apnea (OSA) is associated with poor school performance, developmental delay and behavioral problems such as irritability, inattention, hyperactivity. It can also reduce brain volume. Its prevalence is around 4%. The diagnostic criteria must include polysomnography (PSG) with one or more obstructive or mixed apneas, or hypopneas per hour of sleep (apnea/hypopnea index - AHI). The AHI does not always correlate with these consequences and other PSG data should be considered.

Child neuropsychological assessment aim of early identification of cognitive and behavioral problems and can help with the diagnosis and treatment of many disorders. The NEUPSILIN-INF is a brief child neuropsychological assessment tool. The evaluation can be done in a 50 minutes' session. It was developed by Brazilians psychologists and speech therapists for children aged 6-12 years-old. It evaluates eight neuropsychological functions in 26 subtests: orientation, attention, perception, memory, arithmetic skills, language, visuoconstructive tasks and executive functions. This study aimed to assess neuropsychological functions in children with OSA and to correlate with the PSG data.

Methods: A cross-sectional study conducted between October 2021 and October 2022. Parents of children aged 6-12 years-old with the diagnostic of OSA by overnight polysomnography were invited to participate. An obstructive Apnea Hypopnea Index (AHI) greater than 1 event per hour was used to diagnose OSA. Children with intellectual disability, genetic syndromes, craniofacial malformation, hypothyroidism, neurodevelopmental disorder and those who undergone treatment for OSA after PSG and before the neuropsychology test were excluded. Participants underwent NEUPSILIN-INF assessment, and their results were associated to polysomnography data. Oxygen Desaturation Index ≤ 3% (ODI3%) greater than 5 per hour was consider abnormal. Statistical analyses were performed using SPSS 22, the Mann-Whitney test was used with a significance level of 5% and confidence interval of 95%.

Results: 17 children were included, 64.7% were male. The mean age was 8.7 years (± 2.1). The AHI ranged from 1.2 to 11.0 (mean 4.4/h ± 2.7). The prevalence of OSA based on AHI > 1, 5, and 10 events/h were 70.6%, 23.5% and 5.9%, respectively. The ODI3% ranged from 1.3 to 19.80 (mean 5.8/h ± 4.1). There was not significant difference in the NEUPSILIN-INF results between AHI > 1, 5, and 10 events/h. ODI3% greater than 5 per hour was associated with worse abilities in written language (p=0.014) and oral language (p=0,017).

Conclusions: This study evaluated children with objective tools: PSG and a validated instrument for neuropsychological assessment. It is important to consider others PSG data, beside the AHI, to define the presence and the severity of OSA. Intermittent desaturations during sleep cause oxidative damage and can impair cognitive development, despite the AHI. Our study found association between ODI3% and written language and oral language. The AHI severity did not correlate with cognitive evaluation. Further studies with larger samples and a control group are needed to analyze this relationship.

Acknowledgements: Sleep Laboratory of Núcleo de Otorrino BH

NREM nap differences in children with and without visual impairment: the role of fast sleep spindles

H. Vitali[1,2], C. Campus[1], S. Signorini[3], V. De Giorgis[3], F. Morelli[3], C. Varesio[3], L. Pasca[3], A. Sammartano[3], M. Gori[1]
[1]Istituto Italiano di Tecnologia, Unit for Visually Impaired People, Genova, Italy, [2]University of Genova, DIBRIS, Genova, Italy, [3]IRCCS Mondino Foundation, Unit of Child Neuropsychiatrist, Pavia, Italy

Introduction: Sleep plays a crucial role in brain development since the earliest stages of life. During sleep, the sensory information acquired during wake is off-line reprocessed and consolidated. Sleep spindles are a marker of these mechanisms mirroring the activity of the thalamocortical circuits, and are the first sleep hallmarks maturing after birth. Sleep spindles are bursts of neural oscillatory activity in the sigma band (11–16Hz). Specifically, low spindles oscillate in the low-sigma band (11-13Hz), prevail in frontal areas, and are associated with cognitive function. While fast-spindles oscillate in the high-sigma band (13–16Hz), prevail in central areas, and are associated with sensorimotor processing (visuomotor performance and fine motor functioning), which is affected by blindness.

Materials and Methods: We investigated if developmental differences between sighted and blind children involve sleep maturational processes. Naps were recorded using 21 electrodes video-EEG and extracerebral polygraphy, including breath, heart rate, and electromyography. We compared the macro- and microstructure of daytime sleep in 53 blind and 62 sighted children aged between 5 months to 6 years, subdivided into two age bins (0-3) and (3-6) years.

Results: At the macrostructural level, blind children presented reduced sigma activity. At the microstructural level, we found differences in the maturation of slow and fast spindles' length and density. The main difference involves fast-spindle activity (length and density), which was reduced in blind children in the earliest years (0-3Y) and lacked of any developmental reduction. Accordingly, their spindle frequency missed of any developmental reduction limited to the central area. Finally, considering spindle event-related spectral perturbation (ERSP) after spindle onset, central high-sigma power in blind patients was reduced in the earliest years and without any maturational decrease. Interestingly, a high-beta band (21–30Hz) event, time-locked to the spindle, showed the same ERSP pattern, supporting a possible involvement within sensorimotor integration.

Conclusions: Our results suggest that blind children diverge from the typical developmental trajectory in the neural structures that off-line processes of sensorimotor information, revealing the importance of investigating sleep development in clinical populations.

Observation of curative effect of integrated traditional Chinese and Western medicine on mild to moderate obstructive sleep apnea in children

S. He[1], J. Chen[1], L. Ding[2], K. Sun[2]
[1]Shanghai Children's Medical Center, Otolaryngology, Shanghai, China, [2]Shanghai Children's Medical Center, Traditional Chinese Medicine Department, Shanghai, China

Introduction: To observe the efficacy and safety of combined treatment of traditional Chinese medicine (TCM) and western medicine in treating pediatric obstructive sleep apnea (OSA).
Materials and Methods: 56 patients were randomly divided into the control group and the observation group, each including 28 cases respectively. The control group was treated with acupuncture, montelukast sodium and mometasone furoate nasal spray. The observation group was treated with montelukast sodium and mometasone furoate nasal spray. Both of them have a 3-month-treatment course.
Results: There were 2 cases of abscission. The total effective rate in the observation group was 89.2 %, higher than that in the control group, 53.5%(P<0.05). The change of total score of clinical syndrome after treatment in the observation group improved much more significantly than those in the control group (P<0.05).
Conclusions: Western medicine treatment control the symptoms quickly, but it is difficult to achieve a stable effect, lack of endocrine, autonomic nervous, immune system self-stable regulation. TCM syndrome differentiation and treatment to achieve the balance of Yin and Yang of the body, that is good to prevent recurrence. Combined treatment of traditional Chinese and Western medicine can significantly improve the clinical symptoms with OSA, and the incidence of adverse reactions is low, which is worthy of clinical application.

Offering parents intervention options for Baby's Sleep: preliminary findings from the Turkish sample of the OPTIONS study

P. Boran[1], J. Hyland[2], N. Karabayır[3], H.E. Barış[1], M. Dinleyici[4], P. Millear[2], S. Honaker[5], A. Metse[2], S. Blunden[6]
[1]Marmara University, School of Medicine, Social Pediatrics, Istanbul, Turkey, [2]University of the Sunshine Coast, Queensland, Australia, [3]Medipol University, Istanbul, Turkey, [4]Eskişehir Osmangazi University, Istanbul, Turkey, [5]Indiana University, Indianapolis, United States, [6]Central Queensland University, Adelaide, Australia

Introduction: Sociocultural differences, and culturally based expectations provide important context for conceptualization and treatment of behavioral sleep difficulties in young children. The aims of this study were to:
1) describe parents' experience, beliefs and attitudes about their baby's sleep;
2) assess parental acceptability of a range of infant behavioral sleep interventions; and
3) describe parental perspectives on a new proposed model of care that emphasizes informed parental choice in treatment selection.

Materials and Methods: The OPTIONS study is a descriptive, cross-sectional, international, collaborative survey study of mothers of 6- to 18-month-old children. The English language version of the survey was translated into Turkish with data collection from March to May 2023. Participants were recruited via social media. Seven sleep interventions were described: Unmodified Extinction, Modified Extinction, Parental Presence, Response-based strategies (e.g., settling in arms, in child's bed), Responsive settling, and Co-sleeping. The Theoretical Framework of Acceptability Questionnaire was used to assess parental acceptability of sleep interventions, rating their agreement with the items on a 5-point Likert scale. Higher scores indicate greater acceptability. Parents also rated the acceptability of the Informed Choice model of care, in which parents are supported in making choices consistent with their personal values and preferences among options by providing information on sleep intervention options.

Results: A total of 565 participants were recruited. Of these, 147 were excluded for not meeting the eligibility criteria, and 39 were further excluded during analyses. Thus, a total of 379 were included in the final study sample. The mean age of the children was 10.3 months (SD=3.8), and approximately half of the children were male (n=204, 53.8%). Approximately 68.6% of participants (N = 260) found the proposed 'informed choice' model of care to be acceptable/completely acceptable, whilst only 6.9 % (N = 26) rated the model unacceptable/no opinion. Parents with less education (high school and lower) were 2.9 times more likely to find the informed choice model acceptable than parents with more education (diploma and over). No other sociodemographic or family factors predicted acceptance of the 'informed choice' model of care. The mean score of Overall Anticipated Acceptability for the proposed model of care was 3.53 (n = 273, SD = .35). Unmodified Extinction was the least acceptable to parents (M = 1.76, SD =0.75), whilst Responsive settling was the most acceptable (M = 3.49, SD =0.73), closely followed by Response based (settling in arms, on the breast) (M = 3.30, SD =0.83). In examining specific components of acceptability of the informed choice model, statistically significant correlations were found between overall anticipated acceptability and ratings for individual constructs (e.g., affective attitude, self-efficacy), with the exception of Low Opportunity Cost.

Conclusions: Findings highlight the acceptability of an informed choice model of care for parents seeking help addressing behavioral sleep difficulties in their young child. With high variability in parental acceptance of different behavioral sleep intervention options, it is important to offer parents information about a range of behavioral sleep intervention options that are aligned with their goals and sociocultural beliefs.

Optimizing timing and dose of exogenous melatonin administration in neuropsychiatric pediatric populations: a metanalysis on sleep outcomes

S. Bruno[1], F. Cruz-Sanabria[2,1], G. Cenerini[1], D. Benedetti[1], S. Fiori[2,1], U. Faraguna[1,2]
[1]University of Pisa, Pisa, Italy, [2]IRCCS Stella Maris Foundation, Calambrone, Italy

Introduction: Sleep disorders are highly prevalent in children with neurological and psychiatric disorders. Exogenous melatonin (exo-MEL), a potent chronobiotic with sleep-promoting effects, has been found to improve sleep in neuropsychiatric pediatric patients. However, the optimal dose and time of administration are still under debate. The present study aimed to conduct a systematic review and meta-analysis on the effects of exo-MEL on sleep parameters (Sleep Onset Latency (SOL), Total Sleep Time (TST), Wake After Sleep Onset (WASO), Sleep Efficiency (SE)) in prepubertal children affected by neuropsychiatric conditions. Furthermore, we aimed to identify potential effect modifiers with the objective of maximizing exo-MEL efficacy in promoting sleep initiation and continuity.

Materials and Methods: The systematic search was conducted across multiple databases (PubMed, Embase, Cochrane, and Scopus), following PRISMA guidelines. Inclusion criteria were: English language; clinical trials; patients with sleep disorders or neurological/psychiatric diseases in comorbidity with sleep disorders; prepubertal age; studies published from 2012 onwards. Exclusion criteria were: studies involving melatonin agonists, or melatonin in combination with treatments for sleep disorders; editorial articles, letters to the editor, reviews, preprints, and guidelines; sleep disorders in comorbidity with non-neurological/psychiatric conditions. Time of administration, dose and treatment duration were considered as potential effect modifiers of melatonin treatment. Mean differences (MD) in TST, WASO, SOL between the treatment group (exo-MEL) and the placebo group were considered as study outcomes.

Results: The initial search yielded a total of 1279 articles, 67 of which were selected for full-text review and 6 (7 studies cohorts) were finally included in the meta-analysis. The daily administered dose ranged from 1 to 9 mg, the treatment duration from 3-12 weeks, the time window between administration and bedtime from 0 (bedtime) to 2.5 hours. Exo-MEL significantly reduced SOL (MD=-19.68 min, p=0.001), increased SE (MD=5.68% p=0.0073) and nearly significantly increased TST (MD=29.83 min, p=0.079). SOL was associated with the time between exo-MEL administration and bedtime (β=-10.63, p=0.001), while SE and TST with treatment duration (β=1.15, p=0.001 and β=7.65, p=0.0025, respectively). Exo-MEL dose was associated with the reduction in SOL (p=0.001), and the increase in TST (p=0.0052) and SE (p=0.017), reaching the peak between 2 and 5 mg, with no additional benefit when increasing the dosage over 5 mg.

Conclusions: Our results confirm exo-MEL efficacy on improving SOL, TST, and SE in pediatric neuropsychiatric populations. Treatment schedule may modulate melatonin efficacy, enhancing the sleep initiation when the administration time relatively to bedtime is advanced, and increasing sleep duration and efficacy when the treatment duration is prolonged. Dose can be increased up to 5 mg, while higher doses are unlikely to bring additional benefits. Our results suggest a dose and time of administration that may increase exo-MEL efficacy and could guide future research and clinical practice in managing sleep disturbances in this population.

Pediatric Sleep Apnea: Is objective evaluation, multi-dicipline approach and therapy-tracing needed to improve outcomes?

M.I. Birkisson[1], S. Magnusdottir[2], I. Ingolfsdottir[1,3], E.G. Hallgrimsdottir[1,4], G.B. Johannesdottir[1], L. Hrolfsdottir[5,1], G.E. Arnason[6], H. Petersen[3,1]
[1]Akureyri Hospital, Akureyri, Iceland, [2]MyCardio, SleepImage, Denver, United States, [3]University of Iceland, Reykjavik, Iceland, [4]Aarhus University, Aarhus, Denmark, [5]University of Akureyri, Institution of Health Science Research, Akureyri, Iceland, [6]Orthodontist - Private Practice, Akureyri, Iceland

Introduction: Obstructive sleep apnea (OSA) causes oxygen-desaturations and sleep-fragmentation negatively affecting sleep quality.
Obesity and adenotonsillar-hypertrophy (ATH) are major risk factors for OSA in young children. ATH is the most common indication for adenotonsillectomy (AT), prevalent surgery performed in this age-group. The otolaryngologists (ENT) approach, before deciding if surgery is indicated, is generally to utilize subjective questionnaires asking about the child's sleep quality, snoring, and/or if "paused breathing" has been observed with evaluation of the upper-airway, size of tonsils and adenoids, approach proven suboptimal in the childhood adenotonsillectomy study (CHAT), and subsequent follow-up studies. More accurate methods are therefore needed. Polysomnography (current reference standard) is cumbersome, costly, and not feasible due to large number of children presenting with OSA. The study aimed to evaluate: 1) accuracy of PSQ-SRBD compared to home sleep testing (HST) and 2) otorhinolaryngologic-status (ORLs) of children diagnosed with moderate/severe-OSA.
Materials and Methods: A cross-sectional study. After ethics approval (VSN-22-096) and study registration (NCT05479201) healthy population-based children aged 4-8 years residing in Akureyri, Iceland were invited to participate. Parents assisted their child to record their sleep for a minimum of 2-nights for OSA diagnosis with FDA-cleared/EU Medical Device Directive (CE mark 0413) HST, SleepImage®, and respond to sleep- and health-questionnaires (pediatric sleep questionnaire (PSQ)-sleep realtered breathing disorders (SRBD), attention hyperactivity disorder (ADHD)-DSM-IV). OSA diagnosis was defined based on apnea-hypopnea-index-3% ($AHI_{3\%}$)/hour of sleep; no-OSA (AHI<2), mild-OSA (AHI 2-5), moderate-OSA (AHI 5-10), severe-OSA (AHI³10). Data was collected August 2022 – June 15th, 2023; participation was not compensated for.
Children diagnosed with moderate/severe-OSA were evaluated by pediatrician, orthodontist and ENT that graded tonsils according to standardized grading of tonsil size, adenoids according to *Clemens & McMurray 1998* and mirror test was performed.
Results: Data from 373 children was analyzed, from 386 participating children (thirteen; 3.4%) did not finish recording 2-nights of sleep. Prevalence of OSA is high, with 23.1% (n=86) diagnosed with moderate/severe-OSA.
Positive response on PSQ-SRBD in no-OSA was (37.2%; n=55), mild-OSA (34.1%; n=47), and moderate/severe-OSA- (33.7%; n=29) and 18.1% (n=27), 22.4% (n=31) and 24.4% (n=21) had previously undergone AT, respectively. Collectively, 23.2% (n=52) of AHI ≥2 had previous AT.
Average tonsil size in moderate-OSA group was 1.69, average torus grade 1.55 (6-children with incomplete examination, 10%) and mirror test results showed 1% (n=1) with <30mm, 60% (n=37) 30-60mm and 39% (n=24) >60mm. Average tonsil size in severe-OSA group was 1.65, average torus grade 1.53 (8-children with incomplete examination, 35%), mirror test showed 9% (n=2) <30mm, 52% (n=12) 30-60mm and 39% (n=9) >60mm.
Conclusions: Objective evaluation is needed to verify OSA in children and before AT. Subjective evaluation, PSQ-SRBD, tends to overestimate children without OSA when confirmed with HST and underestimate children with mild-, moderate-, and severe-OSA.
AT is not as effective in treating OSA as previously assumed, i.e., 23% of children with HST verified OSA and previously treated with AT still suffer from OSA. ORLs of moderate/severe-OSA group suggest no direct link between higher AHI score and larger ATH, underlining the importance of therapy-tracing implementation.

Phenotyping sleep disturbances in children and adolescents with ADHD based on clinical assessment and SDSC scoring

O. Hill[1], Q.R. Abalde[2], M. Braschel[3], E. Keys[2], C. Kuo[4], S. McWilliams[1], P. Pandher[1], H. Tesch[4], O. Ipsiroglu[1,5]
[1]H-Behaviours Research Lab, BC Children's Hospital Research Institute, Department of Pediatrics, University of British Columbia, Vancouver, Canada, [2]University of British Columbia - Okanagan, School of Nursing, Kelowna, Canada, [3]BC Children's Hospital Research Institute, Biostatistics, Vancouver, Canada, [4]University of British Columbia, School of Biomedical Engineering, Vancouver, Canada, [5]Interdisciplinary Sleep Clinic, Divisions of Developmental Pediatrics, Child and Adolescent Psychiatry and Respirology, BC Children's Hospital, Department of Pediatrics, University of British Columbia, Vancouver, Canada

Introduction: Sleep disturbances are highly prevalent among children with attention-deficit/hyperactivity disorder (ADHD) yet are often overlooked in clinical practice. To better understand the pathophysiology of ADHD-related sleep disturbances, Miano et al. conducted in-depth sleep lab-based analyses (PSG, actigraphy, MSLT) and identified five ADHD-sleep phenotypes (narcoleptic-like, delayed sleep onset insomnia, OSA, RLS/restless, sleep EEG epileptiform discharges; DOI 10.1016/j.sleep.2018.08.026). We combined clinical information based on descriptions from parents/caregivers, clinician assessment/diagnosis (excessive daytime sleepiness (EDS), insomnia, RLS, seizure disorder/epilepsy) as well as subscores from the Sleep Disturbances Scale for Children (SDSC: DOES, DIMS, SDB) to apply the concept of sleep lab-based ADHD-sleep phenotypes clinically.

Methods: Assessment results of 199 patients referred to the Pediatric Interdisciplinary Sleep Program at Child and Adolescent Psychiatry in BC Children's Hospital were reviewed. Clinical information was collected using the comprehensive Mind-the-Gap-Logic-Model (DOI 10.3389/fpsyt.2022.878356; https://doi.org/10.3389/fpsyt.2022.878356). Statistical analysis was conducted with odds ratios (OR) to identify risk factors (p<0.05) and understand trends (p<0.1) for each phenotype; only 95% confidence intervals are presented.

Results: 92/199 patients aged 4-18 years (mean=11.4 years; 56 male) with a diagnosis of ADHD were included in the analysis. The following correlations and risk factors for each phenotype were found. EDS/DOES-cohort 28/92: CRSD (OR:3.26, p=0.0415) and ns-trend for iron deficiency (OR:0.13, p=0.0861). Insomnia-cohort 57/92: familial iron deficiency (OR:3.44, p=0.0084), familial RLS (OR:2.57, p=0.03222), and neurologic conditions (OR:0.29, p=0.0322); ns-trend for RLS/restless (OR:3.31, p=0.0734), intellectual disability (OR:0.32, p=0.0684), and genetic conditions (OR:0.14, p=0.0828). SDB-cohort 48/92: non-restorative sleep (OR:3.22, p=0.0073), parasomnias (OR:4.28, p=0.0098), and ns-trend for restless (OR:2.43, p=0.0557). RLS/restless-cohort 81/92: internalizing disorders (OR:4.53, p=0.0345) and ns-trend for both insomnia/DIMS (OR:3.26, p=0.0782), and genetic conditions (OR:0.17, p=0.0730). Further analyzes of the RLS, familial RLS, painful RLS, and restless-sleep: RLS sub-cohort 76/92 familial iron deficiency (OR:7.00, p=0.0138); familial RLS sub-cohort 50/92: familial iron deficiency (OR:5.98, p=0.0002), painful RLS (OR:5.64, p=0.0308), and insomnia/DIMS (OR:2.57, p=0.0322); ns-trends for ASD (OR:2.15, p=0.0731) and SWTD (OR:6.67, p=0.0819); painful RLS sub-cohort 13/92: self-injurious behaviours (OR:5.41, p=0.0218) and familial RLS (OR:5.64, p=0.0308); ns-trends for parasomnias (OR:3.38, p=0.0508), familial iron deficiency (OR:3.48, p=0.0525), intellectual disability (OR:3.46, p=0.0754), and restless sleep (OR:0.14, p=0.0689); restless sub-cohort 30/92; non-restorative sleep (OR:2.96, p=0.0198); ns-trends for SDB (OR:2.43, p=0.0557) and painful RLS (OR:0.14, p=0.0689). Epilepsy cohort 5/92: sample size insufficient for further analysis.

Conclusions: The clinical application of the ADHD sleep-phenotypes concept supported the identification of well-known risk factors (e.g., SDB with parasomnias) and some unexpected risk factors (e.g., EDS and/or RLS/restless sleep with internalizing disorders). Of interest is the subcohort analysis of RLS/restless sleep cohort, showing that depending on risk factors associations are changing (e.g., painful RLS sub-cohort with self-injurious behaviours and familial RLS). This discussion will support harmonization of how patients with ADHD should be approached clinically. Larger data sets will further prove the validity of the risk factors, which may change depending on clinic-specific diagnostic focus.

Phenotypization of infant sleep by videosomnography

M. Breda[1], M. Lucchini[2], N. Barnett[2], O. Bruni[3]
[1]Sapienza University, Human Neuroscience, Rome, Italy, [2]Research Department, Nanit, New York, United States, [3]Sapienza University, Developmental and Social Psychology, Rome, Italy

Introduction: During the first year of life, infants go through significant changes in their sleep patterns. From the irregular sleep-wake cycles of newborns, sleep gradually evolves to more predictable patterns. Establishing healthy sleep patterns in infants is crucial for their physical, cognitive, and emotional development. Parents and caregivers can help promote healthy sleep patterns, establishing consistent bedtime routines, creating a sleep-friendly environment, and responding to the infant's cues and needs. Understanding and accepting individual differences in sleep patterns can help parents adapt their caregiving strategies to meet the unique needs of their baby. In this study we propose to identify different sleep patterns in healthy infants, relying on objective sleep metrics.

Materials and Methods: A total of 623 parents of infants aged 9 to 13 months (M=10.31 months ± 1.13, 52.00% females) were recruited among users of Nanit baby-monitor in the United States and were asked to complete the Brief Infant Sleep Questionnaire (BISQ-R). Objective infant sleep metrics obtained from Nanit auto-videosomnography (1 week of data averaged) were: nighttime infant sleep duration, number of nighttime infant awakenings, number of parental nighttime visits, nighttime sleep efficiency, bedtime and wake up time. To group infants based on sleep variables, a cluster analysis was conducted using a series of hierarchical (Ward's method) and non-hierarchical (k-means) cluster analyses to determine the best representative model and to test stability and replicability of clusters. The between-cluster comparison was performed using ANOVA for parametric and the χ^2 test for nonparametric variables. Post hoc tests were performed.

Results: Three reproducible and stable sleep groups were identified: Long Sleepers (LS, n.340), Interrupted Sleepers (IS, n.126) and Short Sleepers (SS, n.156). All sleep metrics were significantly different in the three groups. LS had longer nighttime sleep duration than IS (0.65 ± 0.08 h, p<.001) and SS (1.71 ± 0.07 h, p<.001), also IS had longer nighttime duration than SS (1.06 ± 0.09 h, p<.001), but presented more awakenings than SS (2.16 ± 0.10 h, p<.001) and LS (2.16 ± 0.09 h, p<.001), the latter did not differ in awakenings but in parent interventions, being more frequent in SS than in LS (0.65 ± 0.16, p<.001). Bedtime and wake up time were similar for LS and IS, whereas SS presented later bedtime and earlier wake up time than LS (1.29 ± 0.06 h, p<.001 and -0.26 ± 0.07 h, p<.001) and IS (1.22 ± 0.07 h, p<.001 and -0.30 ± 0.08 h, p<.001). Nighttime sleep efficiency was better in LS than in IS (0.05 ± 0.01, p<.001) and SS (0.01 ± 0.01, p<.001), SS presented better sleep efficiency than IS (0.04 ± 0.01, p<.001). No age or gender difference was found between clusters.

Conclusions: Cluster analysis based on objective sleep metrics offers a novel multidimensional approach to identify and understand infants' sleep patterns. The categorization of infant sleep pattern through a non-invasive objective method like videosomnography might identify infants with sleep problems and might allow an early and specific intervention.

Polysomnographic characterization in children with mucopolysaccharidosis in treatment in a tertiary care facility: a case-control study

M.D. Fiorentino[1], P.H. Ferreira Guimarães[1], L.A. Soster[2], C. Bueno[2]
[1]Hospital das Clínicas of the University of São Paulo Medical School, São Paulo, Brazil, [2]Pediatric Sleep Laboratory and Outpatient Clinic Children's Institute University of São Paulo Medical School, São Paulo, Brazil

Introduction: The mucopolysaccharidoses (MPSs) comprise a heterogeneous group of inherited lysosomal storage disorders, each one associated with a deficiency in one of the enzymes implicated in glycosaminoglycan (GAG) degradation. Enzymatic reposition treatment is changing the outcome scenario of MPSs, as it acts over the main mechanism of the disease. Sleep disorders are common in all types of MPS, with abnormalities in both the respiratory system and the central nervous system that can affect quality of life of patients. To better understand the abnormalities in the sleep structure in MPS we compared the polysomnographic variables of children diagnosed with MPS prior to treatment for sleep disturbances compared with healthy controls.
Materials and methods: An observational, case-control and retrospective study was carried out comparing a group of nine children (n = 9) diagnosed with MPS, who underwent baseline polysomnography in the Institute for Children and Adolescents at the Hospital das Clínicas of the University of São Paulo compared with a healthy control group (n = 15). Descriptive statistics and nonparametric correlation were performed with the Mann-Whitney test to analyze the demographic and sleep variables.
Results: The MPS group had a median age of 7,0 (SD 3,0) years whereas the control group had a median age of 9,0 years (SD 2,6; p-value 0,1338), hence without statistically significant differences regarding the ages. The median apnea-hypopnea index (AHI) was 8.8 events per hour in the MPS group and 0.96 events per hour in the control group (p-value <0.0001), therefore markedly higher. The mean oxygen saturation of the MPS group was 95% (SD 2,4) and the minimum 81% (SD 12,1) with a microarousal index of 7,2 (SD 5,8). Sleep architecture was characterized by a significant reduction in total sleep time (TST) in the MPS group with a median of 373.0 minutes compared to 443.5 minutes in the control group (p-value 0,0122). Compared to the control group, there was a statistically significant reduction in median REM sleep duration (33,5 minutes versus 77,0 minutes; p-value 0,0104) and an increase in the median percentage of N1 sleep in relation to TST (9,9% versus 4,1%; p-value 0,0284). No statistically significant differences were observed in sleep latency, arousal index, sleep efficiency, duration of N2 and N3 stages, and wake after sleep onset (WASO).
Conclusions: Reduction in total sleep time, in REM sleep duration and increase of N1 sleep percentage were the main findings, together with higher AHI, in patients with MPS. The role of GAG deposition is important in defining sleep breathing disorders in this population.

Polysomnographic features of Duchenne Muscular Dystrophy patients in a tertiary care facility in São Paulo

B. Soares de Azevedo Sardano[1], A. Stavitski Costa de Oliveira[1], C. Pereira Borginho[1], T. Brito Santos[1], M. Honorato[1], A.C. Luvizotto Monazzi[1], C. Bueno[1], L. Azevedo Soster[1]
[1]Children`s Institute University of São Paulo Medical School, Pediatric Sleep Laboratory, São Paulo, Brazil

Introduction: Duchenne Muscular Dystrophy (DMD) is a X-linked inherited neuromuscular disorder, characterized by reduced muscle strength, gait impairment with a waddling pattern, Gowers' sign and progression to hipoventilation, cardiac issues, deformities and contractures over the course of years. The impact of sleep-related comorbidities in these patients is frequently neglected. The aim of this study is to present the polysomnography sleep features of DMD patients from a Public Hospital of São Paulo.
Materials and methods: We assessed, retrospectively, type I polysomnography of 69 patients with DMD, carried out in a Public Hospital of São Paulo from 2013 to 2023 and compared to normal controls. Sleep data was: mean sleep onset latency (SOL) and REM sleep latency (RSL); proportion of N1, N2, N3 and REM sleep; sleep efficiency (SE); apnea-hypopnea index (AHI); arousal index and WASO time during the night of the exam. Both group were compared by means of Mann Whitney.
Results: The great majority of variables presented higher among the DMD group, such: N2 sleep percentage (49 ± 8SD vs 40 ± 6SD), arousal index (6 ± 3SD vs 2 ± 1SD), AHI (5 ± 4SD vs 0,9 ± 0,5SD) and WASO (65 ± 47SD vs 33 ± 36SD). On the other hand, SE (%) was significantly lower among the disease group (mean: 78 ± 10SD vs 87 ± 6SD).

Conclusions: The findings of this study show a more disturbed sleep in patients with DMD, represented by spending more time trying to get back to sleep, more time spent on less deeper sleep stage that may also be related to respiratory events.

Positional Obstructive Sleep Apnoea in children

C.C.K. Chan[1,2,3], C.T. Au[1,4], A. Tang[1], A.M. Li[1,2,3]
[1]The Chinese University of Hong Kong, Department of Paediatrics, Shatin, New Territories, Hong Kong, SAR of China, [2]Li Ka Shing Institute of Health Sciences, Faculty of Medicine, The Chinese University of Hong Kong, Laboratory for Paediatric Respiratory Research, Shatin, New Territories, Hong Kong, SAR of China, [3]The Chinese University of Hong Kong, Hong Kong Hub of Paediatric Excellence, Kowloon, Hong Kong, SAR of China, [4]Research Institute, The Hospital for Sick Children, Translational Medicine, Toronto, Canada

Introduction: Positional obstructive sleep apnoea (POSA) is a distinct clinical subtype in which obstructive respiratory events occur predominantly while sleeping in the supine position. Positional therapy serves as a treatment option. However, data on the epidemiology and risk factors of POSA in the paediatric population are limited. In this study, we aimed to investigate the prevalence, characteristics, and risk factors of POSA in children.

Materials and Methods: A retrospective analysis of a hospital-based cohort from 2009 to 2022. Children and adolescents aged 4-17 years with diagnostic polysomnography (PSG) performed at our centre, and with at least 30 minutes of supine and non-supine sleep, were included in the study. This analysis focused on children with moderate/severe OSA as defined by an obstructive apnoea hypopnoea index (OAHI) ≥ 5/h. POSA was defined by an OAHI in the supine position ≥ two times the OAHI in the non-supine position.

Results: Among the 505 eligible children, 147 had moderate/severe OSA (76.8% male, mean age 10.0 ± standard deviation (SD) 2.59 years]. 75 (51%) had POSA, with a median supine OAHI of 19.04/h [interquartile range (IQR): 12.52-32.24] and non-supine OAHI of 3.70/h (IQR: 1.84-7.40). They were significantly older than those with non-POSA (11.0 ± 3.4 c.f. 8.9 ± 2.6 years, p<0.001). Children with POSA tended to have less severe disease than those with non-POSA, with lower overall median OAHI (10.6/h (IQR 6.9-20.0) c.f. 12.7/h (8.3-23.6), p = 0.05), lower median oxygen desaturation index (6.2/h (2.6-13.7) c.f. 10.0/h (6.3-19.3), p=0.003), and higher oxygen saturation (SpO2) nadir (88.9% ± 5.0 c.f. 85.0% ± 12.0, p=0.01). By logistic regression, older age (≥ 10 years) was a significant predictor of POSA (OR 4.381; 95% CI: 1.904-10.081; p=0.001) independent of gender, overweight/obesity and OAHI. OAHI had a weak negative association with POSA status (OR 0.969; 95% CI: 0.942-0.996; p=0.025).

Conclusions: 51% of children with moderate/severe OSA had POSA. Based on polysomnographic parameters, POSA in children and adolescents tended to be less severe than non-POSA. Future studies are needed to investigate whether positional therapy is an effective treatment option in this group of patients.

Predictors of persistent sleep-disordered breathing symptoms in children with mild sleep apnea

L. Korchemny[1], A. Gileles-Hillel[2,1], S. Goldberg[3,1], E. Picard[3,1], J. Reiter[2,1]
[1]Hebrew University, School of Medicine, Jerusalem, Israel, [2]Hadassah Medical Center, Pediatric Pulmonary and Sleep Unit, Jerusalem, Israel, [3]Shaare-Zedek Medical Center, Pediatric Pulmonology and Sleep Unit, Jerusalem, Israel

Introduction: Sleep-related breathing disorders (SDB) are common in children, and may have long-term effects on children's health, including physical and cognitive consequences. Treatment guidelines for mild obstructive sleep apnea (OSA) are unclear with possible surgical intervention, medications, or watchful waiting. The current study aimed to assess the long term persistence of SDB symptoms and their predictors in children with mild OSA.

Materials and Methods: Children diagnosed with mild OSA at the Hadassah and Shaarei-Zedek medical centers, Jerusalem, Israel, were contacted by phone 1-2 years following polysomnographic (PSG) diagnosis and their clinical data was summarized. Each family completed a validated tool, the Pediatric Sleep Questionnaire (PSQ). Persistent SDB was defined as a score > 33%.

Results: A total of 78 children (38 female) were interviewed. The mean age at PSG was 5.45 (±3.98) years and the baseline apnea-hypopnea index (AHI) 2-5/h. The PSQ was positive in 31 (39.7%). Positive PSQ was associated with the presence of any background morbidity, and with a diagnosis of each of prematurity, z score BMI, having no change in complaints, and respiratory rates on baseline PSG.(all ps≤0.05). To avoid central apnea as a confounder, analysis was repeated in the subgroup of patients with an obstructive AHI ≥2 /h (n=45). This analysis yielded nearly identical results.

Conclusions: We identified a high rate of persistent SDB symptoms in children previously diagnosed with mild OSA, emphasizing the importance of continued follow-up of these children, particularly those with background morbidity, prematurity, ively high z score BMI, no change in complaints, or relatively high respiratory rate on initial PSG.

Prevalence of sleep disorders in children and adolescents with primary monosymptomatic enuresis

M.F. Dutra[1], A.E.R. Fernandes[1], J. de Bessa Jr[2], E.M. Lima[1], J.M.B. Netto[3], G.D. Medeiros[1], M.M.A. Vasconcelos[1], F.C.C. Mrad[1]
[1]Universidade Federal de Minas Gerais, Pediatric, Belo Horizonte, Brazil, [2]Universidade Estadual de Feira de Santana, Feira de Santana, Brazil, [3]Universidade Federal de Juiz de Fora, Juiz de Fora, Brazil

Introduction: Enuresis is a Sleep-Related Urologic Dysfunction, as described in a Parasomnia chapter in the International Classification of Sleep Disorders 3rd edition Text Revision. It is an undesirable experience that can occur during non-rapid eye movement sleep (NREM), rapid eye movement sleep (REM), or during sleep wake-transitions. It is a recurrent involuntary voiding, that happens at least once per month, for over 3 months in patients older than five years. Primary enuresis is when bladder control has never been attained and secondary enuresis when incontinence reoccurs after at least six months of continence. Monosymptomatic enuresis appears with no other urinary tract symptoms and non-monosymptomatic is associated with symptoms like bowel dysfunction, daytime incontinence or underactive bladder. It has hereditary factors and its pathophysiology is based on nocturnal polyuria due to the altered circadian cycle of the antidiuretic hormone, decreased bladder capacity, and impaired arousal with a full bladder. It is a condition that occurs in 15-20% of 5-year-olds, 3% in adolescents and between 0.5 to 1% of adults. Enuresis is associated with Sleep Disorder Breathing and its treatment can improve or cure enuresis. Furthermore, sleep deprivation may induce excessive nocturnal urine production and natriuresis in healthy children. It is probably due to a reduced nighttime dip in blood pressure and a decrease in renin-angiotensin-aldosterone system levels. Despite the polyuria, it is still an enigma why children do not wake up to the sensation of a full bladder and the need to pass urine during sleep. Therefore, studying the sleep of children with enuresis is essential to better understand the condition. The aim of this study was to evaluate the prevalence of sleep disorders in children and adolescents with enuresis.
Methods: Cross-sectional study that evaluated sleep using the Sleep Disturbance Scale for Children. It differentiates between conditions such as sleep initiation and maintenance disorders, sleep-disordered breathing, arousal disorders, sleep-wake transition disorders, excessive sleepiness, and sleep hyperhidrosis. The cut-off point used was 39 as a presence of sleep disorders with a sensitivity of 0.89 and a specificity of 0.74. The results were divided into "pathological" (at least three episodes per week) and "normal" scores. The recommendations of the National Sleep Foundation were used to assess the total sleep time.
Results: The sample consisted of 35 participants, aged 7-13 (mean 10.3 ± 1.9), 51.4% were male. The prevalence of sleep disorders was 5.7%, being 5.9% in females and 5.5% in males. Most children slept less than 9 hours (88.5%), 25.7% had a sleep latency more than 30 minutes, 2.8% reluctant to go to bed, 2.8% snored, 5.7% had difficulty waking up and 5.7% scored more than 39.
Conclusion: The sample showed a low prevalence of sleep disorders. However, most of these children and adolescents slept less hours than the recommendation for their age and this may have had an impact on the presence of enuresis. Therefore, adequate sleep duration should be addressed by professionals who assist this population. Further studies with larger samples and a control group are needed to analyze this relationship.

Relationship between sleep alteration and cognitive deficit in children with ADHD associated with OSAS: the importance to take into account dual diagnosis in children sleep medicine

P. Desvergnes[1], J. Coelho[2,1], L. Boileau[1], M. Lecendreux[3], S. Bioulac[4], K. Guichard[5], P.-J. Monteyrol[6], S. Debelleix[1], J.-A. Micoulaud-Franchi[2,1], P. Philip[2,1]
[1]Bordeaux University Hospital, University Sleep Medicine Unit, Bordeaux, France, [2]Bordeaux University, SANPSY UMR 6033, CNRS, Bordeaux, France, [3]AP-HP, Pediatric Sleep Center, Paris, France, [4]Service de Psychiatrie de l'Enfant et de l'Adolescent, Laboratoire de Psychologie et Neurocognition, Grenoble, France, [5]Nouvelle Clinique Bordeaux Nord, Pôle d'Explorations des Apnées du Sommeil, Bordeaux, France, [6]Nouvelle Clinique Bordeaux Tondu, Floirac, France

Introduction: The dual diagnosis of ADHD and OSAS has been increasingly recognized and raises concerns about the cumulative impact on their cognitive abilities. Disrupted sleep can exacerbate ADHD symptoms, but also directly impact cognitive functions. Understanding the intricate relationship between sleep alteration and cognitive deficits in this population is crucial for effective management and intervention strategies. Thus, this study aims to examine the relationships between sleep alteration and cognitive deficit in children with OSAS and untreated ADHD.

Method: We included children aged between 6 and 16 years with an untreated ADHD and treated OSAS that were evaluated for their cognitive deficit in the Sleep Medicine Unit of the Bordeaux University Hospital. Sleep alteration was evaluated with polysomnographic data performed at the time of the OSAS diagnosis. The following polysomnographic metrics were used: Apnea-Hypopnea Index (AHI), Oxygen Desaturation Index (ODI), Arousal Index (AI), Sleep Efficiency (SE), and Periodic Limb Movement Index (PLMI). ADHD symptomatology was assessed using the ADHD-IV total score. Cognitive deficits were evaluated after appropriate and effective OSAS treatment with the Wechsler Intelligence Scale for Children (WISC)-V and the Test of Everyday Attention for Children (TEA-Ch). Neuropsychological assessments were expressed in terms of percentile. Correlations between polysomnographic data and neuropsychological assessments were computed using the Pearson correlation coefficient (r). Stratified secondary analyses were performed according to the results of the neurocognitive assessments (impaired attentional functions or not).

Results: A total of 16 children with treated OSAS and untreated ADHD were investigated (mean age: 10.3 ± 3.0, 62.5% of males, mean body mass index: 18.0 ± 3.2). The mean ADHD-IV score was 29.6 ± 8.9. The polysomnography performed prior to treatment showed a mean AHI of 4.6 ± 3.0 (19% of severe OSAS and 56 % of moderate OSAS and 25% of mild OSAS), a mean ODI of 1.8 ± 2.1, a mean AI of 11.2 ± 4.6, a mean SE of 88.5% ± 5.3%, and a mean PLMI of 2.1 ± 1.9. In all, 11 children showed significant cognitive deficit on the neuropsychological assessments. Overall, the AI was negatively correlated with the verbal comprehension index of the WISC-V (r=-0.76, p=0.016). This correlation was further increased in the subgroup of children with impaired attentional functions on neurocognitive assessments (r=-0.86, p=0.007). In this subgroup, the AI was also correlated with the processing speed index of the WISC-V (r=-0.80, p=0.032). And the ODI showed a significant correlation with impairment in a sub test ("Z") on the TEA-Ch exploring attentional control, cognitive flexibility, inhibition and impulsivity) (r=-0.85, p=0.015).

Discussion: These results highlight the importance of assessing sleep quality and associated OSAS in children with ADHD due to cognitive consequences, particularly in children with impaired attentional functions on neurocognitive assessment. Appropriate management of sleep, including but not limited to OSAS treatment, could contribute to improving cognitive performance in these children and potentially enhance their educational outcomes. Further research is needed to better understand the underlying mechanisms of these associations and develop targeted interventions for this dual diagnosis population.

Response to medical treatment for obstructive sleep apnea in children assessed using sleep questionnaire

S. Rothman[1], J. Pitaro[2]
[1]Tel Aviv University, Otolaryngology, Tel aviv, Israel, [2]Tel Aviv University, Tel Aviv, Israel

Introduction: Pediatric obstructive sleep apnea (OSA) is mostly caused by adenotonsillar hypertrophy and surgery is the first-line of treatment. Recent studies have shown that montelukast and intranasal corticosteroids (INCs) can decrease adenoid size, improve symptoms and polysomnographic results in non-severe OSA, excluding the need for surgery in some cases. OSA is diagnosed using polysomnography (PSG) however, PSG is often not available. In order to identify OSA without PSG, the pediatric sleep questionnaire (PSQ) has been developed. Our objective was to assess the clinical response to montelukast or INCs in children with OSA using the PSQ.

Materials and Methods: We conducted a prospective randomized study including children between 2-15 years with OSA presenting to the pediatric otolaryngology clinic with a referral to surgery from community. After obtaining the parental consent, we administered the PSQ (Hebrew version), conducted a thorough medical history, performed physical examination, and randomly assigned subjects to receive either montelukast or INCs for 2 months. After completing the treatment, the children were re-evaluated, and if there was no improvement, surgery was scheduled.

Results: Seventy-three children were recruited, of them, 7 withdrew from the study with no medical treatment. A total of 66 children with a mean age of 5.25 years (44, 66% Boys) completed the study. The mean PSQ score before and after treatment in the montelukast group was 9.48 (SD=3.3) and 7.06 (SD=4.6) respectively ($P = 0.001$), and in the INCs group it was 9.52 (SD=3.6) and 7.61 (SD=4.15) respectively ($P = 0.002$). Following treatment, adenoid size significantly decreased in both groups ($P < 0.001$), while the tonsils size decreased only in the montelukast group ($P = 0.008$). Both montelukast and INCs groups demonstrated an improvement in snoring ($P = 0.006$, $P = 0.012$, respectively) but not in mouth breathing ($P = 0.727$, $P = 0.727$, respectively). Rhinorrhea significantly decrease only in the INCs group ($P < 0.001$), whereas in the montelukast group, it decreased considerably but did not reach statistical significance ($P = 0.08$). out of the 66 children, only 14 eventually underwent surgery (9 due to low compliance with medication, 1 due to side effect and 4 did not show improvement after completing 2 months of treatment).

Conclusions: In children with OSA caused by adenotonsillar hypertrophy, treatment with montelukast or INCs demonstrated clinical improvement and may serve as an alternative to surgery in some cases. The PSQ may be used clinically as an additional tool to assess pediatric OSA. Further studies are needed to test the effect of medical treatment in pediatric OSA.

Revisiting the original concept of vigilance in personalized, patient reported outcome measures

O. Ipsiroglu[1,2], O. Hill[1], Q.R. Abalde[3], E. Keys[3], S. McWilliams[1], C. Kuo[4], Y. Rishi[1], H. Tesch[4], G. Kloesch[5,6]
[1]H-Behaviours Research Lab, BC Children's Hospital Research Institute, Department of Pediatrics, University of British Columbia, Vancouver, Canada, [2]Interdisciplinary Sleep Clinic, Divisions of Developmental Pediatrics, Child and Adolescent Psychiatry and Respirology, BC Children's Hospital, Department of Pediatrics, University of British Columbia, Vancouver, Canada, [3]University of British Columbia - Okanagan, School of Nursing, Kelowna, Canada, [4]University of British Columbia, School of Biomedical Engineering, Vancouver, Canada, [5]Medical University of Vienna, Department of Neurology, Sleep Lab, Vienna, Austria, [6]Institute for Sleep-Wake-Research, Vienna, Austria

Introduction. The concept of vigilance was suggested by the British Neurologist, Henry Head in 1923 as an individual's ability to respond adequately to environmental stimuli to ensure survival. Head uses this concept in an innovative way to gather insights into wake behaviours. Reviewing how a universal screening concept for sleep disturbances could be implemented in public health-based prevention programs and the lowest tier-service-levels (e.g., primary care), we analyzed to what degree patient/parent-oriented outcome measures reflect Head's concept of affected wake behaviours and could be triggered or caused by sleep disturbances.
Methodology. The first step of the universal sleep screening endeavor is to develop a shared language on main themes summarizing characteristic clinical symptoms, and has three parts: (1) Two clinician sleep researchers (c-SRs) annotated personalized, patient reported outcome measures (PROMs), stated as individual goals/concerns from the intake forms of the Pediatric Interdisciplinary Sleep Program at BC Children's Hospital were reviewed first in 41 consecutive adolescent patients, then in 30 consecutive patients reflecting the age groups preschool, school, and adolescents. 371 original quotations were reviewed and differentiated in the categories *vigilance*, *H-Behaviours* (hyper-/hypo-arousability; hypermotor-restlessness), *sleep quality* and, *others (only vigilance data is show)*. (2) The vigilance annotations of the two cohorts were compared with PROMs in the descriptive domain "E" for Excessive Daytime Sleepiness/behaviours and the SDSC sub-score Disorders of Excessive Daytime Sleepiness (DOES). (3) Further, 6 non-clinician SRs (nc-SRs) annotated a subset of 10 adolescent patients from the second cohort to review the generalizability of the suggested concept.
Results. (1) After six Delphi rounds, the Cohen's kappa interrater agreement of the 2 c-SRs for *vigilance and H-Behaviour annotations* in a group of 39 patients was 0.85 (95% CI: 0.81-0.90). (2) Correlation of vigilance-related PROMs, rated as associated with the domain E was r=0.689 (p=0.000) for the first cohort and on average r=0.686 (p=0.000) for the second cohort; best for the school age group: (0.922; p=0.000), and worst for the preschool age group (0.309; p=0.385). Vigilance annotations correlated with SDSC/DOES (0.355; p=0.023) for the first cohort but not in the second cohort (0.258; p=0.168). (3) Interrater variables for the nc-SRs was 0.40 (95% CI: 0.39-0.42).
Discussion. By re-focusing on the definition coined by Henry Head, the concept of vigilance is an innovative way to gather new insights into the interplay between sleep- and wake behaviours. The proof of concept analysis of the two selected 41+30 consecutive cases over two different time points demonstrates a good content validity of the suggested screening concept for vigilance as a biomarker for sleep disturbances affecting daytime wellbeing, which restricts "survival". Note, that vigilance is a clinical interpretation-based construct that was reproducible for one of the cohorts with E and DOES-sub-scores; larger datasets may support the clarification of these contradictory results. Most importantly, this construct is "teachable" with minimal efforts. However, the variety in interrater results demonstrates the importance of structured teaching. For this purpose, we are developing a REDCap-based teaching program.

Serum ferritin and vitamin D levels in sleep disordered children with attention-deficit/hyperactivity disorder and/or autism

D. Korosec[1], M. Knez[1], B. Gnidovec Strazisar[1]
[1]General Hospital Celje, Centre for Paediatric Sleep Disorders, Celje, Slovenia

Introduction: Children with attention-deficit/hyperactivity disorder (ADHD) and autism can frequently have low serum ferritin and vitamin D levels. Sleep disturbances present a major challenge for these children and their families and can impose a significant burden on them. Iron and vitamin D can regulate sleep through numerous mechanisms. Our study assessed serum ferritin and vitamin D levels in children who presented with ADHD and/or autism with different concurrent sleep disorders.

Materials and Methods: A single-centre, retrospective study was conducted including 95 paediatric patients with a mean age of 7.4 ± 4.3 years (1-17 years) who were diagnosed with either ADHD and/or autism and concurrent sleep disorder at the Centre for Paediatric Sleep Disorders of the Paediatric Department of the General Hospital Celje between April 2016 and May 2023. Each patient included in the study was also diagnosed with a concurrent sleep disorder: (1) parasomnia, (2) insomnia, (3) sleep-related movement disorder. The participants were examined for laboratory serum values of vitamin D and ferritin among three groups of neurodevelopmental disorders diagnosed with – (1) ADHD, (2) autism, (3) autism with comorbid ADHD. Laboratory serum levels of ferritin below 50 µg/l and vitamin D levels below 75 nmol/l were considered inadequate.

Results: There were 67 males (71%) and 28 females (29%) included in the study. 39% ($n = 37$) had autism, 38% ($n = 36$) had ADHD and 23% ($n = 22$) were diagnosed with autism and comorbid ADHD. Serum ferritin level was analysed in 95% of patients ($n = 90$) and vitamin D status was assessed in 78% of patients ($n = 74$). Inadequate serum ferritin levels were detected in 93% of patients (28.0 ± 19.6 µg/l) and low vitamin D levels were measured in 66% of patients (70.9 ± 41.7 nmol/l). When comparing children with ADHD to children without ADHD, significantly lower serum vitamin D levels were observed ($p=0.041$) in the ADHD group. Significantly lower serum ferritin levels were detected in all groups of children with a neurodevelopmental disorder ($p=0.045$). Our study did not find statistically significant differences in the serum ferritin and vitamin D levels among subgroups of children with different sleep disorders.

Conclusions: Inadequate serum vitamin D and ferritin status can commonly be found in children with autism and/or ADHD. Patients with ADHD in all groups had significantly lower serum vitamin D levels. Low serum ferritin levels were observed in all groups of children with a neurodevelopmental disorder. Our study, however, did not find statistically significant differences in the serum ferritin and vitamin D levels among subgroups of children with different sleep disorders.

Sleep abnormalities in De Lange syndrome

R. Villalobos[1], G. Mauricio-Suarez[2], A. Duran-Villalobos[3], S.E. Villalobos[4], S. Najera[4]
[1]University of Texas at Rio Grande Valley, Harlingen, TX, Pediatrics, Harlingen, United States, [2]University of San Luis Potosi, Pediatrics, San Luis Potosi, Mexico, [3]University of Guadalajara, Guadalajara, Mexico, [4]University of Texas Rio Grande Valley, Brownsville Texas, United States

Introduction: De Lange Syndrome or Cornelia de lange is an autosomal dominant disorder (when associated with NIPBL, RAD21, or SMC3 genes) with an incidence of 1:10,000 to 1:50,000 live births, patients affected are known to have a wide variety of sleep disorders, those range from insomnia and abnormal circadian cycle to sleep disordered breathing and hypoventilation. The exact etiology of increased risk of sleep-disordered breathing in patients affected is not fully understood. It is possible that some facial features in these patients expose them to a higher risk (micrognathia, high arched palate, and short neck). We wanted to analyze the sleep related problems in CDLS.
Materials and methods: We included 4 patients with the disorder, age range from 15 months to 18 years old. All patients met criteria for CDLS diagnosis, all had intellectual disability and behavioral associated symptoms. The somnology evaluation included questionnaires of diurnal behavior and sleep focused logs. We performed nocturnal polysomnography in only 3 patients due to inability to tolerate the test in one case.
Results: Sleep clinical information was abnormal in all the cases. Overnight behavioral video evaluation was done. The behavioral abnormalities were evident in all subjects and severe in one. Overnight polysomnography demonstrated a moderate to severe degree of OSA, delayed sleep onset suggestive of insomnia, sleep- wake transition disorder with elevated WASO time, and arousal disorder with elevated spontaneous arousal index. It is of interest the finding of sleep related hypoxemia with limited evidence of obstructive component in one patient.
Conclusions: The abnormalities in sleep are frequent in CDLS are wide and affect the sleep architecture and the sleep ventilation at night. Sleep apnea syndromes are frequent but are not the only major sleep-related abnormalities. When CDLS is caused by mutations in the HDAC8 or SMC1A gene, the condition has an X-linked dominant pattern inheritance. Most cases result from new mutations in the HDAC8 or SMC1A gene and occur in people with no history of the condition in their family, likely our cases are related to this mode of transmission. The sleep disorders in CDLS are frequent with different patters of sleep disruption and potentially independent of the different genes involved.

Sleep and temperament in 12 months old infants

M. Lucchini[1], M. Breda[2], N. Barnett[1], O. Bruni[3]
[1]Nanit Lab, New York, United States, [2]Sapienza University of Rome, Human Neurosciences, Rome, Italy, [3]Sapienza University of Rome, Developmental and Social Psychology, Rome, Italy

Introduction: Sleep in infancy is associated with various aspects of development and physical health. Although general trajectories of infant sleep in the first year of life have been well characterized, not all infants follow the same trajectory. Several factors contribute to different sleep behaviors in infancy, including infant characteristics, parent-infant dynamics, as well as environmental characteristics. Among infant characteristics, temperament has received a lot of attention and previous studies have shown that difficult temperament appears related to more sleep awakenings and sleep problems in general. Nonetheless, results are far from being conclusive due to several limitations of previous studies, including the reliance on parental reports for sleep metrics, small sample sizes and use of heterogeneous questionnaires to evaluate temperament. In this study we propose to address this knowledge gap by investigating the relationship between infant sleep and temperament at 12 months of age, relying on objective sleep metrics.

Methods: Caregivers of 623 infants aged 9-13 mos (M=10.3 mos ± 1.1, 52.0% females) were recruited among users of Nanit baby-monitor in the United States. Caregivers reported on their baby's sleep habits by completing the Brief Infant Sleep Questionnaire (BISQ-R) and on their temperament completing the Infant Behavior Questionnaire (IBQ-R). Objective infant sleep metrics were obtained from the Nanit (1 week of data averaged). Sleep metrics analyzed were: total sleep time, number of night-wakings, sleep efficiency, bedtime, wake up time, time awake at night and parent interventions. Person correlation between each sleep metric and IBQR global score (Orienting/ Effortful control; Surgency/extraversion; Negative Affectivity) and subscales were calculated.

Results: Higer infant negative affectivity was significantly associated with shorter total sleep time (r=-0.25, p<0.01), lower sleep efficiency (r=-0.13, p<0.01), longer time awake at night (r=0.1, p<0.001), later bedtime (r=0.12, p<0.01), more night-wakings (r=0.12, p<0.01) and parental interventions (r=0.17, p<0.01). Although Orienting/ Effortful control and Surgency/Extraversion global scores were not significantly associated with any sleep metric, some of their subscales were. Lower soothability was associated with shorter total sleep time (r=-0.09, p<0.05), poorer sleep efficiency (r=-0.1, p<0.01), and less parental interventions (r--0.08, p<0.05). Higher Perceptual Sensitivity was associated with more night awakenings (r=0.13, p<0.01), and high approachability to later bedtime (r=0.09, p<0.05).

Conclusions: This study adds to the current literature on sleep and development thanks to a large sample size and objective sleep metrics. Our findings support previous research, highlighting that negative affectivity is associated with poor sleep across multiple domains and that, on the other hand, sleep disturbances may predict internalizing problems.

Sleep apnea in the pediatric population of Eastern Colombia

L. Vargas-Ramirez[1], M. Forero[1], L. Rodriguez Corredor[1], F. Valderrama[1], C. Tafur[1], D. Rodríguez[1]
[1]Instituto Neumológico del Oriente, Bucaramanga, Colombia

Introduction: Obstructive sleep apnea (OSA) in children is estimated to affect between 1 to 4% of this population and can occur at any age. The primary predisposing factors include the presence of adenotonsillar hypertrophy, obesity, craniofacial abnormalities, Down syndrome, and neuromuscular disorders.

Materials and Methods: Observational cross-sectional study of a pediatric population referred for baseline polysomnography, whose parents completed standardized symptom questionnaires. Descriptive and stratified bivariate analysis was performed based on anatomical abnormalities, and U-Mann Whitney and Kruskal-Wallis tests were used to assess differences between the groups.

Results: Data was collected from 101 patients referred for a sleep study; 27.7% had some form of anatomical abnormality (most commonly trisomy 21, laryngeal abnormalities, muscular dystrophies, and maxillary deformities). The mean age was 7.8 years (SD 3.8), with an average weight of 34.2 kg, height of 1.43 meters, and BMI of 10.4 kg/m2.

In 81.2% of the patients, parents reported occasional snoring, 38.6% snored more than half of the time, 31.7% snored always, and 56.4% snored loudly.

The average neck circumference was 30.3 cm (SD 4.9), and the mean abdominal circumference was 68.4 cm (SD 17.4).

Severe OSA was found in 23.3%, moderate OSA in 18.2%, and mild OSA in 45.5% of the cases. In the remaining percentage, polysomnography showed a normal Apnea-Hypopnea Index (AHI).

An oxygen desaturation index (ODI) greater than 5/hour was found in 54% of the patients and in 37% of the children with anatomical abnormalities.

There were no differences in neck circumference based on the classification of anatomical abnormalities nor for ODI and AHI.

Conclusions: Most pediatric patients referred for baseline polysomnography presented with snoring, and less than one-third of the population had anatomical abnormalities. In this pediatric population, neck circumference measurements were similar in the evaluated clinical groups. Despite a high clinical suspicion of OSA, the majority of evaluated children are diagnosed with mild OSA or have a normal AHI, reflecting the challenge of clinically predicting the presence of sleep-disordered breathing in the pediatric population.

Sleep disordered breathing in infants 0-2 years of age with Down syndrome: a pilot study in Mexico City

I.E. Renteria-Solis[1], F.J. Rodríguez-Nagore[2], M.D. Castro-Poblette[3], N. Maya-Rincón[2]
[1]Hospital Médica Sur, Pediatric Otolaryngology, Mexico City, Mexico, [2]Hospital Médica Sur, Mexico City, Mexico, [3]Hospital Infantil de México Federico Gómez, Orthodontics, Mexico City, Mexico

Introduction: Sleep disordered breathing (SDB) is a highly prevalent condition in Down Syndrome (DS), estimated between 50-80% among all age groups. SDB has negative impacts on executive functions, cardiovascular and metabolic functions, emotional and economical family burden, and lifelong health and performance in DS population. International recommendations for an initial sleep study vary between 1 to 5 years of age. Our pilot study was done to assess the prevalence and clinical characteristics of sleep disordered breathing in infants with DS from 0 to 24 months of age in Mexico City.

Materials and Methods: A tranversal descriptive study. Patients with Down syndrome from 0 to 24 months of age living in Mexico City were recruited through DS associations and clinics. Patients underwent a clinical consultation with 2 otolaryngologists specialized in Sleep Medicine and a daytime polysomnography (Type I study). Individuals born preterm and those with airway or heart/cardiovascular surgery or procedure were excluded.

Results: 13 individuals completed the evaluation aged 3 to 21 months of chronological age. 8 were male (61.5%). 5 (38.4%) parents and primary caregivers were aware of sleep disorered breathing as a condition to be assessed in Down Syndrome patients. 4 patients (30.7%) had a previous consultation with an otolaryngologist but no indication regarding sleep disordered breathing diagnostic or management was made. 92.3% of infants slept with cervical hyperextension. Snoring was reported in 5 patients (38.4%), witnessed apneas in 8 patients (61.5%), and night awakenings with gasping or choking sound in 9 patients (69.2%). On physical exam, 100% was found to have lip closure incompetence with low tongue position. Nasal obstruction was found in 4 patients (30.7%). Obstructive tonsilar hypertrophy (Brodsky grade 3 and 4) was absent in all individuals. Daytime polysomnography showed a 100% prevalence of severe sleep apnea hypopnea syndrome. Apnea-hipopnea index (AHI) ranging from 10.9 to 58 events/hr.

Conclusions: This was a pilot study that enhances our understanding of clinical presentation of SDB in an age group of DS patients that is not regularly screened or treated. Noticeably, snoring prevalence was lower, and it could prevent some patients from being considered for SDB diagnosis and/or treatment. The fact that every patient exhibited severe AHI levels arises a reflection on whether SDB should be considered and treated much earlier than proposed in international recommendations and consensus. These findings support the need to include SDB education among parents and caregivers of infants with DS, include SDB screening from birth in institutional programs and recommendations, increase awareness in primary care health professionals dealing with DS patients, and an integrative approach from specialized sleep medicine professionals.

Sleep habits and sleep hygiene practices of South African primary school-aged children: an exploratory study

T. Wood[1], N. Rampf[1]
[1]Stellenbosch University, Clinical Anatomy, Cape Town, South Africa

Introduction: Insufficient sleep has adverse effects on the physiological and psychological well-being of children and their families. Reports indicate that children's sleep health is declining; however, comparable data on the South African paediatric population is lacking. To this end, the current study aimed to explore the sleep quality and sleep hygiene practices of South African primary school-aged children.

Materials and Methods: The current study was exploratory in nature and employed convenience sampling. Parents/legal guardians of South African children (6 – 11 years) attending primary school were recruited through social media platforms and asked to complete an online survey. The survey captured basic biographical information and information on the sleep habits (Children's Sleep Health Questionnaire, CSHQ) and sleep hygiene practices (Children's Sleep Hygiene Scale, CSHS) of their child. Survey responses were collected from May – August 2022.

Results: Of the 448 responses, 208 were included in the data analysis. Responses were received from eight South African provinces; the highest response was from the Western Cape (38.5%) followed by Gauteng (30.3%). The mean age of the study population was 8.0 ± 1.7 years (mean ± SD) and 51% were female. Of the children surveyed, 49.5% attended government schools. The mean parental report of sleep duration was 9.31 ± 0.45 hrs. The mean total sleep disturbance score based on the CSHQ was 47 ± 8.4 with 76% of children scoring ³ 41, indicating the presence of a possible sleep disturbance. The mean sleep hygiene index was 28.0 ± 3.4. Linear regression analysis revealed a significant correlation between total sleep disturbance and sleep hygiene scores ($R^2 = 0.32$, $p < 0.001$); low sleep hygiene index scores were associated with a higher total sleep disturbance score. Multiple quantile regression models revealed that home-schooling and increased age were also significantly associated with sleep disturbance scores.

Conclusions: While the reported total sleep time for South African primary school-aged children was within the recommended range (9 – 11 hrs) for this age group, the overall presence of possible sleep disturbances was high, and these disturbances could potentially be attributed to poor sleep hygiene practices.

Acknowledgements: Not applicable

Sleep in children from northeastern Brazil with congenital Zika syndrome: assessment using polysomnography

V. Marquis[1,2,3], A. de Oliveira Melo[1,2], M. Pradella-Hallinan[4], G. Ataide[1], M. Amorim[1,2], D. Miranda-Filho[3], R. Ximenes[3]
[1]Federal University of Campina Grande, Campina Grande, Brazil, [2]Professor Joaquim Amorim Neto Research Institute, Campina Grande, Brazil, [3]Federal University of Pernambuco, Recife, Brazil, [4]Associacao Fundo de Incentivo a Pesquisa, Sao Paulo, Brazil

Introduction: We performed this study to describe the characteristics of sleep in children with congenital Zika syndrome through polysomnographic assessment.

Materials and Methods: Polysomnography with neurological setup and capnography was performed. Respiratory events were scored according to American Academy of Sleep Medicine criteria. Children were classified based on neuroclinical examination as having corticospinal plus neuromuscular abnormalities or exclusively corticospinal abnormalities. Neuroradiological classification was based on imaging exams, with children classed as having supratentorial plus infratentorial abnormalities or exclusively supratentorial abnormalities.

Results: Of 65 children diagnosed with congenital Zika syndrome, sleep apnea was present in 23 children (35.4%), desaturation in 26 (40%), and snoring in 13 (20%). The most prevalent apnea type was central in 15 children (65.2%), followed by obstructive apnea in 5 (21.7%) and mixed type in 3 (13%). The average of the lowest saturation recorded was slightly below normal (89.1 ± 4.9%) and the mean partial pressure of end-tidal carbon dioxide value was normal. Periodic leg movements were present in 48 of 65 children. Lower ferritin levels were observed in 84.6% of children. Palatine and pharyngeal tonsils (adenoids) were small in most children and not associated with the presence of obstructive apnea. Ventriculomegaly and subcortical and nucleus calcification were the most frequent neuroimaging findings. Supratentorial and infratentorial anomalies were present in 26.7% (16 of 60) and exclusively supratentorial changes in 73.3% (44 of 60). In the neuroclinical classification, isolated corticospinal changes were more frequent and the mean peak in capnography was lower in this group. There was no difference regarding the presence of apnea for children in the neuroclinical and neuroradiological classification groups

Conclusions: This report contributes to the limited store of information available to date on sleep characteristics in children with microcephaly associated with congenital Zika syndrome. To our knowledge, this is the first study to use extended neurologically mounted polysomnography with whole-night capnography. Sleep disorders were frequent in children with congenital Zika syndrome, with central sleep apnea being the main finding.

Sleep in infants and toddlers with Down syndrome

A.E.R. Fernandes[1], A.V.M.V. Silva[2], G.A. Maia[2], I.A.d. Castro[2], R.M.M.M. Furlan[3], H. Pretti[2], L.G. Abreu[2], J.M.C. Serra-Negra[2]
[1]Universidade Federal de Minas Gerais, Pediatric, Belo Horizonte, Brazil, [2]Universidade Federal de Minas Gerais, Faculty of Dentistry, Belo Horizonte, Brazil, [3]Universidade Federal de Minas Gerais, Speech Therapy, Belo Horizonte, Brazil

Introduction: Sleep disorders are frequent in children with Down syndrome (DS), especially obstructive sleep apnea (OSA) with significant behavioral and cognitive consequences. Due to the high prevalence of OSA (50–79%), the American Academy of Pediatrics (AAP) recommend asking about its symptoms during and after the first 6 months and refer to a specialist when they occur. The AAP recommend a polysomnography for all children between 3-4 years-old because clinical history and examination are poor at predicting OSA in this population. The symptoms to be investigated include snoring, uncommon sleep positions, frequent night awakening.
The Brief Infant Sleep Questionnaire (BISQ) is a tool for screening sleep disorders in infants and toddlers. It was correlated significantly with actigraphy. It defines poor quality sleep with at least one of the following: > 3 wakings per night, nocturnal wakefulness > 1 hour and total sleep time < 9 hours in 24 hours.
The AAP also recommend a safe sleep environment to reduce the risk of sleep-related deaths in infants aged under 1. It includes sleeping in a supine position, on a firm, non-inclined surface and sharing a room without bed sharing.
This study aims to assess the sleep of children with DS, investigate symptoms of OSA and the sleep environment.
Methods: Cross-sectional study, with parents of children with DS, between 0-36 months, assisted in Dental School of Federal University of Minas Gerais. Age and gender were collected in medical records. Sleep was assessed using BISQ and indicators of poor sleep and information about safe sleep were analyzed.
Symptoms of OSA (snoring, unusual sleeping positions and restless sleep) when occurring over 3 times per week were analyzed. Descriptive analysis was performed using SPSS 21.
Results: parents of 106 children completed the BISQ. The mean age was 9.2 (± 6.8) months and 76.4% were under 1 year-old, 47.9% were male.
5.7% had > 3 wakings (mean 1.4 times - ± 1.2). 11.3% had nocturnal wakefulness > 1 hour (mean 22.8 minutes - ± 39.8). 5.7% had total sleep duration < 9 hours (mean 13.52 hours - ± 2.37). 76.4% of parents do not consider their child's sleep a problem.
Conversely, 33.0% reported that their children had habitual snoring, 49.1% slept in unusual positions (extended neck), and 43.4% restless sleep.
In infants under 1, 50.6% did not follow the recommendation to share a room without bed sharing, 18.5% shared the bed and 29.1% slept in the prone position.
Conclusions: most infants and toddlers with DS did not show poor quality sleep by BISQ. It can be why most parents do not recognize their children's sleep as a problem. But many of them reported symptoms related to OSA and must be investigated according to AAP. Pediatricians should advise about safe sleep environments because most parents did not follow the recommendations. Studies with a control group are needed to analyze the sleep differences in children with Down syndrome. Parents and health professionals should know which symptoms to observe to improve sleep and consequently the development of these children.

Sleep in the Hikikomori syndrome

G. Rapelli[1], A. Musetti[2], C. Franceschini[1]
[1]University of Parma, Department of Medicine and Surgery, Parma, Italy, [2]University of Parma, Department of Humanities, Social Sciences and Cultural Industries, Parma, Italy

Introduction: The world's population in recent years, due to the pandemic, has had to cope with sudden changes in social interactions and lifestyle. Recent studies have found an increase in psychological disorders in the last two years, especially in adolescents. Forced confinement at home and distance learning may have favored the massive use of the Internet, social networks, and recourse to gaming, which increase the condition of self-isolation/social withdrawal recently described in the Japanese phenomenon of the Hikikomori, teenagers who may spend more than 12 hours a day at the computer using games and social networks.

Materials and Methods: The present contribution aims to photograph the phenomenon of Hikikomori in Italian adolescents on a sample of 1348 adolescents, 750 females and 598 males (age: M= 15.59 years; SD: 2.49; range: 11-18). Finally, it is proposed to study the effects on sleep by comparing adolescents presenting a low risk of social withdrawal (n=245; 20%) with those presenting a high risk of social withdrawal (n=215; 17.7%). The following scales were administered: Hikikomory Risk Inventory-24, Pittsburgh Sleep Quality Index (PSQI).

Results: The results show that females have a higher social withdrawal score than males. The gender difference also remains significant for the 4 subscales of social withdrawal (anthropophobia, lethargy, agoraphobia and depression). This is in contrast to the literature, which sees males more at risk. Comparing adolescents with a low risk of social withdrawal with adolescents with a high risk, the latter present a worse quality of sleep, more disturbed sleep, less efficient sleep, more daytime sleepiness, greater latency to falling asleep, and short sleep duration.

Conclusions: Deepening knowledge of the possible behaviors associated with the risk of social withdrawal and isolation could facilitate the design and implementation of psychological interventions aimed at promoting the socio-psychophysical well-being of young people and limiting the social damage caused by this current problem, which has been growing in recent years in Italy as well.

Sleep patterns and epileptiform activity in children with severe cerebral palsy and Congenital Zika syndrome: insights and implications

V. Marquis[1,2], M. Pradella-Hallian[3], A. Melo[1,2], G. Ataíde[1], R. Ximenes[4]
[1]Federal University of Campina Grande, Campina Grande, Brazil, [2]Professor Joaquim Amorim Neto Research Institute, Campina Grande, Brazil, [3]Associacao Fundo de Incentivo a Pesquisa, Sao Paulo, Brazil, [4]Federal University of Pernambuco, Recife, Brazil

Introduction: The study focused on sleep characteristics and epileptiform activity in a group of children with severe cerebral palsy and Congenital Zika Syndrome (CZS).

Materials and Methods: The study involved a group of sixty-five children who tested positive for Zika through reverse transcription-polymerase chain reaction and exhibited neuroimaging findings consistent with Congenital Zika Syndrome. These children were born between 2015 and 2017 and were followed up at the Professor Joaquim Amorim Neto Research Institute (IPESQ) in Campina Grande, PB, Brazil. Overnight polysomnography was conducted in accordance with the AASM guidelines and setup included an electroencephalogram, electrooculogram, electrocardiogram, electromyogram, airflow-pressure transducer, snoring and position sensors, integrated inductance chest/abdomen effort bands, capnography sensor, and pulse oximeter. For analysis, the children were classified in accordance to neuroclinical and radiological changes.

Results: Despite the majority of the children being on anticonvulsant medication, epileptiform activity was prevalent throughout wakefulness, N sleep, and REM sleep. Children presented frequent epileptiform activity (EA) and seizures were observed in 19/65 (29.2%) children during polysomnography. Sleep apnea was linked to the presence of epileptiform activity and the absence of sleep waves. Sleep waves, such as sleep spindle, k-complex, vertex sharp and delta waves were rarely identified in this group of children. Sleep spindle was identified in 14/65 (21,5%) and k-complex in only 6/65 (9,2%) of the children. The impact of anticonvulsants on REM sleep, especially benzodiazepines, was considered, but cases without medication also exhibited sleep disturbances. During wakefulness, continuous trace was observed in 32 out of 65 children (49.2%), and burst-suppression (BS) in 31 out of 65 children (47.7%). Absence of posterior base rhythm (PBR) was noted in 48 out of 65 children (73.4%), and EA was present in 51 out of 65 children (79.6%), all with sharp slow wave activity. In N sleep, most children (41 out of 65, 63.1%) presented BS activity, absence of sleep waves in 51 out of 65 children (78.5%), and EA was present in 64 out of 65 children (98.5%), mostly with sharp slow wave activity (61 out of 65, 95.3%). There was no significant EEG trace modification when compared to wakefulness in 36 out of 65 children (55.4%). In REM sleep, most children had a continuous trace (35 out of 65, 53.8%), presence of rapid eye movement in 45 out of 65 children (69.2%), EA in 61 out of 65 children (93.8%), mostly with sharp and slow wave activity (56 out of 65, 91.8%), and EEG presented modifications when compared to wakefulness and N sleep in 37 out of 65 children (56.9%)

Conclusions: Brainstem lesions were suggested as a potential explanation for these findings, as they are implicated in sleep manifestation. The findings underline the complex sleep patterns and neurological implications in this population, emphasizing the need for further research and interventions to address these challenges.

Sleep problems linked to increased symptoms of depression in children

J. Moo-Estrella[1], G. Arankowsky Sandoval[2]
[1]Universidad Autónoma de Yucatán, Sleep Laboratory, Mérida, Mexico, [2]Universidad Autónoma de Yucatán, Neurobiology Laboratory, Merida, Mexico

Introduction: Complaints of sleep problems in children are very frequent. Likewise, unidentified and untreated sleep problems in children have a negative impact on their physical, mental, and emotional health. The purpose of this study is to identify which sleep problems and sleep habits are associated with depression symptoms in school-aged children.

Method: A convenience sampling included 524 elementary school children, equally distributed by gender (51.1% female, 48.9% male, $Ji2 = 0.275$, $p = 0.60$), with an average age of 10.29 ± 1.34 years. The sample was selected from four elementary schools IN Mérida, Yuc., Mexico. Instruments. Children's Depression Inventory (CDI; $\alpha = 0.82$). This scale consists of 27 items, possible scores range from 0 to 54, with higher scores indicating higher levels of depressive symptoms. The cutoff value (≥ 19) according to the Spanish version (Davanzo et al., 2004), was used to define depressive symptomatology. Sleep Problems Scale for Children ($\alpha = 0.91$). This instrument was previously designed and validated for the study population (Moo-Estrella et al., 2018), based on the indicators of the International Classification of Sleep Disorders. The scale includes six factors: (1) difficulty initiating sleep, (2) nightmares, (3) nocturnal awakenings, (4) daytime sleepiness, (5) difficulty waking up, and (6) sleepwalking.

Results: Odds ratio (OR) analysis indicated that children who reported poor sleep quadrupled their risk of depression symptoms (OR = 4.472, 95% CI = 2.109–9.483). Linear regression analysis indicated that poor sleep quality, short sleep, and the following sleep problems: nocturnal awakenings, nightmares, and difficulty waking up were related to increased symptoms of depression. The set of sleep habits and sleep problems explains 23% of the variance ($R = 0.48$, adjusted $R2 = 0.23$), with an estimation error of 5.98. Sleep problems increased the score from 2.07 to 13.50 points on the CDI scale.

Conclusions: Our results support the hypothesis that depressive symptoms increase in sleep-deprived children, along with the presence of parasomnias such as nightmares, night terrors, and awakenings. The identification of sleep habits and sleep problems associated with depression is of great clinical relevance because both are modifiable variables for primary care and prevention.

Sleep spindles characteristics in children with OSA and their relation to cognition

J. Zeng[1], D. Liu[1]
[1]Shenzhen Hospital, Southern Medical University, Pediatric Otorhinolaryngology, Shenzhen, China

Aim: To investigate the characteristics of sleep spindles and cognitive characteristics in children with OSA, and to explore the potential of sleep spindles as a biomarker of cognitive function in children with OSA.

Methods: In the present study, a total of 54 suspected OSA children (aged from 5 to 14 years) were enrolled. All children received polysomnography overnight. They were divided into four groups based on their polysomnography results: primary snoring group and mild, moderate, and severe OSA. The cognitive function was evaluated by the Das-Naglieri cognitive assessment system. The characteristics of sleep spindles and cognitive function between primary snoring group and OSA groups were compared, and the correlation between sleep spindles and cognitive function were further analyzed.

Results: ① The number and density of sleep spindles in different degrees of OSA groups were generally lower than those in PS group, and the difference between moderate and severe OSA group and PS group was statistically significant. OAHI was negatively correlated with the decrease in the number and density of sleep spindles. ② There was no significant difference in the number and density of sleep spindles between genders within the PS, mild, moderate and severe OSA groups (p > 0.05).③ Compared with the PS group, children with different degrees of OSA had no significant differences in the scores on planning and attention subscales of the Das-Naglieri Cognitive Assessment System, as well as total scores, except for a statistical difference between groups in the planning coding subtest. ④ Correlation analysis showed no correlation between the number and density of sleep spindles and the scores in planning and attention subscales of Das-Naglieri Cognitive Assessment System, as well as total scores.

Conclusions: ① Comparing the number and density of sleep spindles in children with OSA and PS, we found that sleep spindles abnormalities in children were associated with the development of OSA. ② Children with OSA were similar to children with primary snoring in terms of planning, attention and general cognition. ③ The lack of a favorable correlation between the number and density of sleep spindles and cognitive measures does not enable the usage of sleep spindles as a biomarker of cognitive function in children with OSA.

Sleep wake cycle patterns in infancy are associated with nutritional status in adolescence

C. Algarin[1], K. Elgueta[1], C. Martinez[1], S. Reyes[1], E. Blanco[2], S. Gahagan[2], B. Lozoff[3], P. Peirano[1]
[1]University of Chile, Sleep Laboratory, INTA, Santiago, Chile, [2]University of California, San Diego, United States, [3]University of Michigan, Ann Arbor, United States

Introduction: The relationship between the sleep wake cycle (SWC) and nutritional status has been well documented. An inadequate quality or quantity of the SWC promote metabolic alterations which trigger weight gain. Epidemiological studies have reported that sleep deprivation is negatively associated with BMI determining an obesity risk. However, most of the studies performed at pediatric age are based only on the sleep amount and/or are transversal studies that could not establish causality.
Therefore, in this study we will identify the SWC patterns at infancy and the nutritional status in adolescence.

Materials and Methods: Participants belonging to a longitudinal historic cohort who had SWC pattern data in infancy (questionnaires) and anthropometric measures and body composition obtained by mean of Dual-energy X-ray absorptiometry (DEXA) in adolescence were included in the study. The SWC variables were divided into diurnal and nocturnal period and defined as: sleep total amount (STA), wake total amount (WTA), number of sleep episodes (NSE), number of wake episodes (NWE), mean duration of wake episode (MDWE) and the hours of sleep onset (SO) and wake up time (WUT). The nutritional measures in adolescence were expressed by BMI (kg/m2), waist circumference, and body mass composition. For the statistical analysis a GLM was used to establish the association between sleep patterns and nutritional status in adolescence.

Results: A total of 193 participants had data at both ages, with 100 being boys. The mean age at infancy was 178,4±13,9 days The results of diurnal SWC patterns were: WUT (hs) 7:32 ±1:12 , STA(hs):3:36 ±1:54, WTA(hs): 10:54 ±2:28 and NSE:2,5 ±0,9. Nocturnal patterns presented: SO:22:18±1:30, STA: 8:51±1:42, WTA:1:11±1:02 and NEW :1,4 ±0,7. Adolescent mean age was 16,8 ± 0,3, nutritional variables were: BMI: 23,5 ± 4,7, WC: 80,8 ±11,7 cm , FMI:6,88 ± 3.94, FFMI: 15.67 ± 2.21. In the GLM significant differences were found only in girls. Related to anthropometric measures there were positive association between waist circumference and BMI with WTA ∈(ß=0.54, p=0.04) and (ß=0.59, p=0.03) respectively∍. Regarding the body composition measures FMI in adolescence was positive associated with nocturnal WTA (ß =0.55, p=0.04).

Conclusions: The results support the hypothesis that the course of SWC development in infancy, especially the consolidation of the sleep nocturnal period could become a risk factor for weight gain and obesity in adolescence. The mechanisms underlying this condition could involve metabolic, hormonal and neurophysiological changes. Longitudinal studies with objective measures at several ages, since infancy until adolescence, are necessary to establish the timing and different factors which could promote these changes, especially in girls. Finally, education about sleep habits in infancy is a priority task for public health.

Telehealth sleep intervention for young children with autism: recent findings from a randomized clinical trial

C. Johnson[1], L. Barto[2], M. Alder[3], R. Rothstein[2], S. Worley[4]
[1]Case Western Reserve University / Cleveland Clinic, Center for Autism, Cleveland, United States, [2]Cleveland Clinic, Center for Autism, Cleveland, United States, [3]Emory University, Atlanta, United States, [4]Cleveland Clinic, Cleveland, United States

Introduction: Poorly regulated sleep patterns (trouble falling asleep, mid-sleep awakening and early morning awakening) affect as many as 80% of children with ASD regardless of cognitive functioning level. Sleep disturbances in children with ASD can amplify already delayed social interactions, repetitive behaviors, inattention/hyperactivity, and irritability. Given the documented detrimental effects of poor sleep on cognition, attention, memory consolidation, and daytime behavioral adjustment, addressing sleep disturbances in young children with ASD may promote overall improvement. In a previous trial delivered in a clinic setting, we demonstrated the promise of a parent mediated intervention compared to an active control. This larger trial further tests the efficacy of the intervention, but adapted for telehealth delivery for broader reach.

Objective: To describe 1) the adaptation of a parent mediated intervention specifically for sleep disturbances to be telehealth delivered, 2) the active control group which included one session on addressing sleep disturbances, and 3) treatment fidelity and outcome data from the just completed randomized control trial.

Materials and methods: Children with ASD between the ages of 2-7 years enrolled in the study from October 2017 to August 2022. Children were included if a clinical diagnosis was corroborated on the Modified Checklist in Toddlers-Revised or the Social Communication Questionnaire, a severity score of ≥ 5 on the Composite Sleep Index (CSI), and a Clinical Global Impression Severity of Moderate or greater. Children were excluded if there was a known or suspected medically-based diagnoses underlying the sleep disturbance (e.g., sleep apnea). Participants were randomized 1:1 to either the sleep parent training program (SPT) or the parent education program (SPE) which include one session on addressing sleep problems mirroring what often happens in typical clinical care. Each arm involved five, individually delivered sessions via telehealth. Study groups were compared on the Clinical Global Impression – Improvement scale (CGI-I) completed by a masked independent evaluator. Participants rated as "much improved" or "very much improved" were "treatment responders." Other child outcomes included the modified Simonds and Parraga Sleep Questionnaire and the Aberrant Behavior Checklist. Parent measures of stress were also collected.

Results: Sixty-seven children were randomly allocated to the SPT group (N=32) or SPE group (N=35). Treatment fidelity for both groups was 98% while parent adherence was also very high (99% for SPT; 97% for SPE). On the CGI-I, 63% (20/32) of the participants in SPT were rated as positive responders compared to 31% (11/35) in the SPE control group (absolute difference 31%, 95% confidence interval 8.3%-54%, Chi-square test $p = 0.011$). Additional outcome data for both child and parents will also be presented.

Conclusions: This manualized parent mediated program to address sleep disturbances was successfully delivered via telehealth. Efficacy data suggested SPT was superior in comparison to SPE in improvement of sleep related problems. Telehealth delivery was found to be acceptable and feasible.

The longitudinal associations between sleep and registry-based school grades among Norwegian adolescents

I.W. Saxvig[1], L.N. Evanger[2], S. Pallesen[1,3], M. Hysing[3], B. Sivertsen[4], B. Bjorvatn[1,2]
[1]Haukeland University Hospital, Norwegian Competence Center for Sleep Disorders, Bergen, Norway,
[2]University of Bergen, Department of Global Public Health and Primary Care, Bergen, Norway,
[3]University of Bergen, Department of Psychosocial Science, Bergen, Norway, [4]Norwegian Institute of Public Health, Department of Health Promotion, Bergen, Norway

Introduction: Few studies have explored the longitudinal relationship between sleep and school performance, and most have relied on self-reported school grades. The present study aimed to investigate the longitudinal associations between sleep and registry-based school grades among Norwegian adolescents across two counties (Hordaland and Rogaland).

Materials and Methods: The sample comprised 1183 high school students aged 16-17 years at baseline (mean age = 16.4 years; 65.3% females) who completed a survey assessing sleep duration and insomnia symptoms in the spring of 2019 and 2021, respectively. School day sleep duration was assessed based on the Munich Chronotype Questionnaire. Insomnia symptoms were assessed using the Bergen Insomnia Scale (ranging from 0-42, with higher score indicating more severe insomnia symptoms). Students' grade point averages (GPA; ranging from 0 – 60, of which higher score reflects higher GPA) were collected through the respective counties' school authorities. Data were analyzed using paired samples t-tests and linear regression analyses.

Results: Average school day sleep duration remained stable from 2019 to 2021 (6:53±76 vs. 6:55±71; p = .419), whereas the severity of insomnia symptoms increased (11.9±7.6 vs. 12.8±8.1; p < .001). Among students with GPA eligible for statistical analyses (N = 1097), longer school day sleep duration in 2019 was associated with higher GPA two years later when controlling for GPA at baseline (B = .009; p < .001). Similarly, more severe insomnia symptoms in 2019 was associated with lower GPA in 2021 when controlling for GPA at baseline (B = -.050; p = .035). The longitudinal associations remained significant when controlling for sex and parental educational levels.

Conclusions: Shorter school day sleep duration and more severe insomnia symptoms predicted lower registry-based grade point averages among Norwegian high school students within a two-year timeframe.

Therapeutic effects of intranasal steroids and antileukotrienes in children with remnant obstructive sleep apnea syndrome after adenotonsillectomy: a randomized controlled study

J. Bae[1]
[1]Ewha Womans University, College of Medicine, Otorhinolaryngology, Seoul, Korea, Republic of

Introduction: Pediatric obstructive sleep apnea syndrome (OSAS) is a prevalent condition characterized by recurrent episodes of upper airway obstruction during sleep. Adenotonsillectomy is the primary treatment for OSAS in children, but residual symptoms may persist after surgery. Intranasal steroids (INS) and antileukotrienes are potential therapeutic options for managing remnant OSAS symptoms; however, their comparative effectiveness remains unclear. This randomized controlled study aimed to compare the therapeutic effects of INS and antileukotrienes in children with remnant OSAS after adenotonsillectomy.

Materials and Methods: Eleven children with significant remnant symptoms of OSAS, as indicated by the OSA-18 survey, were enrolled in the study. After adenotonsillectomy, post-operative portable polysomnography was performed. The participants were randomly assigned to receive either INS or antileukotrienes for a 12-week period. The post-treatment outcomes were measured using portable polysomnography and the OSA-18 survey to evaluate changes in sleep quality and quality of life. Paired Student's t-tests were utilized for intergroup comparisons.

Results: The mean age of the participants was 7.1 years (range: 4.4-11.4). The mean pre-treatment respiratory disturbance index (RDI) was 8.4, which decreased to a mean post-treatment RDI of 4.5. Although the INS group showed more significant improvements in polysomnography and OSA-18 survey results compared to the antileukotriene group, no statistically significant difference was found between the two groups (p > 0.23).

Conclusions: Adenotonsillectomy is an established surgical procedure for the management of pediatric OSAS. However, a subset of patients may experience residual symptoms. In such cases, medications like INS and antileukotrienes can be considered as initial treatment options. INS effectively reduce nasal inflammation and related symptoms, while antileukotrienes offer potential benefits in reducing inflammation and cough. Although numerous studies have demonstrated the efficacy of INS, there is limited research on the effects of antileukotrienes, and no studies have directly compared the therapeutic effects of these two drug classes. Therefore, this study aims to provide treatment options for persistent symptoms after adenotonsillectomy. In this study, both INS and antileukotriene groups showed improvements in respiratory disturbance index and quality of life over several months. However, no statistically significant difference was found between the two groups. The findings of this study contribute to the understanding of pharmacological treatment options for managing remnant symptoms after adenotonsillectomy and can assist clinicians in making informed decisions regarding the most effective treatment approach for this patient population. Further research is warranted to validate these findings and explore additional treatment modalities.

To breathe, or not to breathe through the mouth: analysing mouth breathing in a pediatric sleep study

L. Biedebach[1], D. Gozal[2], E.S. Arnardóttir[1,3], S. Sigurðardóttir[3], A.S. Islind[1]
[1]Reykjavik University, Department of Computer Science, Reykjavik, Iceland, [2]Marshall University, Joan C. Edwards School of Medicine, Huntington, United States, [3]Reykjavik University, Department of Engineering, Reykjavik, Iceland

Introduction: Even though mouth breathing during sleep has a high clinical relevance for children, there is little research about when and how it occurs. This research aims to provide insights on the duration and frequency of mouth breathing, the prevalence of mouth breathing in different sleep stages as well as the relationship between mouth breathing, respiratory events and arousals. Furthermore, we compare these findings about pediatric mouth breathing with an adult cohort to show the unique features of pediatric sleep.

Materials and Methods: Based on a pediatric sleep study with 20 one-night recordings of children between the age of 10 and 13 years, we analysed both the oral and nasal flow signal from an oronasal cannula with separate pressure sensors. The children had an AHI ranging between 0.1 and 3.1 with a median of 0.7. The mouth breathing of adults was recorded with a Rothenberg mask which captures the airflow of mouth and nose also in separate pressure sensors. The AHI of the adults ranged between 2.5 and 60.4 with a median of 19.2. All recordings were manually scored according to the guidelines provided by the American Academy of Sleep Medicine. A mouth breathing event was defined as a visual increase in amplitude greater than baseline.

Results: The average duration of mouth breathing ranged between 5 and 180 seconds with a median of nine seconds. Analysing mouth breathing by sleep stage showed that mouth breathing primarily took place in REM (48.9%) and N3 (39.0%). Considering the distribution of sleep stages, this shows a high prevalence of mouth breathing in REM sleep, as mouth breathing accounts for 2.8% of REM sleep and only for 0.8% of N3 sleep. Arousals, apneas and hypopneas appeared often before or after mouth breathing. Furthermore, the total duration of mouth breathing per night was positively correlated with the total number of arousals. In the adult cohort, most of the mouth breathing (45.3%) occurred in N2. The relative percentage of mouth breathing in each sleep stage shows little difference across all sleep stages. There is a positive correlation between the amount of mouth breathing and respiratory events, but not between mouth breathing and arousals in the adult cohort.

Conclusions: Mouth breathing primarily occurs in REM sleep in children. A relationship between mouth breathing, arousals and respiratory events exists. Comparing the findings of the pediatric and the adult cohort indicates a uniqueness of mouth breathing in children.

Treatment of obstructive sleep apnea in children and adolescents with Down syndrome: systematic review and meta-analysis

C.M. Fontes Ferreira[1], C. Pena Galvão dos Anjos[1], L. Paiva Franco[2], M. Maciel Tinano[3], F. Barbosa Nunes[1], L. Lima Torres[4], A.A. Guerra Júnior[4], L. Peres Gargano[4], R. Becker Guimarães[5], M. Fontes Pereira[6], J.V. Lima Bueno[2], H.M. Gonçalves Becker[2]
[1]UFMG, Saúde da Criança e do Adolescente, Belo Horizonte, Brazil, [2]UFMG, Otorrinolaringologia, Belo Horizonte, Brazil, [3]Ciências Médicas, Odontologia, Belo Horizonte, Brazil, [4]UFMG, Farmácia, Belo Horizonte, Brazil, [5]FASEH, Vespasiano, Brazil, [6]UFOP, Ouro Preto, Brazil

Introduction: Obstructive Sleep Apnea Syndrome (OSAS) is a frequent comorbidity in children with Down Syndrome (DS), with a prevalence ranging from 50-70%, versus 2-6% in typical children. OSAS can lead to behavioral, cardiovascular, endocrine-metabolic and cognitive consequences in a population that already has important neurocognitive challenges, in addition to several medical comorbidities. The impact of OSAS can be even greater if it starts at a crucial stage for neuropsychomotor development and persists severely throughout life. However, there is scarce research, guidelines and services specialized in diagnosis and management, with the necessary particularities to address the complexity of OSAS and its multiple risk factors in DS. The specificities of this population must be considered for the treatment of OSAS.

Materials and Methods: A literature search was conducted using the MEDLINE databases via PubMed, EMBASE, CINAHL, Cochrane Library, LILACS and Web of Science, until June 2022. The search strategy combined the population (children with DS) and the interventions (CPAP or BiPAP, adenotonsillectomy or maxillary disjunction). Observational studies, randomized and non-randomized clinical trials that reported outcomes such as AHI, AOHI, mean oxygen saturation, minimum oxygen saturation (SpO2Nadir), adherence, tolerance and safety data were included. The methodological quality and risk of bias of the included studies were evaluated using ROB 2.0, ROBINS-I. It was possible to perform a meta-analysis combining results from six studies, extracting the averages, with the respective standard direction and Confidence Interval (CI) of 95% to quantitatively assess the association between polysomnographic indices before and after adenotonsillectomy. The research protocol was registered in Prospero.

Results: 23 studies were selected, among 796 publications: 11 addressed the safety and 13 the efficacy of adenotonsillectomy (of these, six were meta-analyzed) and three, the effectiveness of CPAP. No study of maxillary disjunction was included. Overall, CPAP reduced obstructive events during sleep, and patients showed good adherence and tolerance. Days of CPAP use were higher in children with DS, but with greater mask leakage and higher residual AHI. Regarding adenotonsillectomy, children with DS had longer hospital stays and the complications were up to five times more frequent, 15-20% had worsening of AHI and 28-88% persisted with OSAS after surgery. The risk of bias of most studies was considered high due to low methodological quality. The meta-analysis showed that, after adenotonsillectomy, there was a significant improvement in AHI, AOH, SpO2Nadir, saturation time <90% and arousal índex.

Conclusions: In children and adolescents with DS, there is a significant improvement in obstructive events during sleep after adenotonsillectomy, although residual OSAS is frequent, making it imperative to repeat PSG after surgery. Complications are more frequent in children with DS, although it is usually transitory. Clinical benefits have been seen with the use of CPAP, but with even more limited evidence. The findings about OSAS treatments in children with DS must be extrapolated with caution. Future studies should address the effectiveness of treatments needed after adenotonsillectomy.

Utilizing epworth sleepiness scale and sleep questionnaires to understand sleep in pediatric residents

J.H. Valencia Rico[1], P. Chapman[1], H. Pallera[1], T. Vazifedan[2], M.J. Strunc[3], C. Sendon[4]
[1]Eastern Virginia Medical School / Children's Hospital of the King's Daughters, Pediatrics, Norfolk, United States, [2]Eastern Virginia Medical School, Research Division - Biostatician, Norfolk, United States, [3]Eastern Virginia Medical School / Children's Hospital of the King's Daughters, Neurology and Sleep Medicine, Norfolk, United States, [4]Eastern Virginia Medical School / Children's Hospital of the King's Daughters, Pulmonary and Sleep Medicine, Norfolk, United States

Introduction: Adequate sleep plays a key role in decision-making and overall well-being. However, pediatric residents often experience inadequate sleep, with their average nightly sleep duration falling below the recommended seven to nine hours. To address this issue and prioritize the health and performance of pediatric residents, it is essential to implement interventions that foster healthy sleep habits. Sleep Questionnaires and tools such as the Epworth Sleepiness Scale can provide valuable insights enabling the development of targeted strategies to promote healthy sleep practices. We aim to enhance the well-being and cognitive functioning of pediatric residents, ultimately improving their overall performance and quality of life.

Materials and Methods: A total of 74 residents were initially included in this study. A self-administered questionnaire was designed to collect data on various aspects of sleep patterns, medication use, and lifestyle habits. The questionnaire included validated scales such as the Epworth Sleepiness Scale to assess daytime sleepiness. The survey was sent electronically, ensuring anonymity and confidentiality. Descriptive statistics were used to analyze the collected data, calculating the percentage of residents falling into different categories for variables such as bedtime preferences, sleep duration, medication use, caffeine consumption, habits, and daytime sleepiness.

Results: A total of 62 residents (84%) completed the survey and were included in the results. A female predominance of 74% was observed. The majority of residents exhibited late bedtimes, with 48% going to bed between 2100-2200 and 41% going to bed after 2200. Sleep duration was reported by 70% of participants, with six to seven hours of sleep. Most participants (76%) did not take sleep medication, while a significant portion (33%) reported the use of antidepressants. Daily caffeine consumption was common among the participants, with approximately 72% reporting regular intake. In contrast, only 35% of the participants engaged in regular exercise. A notable finding was that two residents had pre-existing Obstructive Sleep Apnea, and one resident had pre-existing Narcolepsy. Additionally, 35% of participants reported experiencing significant daytime sleepiness, as indicated by a score of 10 or higher on the Epworth Sleepiness Scale.

Conclusions: The findings underscore the importance of the complex relationships between sleep patterns, medication use, and daily habits among residents. Addressing sleep-related issues and promoting healthier sleep habits should be a priority for residency programs when arranging schedules. The implementation of sleep questionnaires is crucial in promptly detecting any issues or underlying medical conditions that residents may face. This proactive approach offers an opportune possibility for timely intervention and treatment. Since our results indicate that approximately one out of three residents had a score of 10 or greater on the Epworth Sleepiness Scale, highlighting significant daytime sleepiness, it is imperative for residency programs to provide further assistance to these individuals. By integrating sleep assessments into regular evaluations and offering appropriate support, residency programs can effectively support the sleep health of residents and contribute to their overall quality of life.

Vocal cord dysfunction and sleep disorders: bridging the knowledge gap – 5 year insight from a single center tertiary hospital

J.H. Valencia Rico[1], H. Pallera[1], T. Vazifedan[2], P. Chapman[1], J.F. Chocano[3], C. Sendon[3]
[1]Eastern Virginia Medical School / Children's Hospital of the King's Daughters, Pediatrics, Norfolk, United States, [2]Eastern Virginia Medical School, Research Division - Biostatician, Norfolk, United States, [3]Eastern Virginia Medical School / Children's Hospital of the King's Daughters, Pulmonary and Sleep Medicine, Norfolk, United States

Introduction: Sleep disorders in Vocal Cord Dysfunction (VCD) are rarely mentioned in the literature, particularly in pediatric cases. VCD involves the vocal cords paradoxically closing during breathing, often mistaken for refractory asthma. Symptoms include dyspnea, throat tightness, stridor, dysphonia, and asthma-like symptoms such as cough, chest pain, or wheezing. Triggers for VCD include exercise, emotions, reflux, cigarette smoke, cold air, strong odors, and respiratory infections. While laryngoscopic demonstration is the standard diagnostic method, historical factors and pulmonary function findings can also provide useful clues. Our aim is to bridge the knowledge gap regarding the association between VCD and sleep disorders, which is currently insufficiently understood.

Materials and methods: Retrospective chart review conducted on patients diagnosed with VCD in a Children´s Hospital in the U.S from September 1, 2017 – September 1, 2022. Inclusion criteria included pediatric patients with VCD up to 21 years old. Exclusion criteria included patients with chest deformities, vocal cord paralysis, history of intubation or discrepancies in diagnosis between ENT, Allergy or Pulmonology regarding diagnosis. Univariate associations between sleep disorder and age, weight, gender, and asthma were assessed using chi-square or Fisher's exact test. Multivariate correlation was analyzed using logistic regression. Odds Ratio (OR) adjusted OR (aOR), and 95% CI were computed. SPSS.28 was used for statistical analysis. Significance was set at $p < 0.05$.

Results: Out of the initial 473 patients, only 96 met the inclusion and exclusion criteria after rigorous population selection. Among these patients, 47% exhibited a sleep concern. The most common sleep concerns were snoring (33%), excessive daytime sleepiness (EDS) (29%), insomnia (20%), and other complaints (10%). Among the patients with sleep concerns, 44% underwent a polysomnogram (PSG). PSG results revealed that 35% had Obstructive Sleep Apnea (OSA), 20% had periodic limb movement disorder (PLMD), and 10% had type 1 narcolepsy. Interestingly, no significant associations were observed between baseline demographics such as asthma (OR 2, 95% CI 0.79-5.10, p=0.14) or obesity (OR 1.6, 95% CI 0.68-3.8, p=0.28) and sleep disorders

Conclusions: Our study brings attention to the underappreciated association between sleep disorders and VCD. This suggests that sleep disorders in this condition may not be solely attributed to comorbidities like asthma or obesity. With nearly 1 in 2 pediatric patients with VCD expressing sleep concerns, this emphasizes the importance of considering sleep disorders as part of the initial assessment. By understanding and addressing these sleep concerns, clinicians can improve the overall care and quality of life for individuals with VCD. Further research is needed to explore the underlying mechanisms and potential mechanisms, patophysiology and interventions for sleep disorders in this population.

Pharmacology

Addiction potential of zolpidem: evidence from preclinical studies

J. Rowlett[1], L. Berro[1]
[1]University of Mississippi Medical Center, Psychiatry and Human Behavior, Jackson, United States

Introduction: Zolpidem (Stilnox®, Patz®, Ambien®) is a commonly prescribed drug for the treatment of insomnia, and its use has increased worldwide since the COVID-19 pandemic in 2020. Zolpidem binds to the benzodiazepine site of the $GABA_A$ receptor and, like conventional benzodiazepines, is a positive allosteric modulator, although it has highest binding affinity at the a1 subunit-containing $GABA_A$ receptor. Here, we review and compile data from our research program on the addiction-related effects of zolpidem in rats, non-human primates, and human subjects. The overall goal was to establish the abuse liability of zolpidem in comparison with conventional benzodiazepines (e.g., alprazolam, clonazepam).

Materials and Methods: Data from studies with three standard preclinical models of addiction potential were collated, including drug discrimination (a model of the subjective effects of drugs, used to distinguish a drug effect "cue" from a placebo condition), i.v. self-administration (a procedure used to assess the positive reinforcing effects of drugs), and physical dependence after acute and chronic treatment. Species used included Sprague-Dawley rats, squirrel monkeys (*Saimiri sciureus*), rhesus macaque (*Macaca mulatta*), and human subjects. The primary outcome of interest was identified across procedures as "benzodiazepine-like" effects (drug discrimination= criterion-level of drug-paired lever responding; self-administration= maximal performance measures comparable to the standard benzodiazepine, midazolam; physical dependence= somatic signs or operant-behavior changes aligned with benzodiazepine-associated precipitated withdrawal).

Results: In drug discrimination models of the subjective effects of drugs, zolpidem could be trained as a discriminative stimulus in squirrel monkeys and human subjects. Zolpidem showed partial overlap as a discriminative stimulus with conventional benzodiazepines, but not other $GABA_A$ modulators (e.g., barbiturates) or non-GABAergic ligands, in both species. When evaluated under other training drug stimuli (e.g., the conventional benzodiazepine triazolam), zolpidem in almost all instances fully substituted for the training drug, with some exceptions (barbiturate discriminative stimulus in rats, but not monkeys or humans). In self-administration procedures in rhesus monkeys, zolpidem had more robust effects than conventional benzodiazepines. In physical dependence procedures, zolpidem engendered acute dependence-like effects in squirrel monkeys, and showed cross-dependence in rhesus monkeys treated chronically with the benzodiazepine alprazolam.

Conclusions: In general, zolpidem showed an overall profile across species and procedures consistent with $GABA_A$ receptor positive allosteric modulation (i.e. benzodiazepine-like effect). There were, however, differences from conventional benzodiazepines, primarily in the overall profile of discriminable subjective effects, as well as the finding that zolpidem showed higher reinforcing strength compared to other benzodiazepines. Based on the in vitro profile of zolpidem, the differences vs. benzodiazepines may be attributable to the selective affinity of this drug for the a1 subunit-containing $GABA_A$ receptor subtype. Irrespective of these differences, the preponderance of our preclinical data supports the conclusion that zolpidem has addiction liability consistent with benzodiazepine-type drugs, including development of physical dependence. These observations support the continued coverage of this drug by governmental regulatory agencies concerned with addiction, and emphasize the need for more controlled prescription practices when it comes to insomnia management using zolpidem.

Assessing genetic variation for effects of lithium on circadian clock period, sleep behaviour, and mortality in fruit flies

N. Fryou[1], M. Li[1], B. Possidente[2]
[1]Skidmore College, Saratoga Springs, United States, [2]Skidmore College, Department of Biology, Saratoga Springs, United States

Introduction: Lithium is the treatment of choice for bipolar disorder, but the mechanism for its therapeutic effect remains unknown, and it has a low threshold for toxic side-effects. Bipolar disorder is cyclical disorder with periodic onsets of illness including depressive and manic episode that vary in cycle length among patients. One of lithium's well-documented effects- a lengthened circadian clock period- is intriguing since a circadian system abnormality is a potential explanation for the cyclical nature of bipolar disorder. Fruit flies are an efficient model organism for genetic analysis of circadian clock mechanisms, but few *Drosophila* studies have documented circadian effects of lithium, and none have examined genetic variation.

Materials and Methods: We used a random sample of inbred strains from the *Drosophila* Genetic Resource Panel and three wild-type strains for the response of circadian clock period to 20mM LiCl, and its toxicity. Adults were assayed for circadian locomotor activity in constant dark using *Drosophila* Activity Monitors. Circadian clock period was estimated using chi-squared periodogram.

Results: Among 13 inbred strains examined there is no significant effect of lithium or genetic variation for effects of lithium on circadian period, and only one inbred strain significantly lengthened circadian clock period in response to lithium. There was a significant sex difference in the response to lithium for circadian period, with an increase in females and a slight decrease in males. There are significant strain differences in mortality in response to lithium. All three wild-type strains significantly increased circadian period in response to lithium and varied in sensitivity to its toxicity.

Conclusions: Results to date suggest that the set of approximately 200 DGRP strains will be useful for investigating genetic variation for lithium toxicity and sex-differences for effects of lithium on circadian clock period. Circadian period in wild-type strains is more responsive to the period-lengthening effects of lithium, suggesting that genetic heterozygosity may play a role in the effects of lithium on circadian clock period. Further studies investigating circadian clock period in additional inbred strains and their F1 hybrids will be useful for understanding the mechanisms mediating effects of lithium on circadian clock function in fruit flies.

Association between chronic use of benzodiazepines and the severity of Obstructive Sleep Apnea syndrome and changes in sleep parameters

L. Bastos Ferreira[1], R. Becker Guimarães[1], A. Rodrigues de Almeida Paiva[2], C. Gomes Francisco[3], H.M. Gonçalves Becker[4], C.M. Fontes Ferreira Nader[5], J. Becker Guimarães[6]
[1]Faculdade da Saúde e a Ecologia Humana, Belo Horizonte, Brazil, [2]Hospital Felicio Rocho, Belo Horizonte, Brazil, [3]Ciência Médicas de Minas Gerais, Belo Horizonte, Brazil, [4]Nucleo de Otorrinolaringologia de Belo Horizonte, Belo Horizonte, Brazil, [5]Universidade Federal de Minas Gerais, Belo Horizonte, Brazil, [6]University of Central Lancashire, Preston, United Kingdom

Introduction: Obstructive Sleep Apnea Syndrome (OSAS) is characterized by partial or complete obstruction of the upper airway, intermittently and recurrently. It results from collapses of the pharyngeal region, providing a substantial reduction in airflow, determining apnea or hypopnea. It is associated with several symptoms and comorbidities, such as excessive daytime sleepiness, cognitive impairment, depression, obesity, reduced quality of life, increased risk of occupational and traffic accidents, and risk of cardiovascular disease, among others. Affected patients complain of poor sleep quality, making them candidates for the use of hypnotic drugs, benzodiazepines. These drugs typically have ansiolitic and hypnotic effect but also behave as anticonvulsivants and muscle relaxants. Therefore, in patients presenting OSAS, the negative effect of benzodiazepines in the ventilatory control during sleep has been questioned. The goals of the present study is to associate the chronic use of benzodiazepines with the severity of OSAS and changes in sleep parameters in adult patients diagnosed by Polysomnography.
Materials and Methods: This is a cross-sectional study, consisting of 525 patients over the age of 18 of a private clinic in Belo Horizonte, Brazil, between April and July of 2022. The patients underwent Polysomnography aiming the assessment of the presence and degree of apnea/hypopnea and responded to a questionnaire beforehand considering comorbities and chronic use of medications. Were excluded from this study in use of any other medications that affect the central nervous system, insufficient data of the Polyssomnography, patients diagnosed with any other sleep syndrome, neuromuscular syndromes, neurologic syndromes that have impact on the OSAS, cranial malformation or any genetic syndrome that has impact on respiratory sleep syndromes. The data obtained by both the test and questionare revealed a number of 33 chronic users of benzodiazepines. The association between these patients, the severity of the Obstructive Sleep Apnea Syndrome and the changes in sleep parameters was calculated using the Chi-Square test.
Results: Chronic benzodiazepine use and the diagnose of OSAS was not associated (p = 0.078). As for the polysomnographic variables analyzed, there is a statistical association between the use of the medication and changes in sleep patterns, such as increase of REM latency (p=0,000) and N2 stage(p=0,003) and decrease of N1 (p=0,022), and REM (p=0,001) stages.
Conclusions: Benzodiazepine chronic use demonstrated no difference in the severity of OSAS but presented changes in the parameters of sleep.

Impact of melatonin-rich milk on subjective sleep duration in adults. First results from an interrupted time series analysis

F.J. Rodriguez-Córtez[1], J.M. Jiménez-Pastor[1], L. López-Coleto[1], J. Gálan-Sánchez[1], P.J. López-Soto[1], M. Meira e Cruz[2,3]
[1]IMIBIC, Universidad de Cordoba, Department of Nursing, Cordoba, Spain, [2]Cardiovascular Center, University of Lisbon, Lisbon School of Medicine, Sleep Unit, Lisbon, Portugal, [3]European Sleep Center, Lisbon, Portugal

Introduction: It has been found early on that the sleep-inducing properties of milk would be related to both its psychological associations and its richness in sleep related compounds, with one of those compounds being the essential amino acid tryptophan, which can be converted into serotonin and melatonin. Melatonin and calcium-supplemented milk at night was shown to improve sleep quality in animal models. The main objective of this work was to investigate the effect of melatonin-enriched milk intake in subjectively assessed sleep duration of human adults.

Materials and Methods: A Randomized, double-blind, crossover trial design was implemented to compare the effects of melatonin-enriched milk with a placebo (same type of milk). Adults, from both genders, aged between 35 and 65 years old, followed a nine-week protocol: four weeks within the experimental condition, one-week washout period, and four weeks with a placebo. Those taking medication that interfered with the sleep/wakefulness pattern, pregnant women, shift workers, or those experiencing jet lag, those intolerant to lactose or any milk ingredient, and those with pathologies that generate an alteration in the sleep pattern (respiratory, digestive...) were excluded. Objective and subjective total sleep time (TST) during weekdays and weekends was assessed using actimetry (altigraph) and a sleep diary, respectively. An interrupted time series analysis was used to compare the two phases and to predict whether there is any variation in the temporal trend.

Results: Diary records were obtained from a total of 25 participants (17 started on melatonin-enriched milk and 8 on placebo). The mean TST recorded during the wash phase is lower, but not significant, than the mean TST recorded during the enriched milk phase (7.53 hours versus 7.15 hours; p=0.41) and placebo milk phase (7.51 hours versus 7.15 hours; p=0.43). There was no significant difference between the intervention and placebo phase. From the 17 participants who started taking melatonin-enriched milk in the first phase, a change in the time trend was observed in 8 (47.05%). From the participants who witnessed significant temporal changes, 75% did so by decreasing the TST during the placebo milk phase. From 8 participants who started the study consuming the placebo milk, a change in trend was observed in 5 of them (62.5%). In this case, three of the five participants (60%) who witnessed significant temporal changes, did so by decreasing the TST during the intake of enriched milk. Considering the two weekdays and weekend days with the highest sleep efficiency for each patient in the two phases, differences between the median TST during weekdays and during weekends/free days were significant only for the melatonin phase (30 min; p=0,049).

Conclusions: A clinical and statistically significant improvement on subjectively assessed sleep duration was mostly perceived by patients starting with melatonin-rich milk compared to those starting with placebo, therefore suggesting an effective, delayed effect of melatonin-supplemented milk on total sleep time. Further, positive differences in TST between weekdays and weekends makes plausible a positive homeostatic role of melatonin. Such findings should be confirmed in the future and may have important therapeutical applicability.

Influence of light and dark cycle on recovery from ketamine and xylazine anesthesia in mice

A. Rodrigues-Santos[1], A. Rodrigo Calarga[1], E. Cristina Marqueze[1], G. Jussilane Alves[1]
[1]Butantan Institute, São Paulo, Brazil

Introduction: In recent years has been an increasing interest in understanding the role of biological rhythms on pathological and therapeutic processes. The circadian variation in the organs' activity can impact the pharmacological and or toxicological drug parameters because of your intimate relationship with the physiological processes. This study sought to assess whether the light and dark cycle impact recovery time from ketamine and xylazine anesthesia.

Materials and Methods: In this pre-clinical trial, the studied sample consisted of ten C57BL/6 mice, five males, and five females, anesthetized with ketamine 100 mg/kg and xylazine 10mg/kg intraperitoneally at times ZT2 (light) and ZT12 (dark). After a week of washout, was applied the crossover method to toggle the groups depending on the light and dark phases. During anesthesia, the mice were placed in dorsal decubitus to evaluate their recovery of postural straightening to the ventral decubitus. Then, the time blocking of mice's skeletal muscle was estimated through the time elapsed between remaining in dorsal decubitus until return to ventral decubitus. The paired t-test verified the study hypothesis through a bivariate analysis of independent groups with a P value of <0.05 to indicate statistical significance. The unpaired t-test was applied to compare the difference between genders. An analyze two-tailed post hoc with different means for independent groups and a 0.05 significance level measured the statistical power.

Results: The mice anesthetized in the dark recovered postural straightening significantly faster than those anesthetized in the light (p<0.001). This effect is independent of the sex of the animal (p= 0.36). Therefore, both male mice (p<0.05) and female mice (p<0.01) returned to ventral decubitus significantly faster in the dark than in the light phase. During the dark phase, the mice took, on average, 2h21 to return to the ventral decubitus, while during the light phase, they took 3h24. The data proved mighty because, in the statistical analysis, the power was 99% (1-Beta= 0.9928) and the effect size (effect size)= 2.8551, for an alpha= 0.05.

Conclusions: The light and dark cycle impacted the recovery time from ketamine and xylazine anesthesia in mice. During the sleep phase of the animals (light), the drugs kept the mice for a longer time under neuromuscular blockade, suggesting that during the sleep phase, the anesthetics have a potentiated effect on the neuromuscular system when compared with anesthesia in the waking period (dark). The findings emphasize the need to investigate the effects of anesthetics in different periods of the light and dark cycle to improve the safety and efficacy of anesthetic drugs.

ORX750, an oral selective Orexin Receptor 2 agonist, promotes wakefulness and reduces cataplexy in the orexin/ataxin-3 mouse

S.W. Black[1], T. Steinfeld[1], K. Gibson[1], G.R. Ott[1], E. Ratti[2], D. Grainger[3], M.A. Accardi[2], D.S. Hartman[1]
[1]Centessa Pharmaceuticals, Inc., Boston, United States, [2]Centessa Pharmaceuticals (Orexia) Limited, Altrincham, United Kingdom, [3]Centessa Pharmaceuticals (UK) Limited, Altrincham, United Kingdom

Introduction: Narcolepsy Type 1 (NT1) is a rare neurological disease caused by the profound loss of orexin-producing neurons. Orexin (also called hypocretin) is a neurotransmitter that regulates wakefulness, arousal, and energy homeostasis via activation of Orexin Receptor-1 (OX1R) and -2 (OX2R). Orexin agonists are designed to directly address the underlying disease pathology of NT1 to restore orexin neurotransmission in the brain. The orexin/ataxin-3 (Atax) mouse model of NT1 recapitulates key features of the human disorder, such as orexin loss, inability to sustain wakefulness, and cataplexy (emotionally triggered, transient loss of muscle tone). Here we present ORX750, a novel, orally available, brain penetrant, OX2R selective agonist. ORX750 was developed using structure-based drug design with an OX2R stabilized receptor (StaR®) protein and high-resolution protein crystallography.

Materials and Methods: *In vitro* calcium mobilization (FLIPR), β-arrestin recruitment, and inositol-phosphate accumulation assays were performed in Chinese hamster ovary (CHO) cells stably expressing human recombinant OX1R or OX2R. Electrophysiological recordings were performed on slices of the ventral tuberomammillary nucleus (TMN) from mouse hypothalamus; effects on membrane potential were measured in the presence of 1 micromolar tetrodotoxin to block neuron firing. *In vivo* efficacy for enhancing wakefulness was evaluated in wild type (WT) and Atax mice during their rest phase using PiezoSleep, a rapid, non-invasive method for classifying sleep and wakefulness by unsupervised machine learning on physiologically relevant readouts, including body movement and breath rate. Electroencephalogram (EEG), electromyogram (EMG), and video recordings were used in Atax mice during their active phase to evaluate effects at 0.3-10 mg/kg on arousal states and cataplexy.

Results: ORX750 behaved as a potent full agonist at human OX2R (EC50=0.11 nM) relative to the native ligand orexin A (OXA; EC50=0.035 nM) and showed 9,800-fold selectivity over human OX1R (EC50=1100 nM) in the FLIPR assay. Biased agonism was not detected by measurement of b-arrestin recruitment at OX2R in comparison to OXA. ORX750 depolarized membrane potential (EC50=5.0 nM, max DmV=9.5) in whole cell current-clamp recordings in the TMN. In the PiezoSleep assay, in which wakefulness readouts are highly correlated with EEG/EMG-defined wakefulness, ORX750 increased time awake and the consolidation of wakefulness vs. vehicle in a dose-related manner when administered to WT and Atax mice during the rest phase. Increased sensitivity to these wake-promoting effects was observed in Atax vs. WT mice. In Atax mice, ORX750 increased time awake; consolidated wakefulness; increased EEG gamma power during wakefulness; reduced cataplexy occurrences; and increased latencies to sleep and cataplexy in a dose-related manner during the active phase using the EEG/EMG/video assay. At the lowest dose tested (0.3 mg/kg) and compared to vehicle, the latency to sleep was 2.3 h vs. 0.69 h and the latency to cataplexy was 2.7 h vs. 1.3 h.

Conclusions: ORX750 is an oral, highly potent, and selective OX2R agonist with the potential to treat patients with primary symptoms of NT1, as well as reduce excessive sleepiness in those presenting sleep/wake disorders with normal orexin levels.

The effects of opioid use on sleep microstructure in subjects with sleep-wake disorders

S. Daccò[1,2,3], M. Grassi[1,2,3], D. Caldirola[1,3], A. Defillo[2], Z. Wolfy[2], A. Alciati[4,3], G. Perna[1,2,3], T. Young[2]
[1]Humanitas University, Biomedical Sciences, Pieve Emanuele, Milan, Italy, [2]Medibio Limited, Research and Development, Savage, United States, [3]Villa San Benedetto Menni Hospital, Hermanas Hospitalarias, Clinical Neurosciences, Albese con Cassano, Como, Italy, [4]Humanitas Clinical and Research Center, IRCCS, Rozzano, Milan, Italy

Introduction: Opioid use induces detrimental effects on subjective and objective sleep quality and sleep architecture, persisting also after the discontinuation. Polysomnography (PSG) studies in acute opioid administration showed a dose-related decrease in total sleep and sleep efficiency. Acute administration of heroin in non-addicted subjects has been shown to suppress rapid eye movement (REM) sleep and slow-wave sleep (SWS) while increasing both lighter non-REM sleep and transitions to wakefulness and drowsiness. Similar results have been found using an infusion of remifentanil and long and short-acting morphine and methadone.

To date, studies have investigated sleep macrostructure changes associated with the use of opioids, but none have investigated sleep microstructure modifications.

This preliminary study aimed to detect polysomnographic differences in sleep-related electroencephalography (EEG) bands in patients with sleep-wake disorders and opioid use compared to those without opioid intake.

Materials and methods: This study is based on sub-analyses of data collected in an ongoing cross-sectional, multicenter study aiming to develop a machine learning-based device to screen for a current major depressive episode using sociodemographic, clinical, and physiological data collected during PSG, in adults (22 to 75 years old) referring to sleep clinics (SCs) for sleep disturbances. For this study, we used EEG signals recorded during PSG and processed by an automatic sleep-staging software to extract sleep-related EEG bands throughout sleep stages. Sociodemographic, clinical, and opioid intake information was extracted from medical records.

To compare opioid use and non-opioid use groups, we apply for continuous variables Mann-Whitney U test and categorical variables Fisher Exact test.

Results: Data of 477 patients from a set of 10 different sleep clinics in the US were analyzed.

19 patients (4%) reported opioid use, of which 12 (63%) patients had daily use and 4 (21%) *pro re nata* use for pain relief, and 3 (15%) patients were taking opioid detoxification treatment.

Patients with opioid use reported a symmetric decrease in the absolute power of alpha bands in the central montages from lights-off to the first N2 epoch (right, U p-value: 0.03; left, U p-value: 0.024), an increase in beta 1 band activity in the left occipital montage from lights-off to the first N2 epoch (U p-value: 0.04); a decrease in the absolute power of theta bands in the central montages in the first two minutes after lights-off (right, U p-value: 0.02; left, U p-value: 0.009), in the first period after lights-off until the first N1 epoch (right, U p-value: 0.02; left, U p-value: 0.009), and in N3 (U p-value: 0.034); a decrease in absolute and relative power theta/beta 1 bands ratio in N3 (absolute power, U p-value: 0.05; relative power, U p-value: 0.044).

Conclusions: These findings showed for the first time multiple opioid-related alterations in sleep microstructure indicating a general reducing effect on slow brain activity during sleep, which may explain insomnia and sleep impairment repeatedly found in opioid users. Confirmatory studies in larger samples are warranted.

Psychiatric Disorders Affecting Sleep/Wake

Auditory closed-loop modulation of slow wave sleep to treat major depressive disorder

K.D. Fehér[1,2], P. Henckaerts[1], X. Omlin[2,3], L. Tarokh[3,4], C.L. Schneider[3], Y. Morishima[3], M.A. Züst[5], M. Wunderlin[5], T. Koenig[3], E. Hertenstein[2,3], E. Trinca[3], B. Ellenberger[6], S. Ruch[7], F. Schmidig[8], C. Mikutta[9,3], W. Senn[6], S. Klöppel[5], C. Nissen[2,1]
[1]University of Geneva, Centre for Neuroscience and Mental Health Research, Faculty of Medicine, Geneva, Switzerland, [2]Geneva University Hospitals, Division of Psychiatric Specialties, Geneva, Switzerland, [3]University Hospital of Psychiatry and Psychotherapy, University of Bern, Bern, Switzerland, [4]University Hospital of Child and Adolescent Psychiatry and Psychotherapy, University of Bern, Bern, Switzerland, [5]University Hospital of Old Age Psychiatry and Psychotherapy, University of Bern, Bern, Switzerland, [6]University of Bern, Institute of Physiology, Bern, Switzerland, [7]University Hospital and University of Tübingen, Institute for Neuromodulation and Neurotechnology, Department of Neurosurgery and Neurotechnology, Tübingen, Germany, [8]University of Bern, Cognitive Neuroscience of Memory and Consciousness, Institute of Psychology, Bern, Switzerland, [9]Privatklinik Meiringen, Meiringen, Switzerland

Introduction: The strong and rapid antidepressant effect of sleep suppression on individuals with major depressive disorder (MDD) has been known since the 1960s, although its benefits are limited by frequent relapse after subsequent nighttime sleep. More recently, selective suppression of slow wave sleep (SWS) has been proposed as an effective, more sustainable and significantly less burdensome alternative to therapeutic sleep deprivation. The aim of the present project is to develop a fully automatized selective suppression protocol of SWS based on closed-loop auditory stimulation, and assess its effect on sleep physiology, synaptic plasticity and excitability and depressive symptomatology.

Materials and Methods: A new automatized SWS suppression approach was first developed and evaluated in a healthy, young population (N = 15). Participants underwent a repeated measures design consisting of three sleep laboratory nights; one adaptation night and two experimental nights (auditory stimulation and sham in counterbalanced order). Stimulation was applied upon detection of SWS until it was no longer detected. The SWS detection protocol relied on a topographical template of slow waves. Stimulation consisted of discrete bursts of pink noise with a randomized duration (50-500 ms) and inter-onset interval (1-4 s). A random walk (+-2.5 dB, Ornstein-Uhlenbeck process) was superimposed on the linear increase of volume (40-106 dB in 60 s) to add unpredictability in volume.

Results: The stimulation protocol led to a significant reduction of SWS (-30%; $p < 0.01$), with an associated increase in sleep stage N2 (+12%; $p < 0.001$), and a decrease in REM sleep (-12%; $p = 0.03$) as compared to sham. No other significant changes in sleep continuity or architecture were observed. Slow wave activity averaged across the night and cumulative slow wave energy at the end of the night were both significantly reduced by about 23 % across channels and individuals ($p < 0.05$), without changes in other frequency bands, and with changes specific to SWS.

Conclusions: We demonstrate that a fully automatized approach can suppress SWS. The protocol is currently being assessed in MDD patients (N=30; outpatient setting) and healthy controls (N=30) to investigate potential functional consequences on synaptic plasticity and depressive symptomatology. Further developments bear the potential for translation to broader and even ambulatory use of automated SWS detection and modulation, and could open up possibilities for a new kind of fast-acting sleep-based treatment for individuals suffering from MDD, leading to a substantial improvement in their quality of life.

Auditory vocal hallucination group treatment of patients with schizophrenia experiencing severe sleep problems and obesity

P. Hjorth[1], H. Juul[1]
[1]University of Southern Denmark, Vejle, Denmark

Introduction: Studies have shown that up to 40 percent of patients with a diagnosis of schizophrenia receiving outpatient treatment experience auditory hallucinations. Hearing voices may be associated with discomfort and suffering, and the voices can encourage self-destructive actions such as self-harm or suicide.
Research has shown that Cognitive Behavioral Treatment, in addition to medical treatment of auditory hallucinations works better than other psychological methods.
We wished to measure index values and changes in voice scores and sleep in patients with auditory hallucinations.
Materials and Methods: Groups of 8 patients each started voice-hearing group treatment led and performed by a psychiatric nurse with extensive experience in voice-hearing therapy. We collected data on age, gender, diagnosis, antipsychotic medicine in daily defined doses (DDD), waist circumferences, body mass index (BMI) and Global Assessment of Functioning (GAF).
We rated the patients' voices using the Auditory Vocal Hallucination Rating Scale (AVHRS). Quality of sleep is important for patient's overall health and well-being and were measured with the Danish version of the Pittsburgh Sleep Quality Index.
The group treatments were performed once every 14 days for 1.5 hours and were based on the patient's actual needs and wishes in order to learn how to cope with trauma, neglect, and emotions connected with their voice hearing experiences. They were working with the literal content and perceived meaning of "voices heard". The identity (age, name, and personality) and characteristics (form, content) of voices heard, their history of origin, and the context in which they are heard. An important theme of the group meetings was that the patients should share their experience of hearing voices with others. Furthermore, participants should obtain better acceptance and knowledge of hearing voices and achieve better cooperation with their voices.
Results: Twenty-one patients completed the study. At index the participating patients scored 48.2 (standard deviation [SD] 7.3) on the AVHRS scale. They scored a mean of 43 (SD 6.3) on the GAF and had 16.4 (SD 9.5) years of hearing voices. Patients received a high quantity of antipsychotic medication (DDD 1.6 [SD 1.4]) and, overall, had very bad sleep quality (10.1 [SD 3.5]). In general, women had problems with obesity (BMI 34.8 kg/m2 [SD 8.3 kg/m2]).
There was a reduction of 2.3 in scores ($P = 0.03$) for voices in the participating women after 1 year of intervention.
The participating women had an average of 15 sessions lasting 1.5 hours, and they almost all expressed that they liked the voice-hearing group sessions and that the group therapy helped them with their auditory hallucinations in a satisfactory way.
Conclusions: We conducted a 1-year intervention with 21 patients. A result from our study was that the participating women were generally exposed to a coincidence of high degree of voice hearing, very poor sleep and high doses of antipsychotic medication. An indication for treatment with antipsychotics was to reduce auditory hallucinations and the women receive high doses and several different antipsychotic drugs, nevertheless the participating women persistently experience massive problems with voice hearing.

Circadian and sleep alterations in patients with schizophrenia

L.H. Yuasa[1], J.G.F. Borgio[1]
[1]UFPR, Psychiatry, Curitiba, Brazil

Introduction: Schizophrenia is an extremely complex mental disorder and has a wide variety of symptoms. Among its symptoms, sleep disorders are common and occur in 30 to 80% of patients with schizophrenia, affecting the remission or relapse of the disease. Among patients with schizophrenia, there is a greater propensity for the evening chronotype, which can have serious health consequences and lead to sleep loss and desynchronization of rhythms. Patients with schizophrenia also have lower levels of motor activity in the daytime when compared to healthy controls, which is related to medication side effects, increased age and severity of symptoms. Therefore, there is a great interest in evaluating sleep patterns and motor activity in schizophrenia, as markers of treatment and disease evolution, since a better understanding of these aspects in the disease can contribute to diagnosis - both by biological and clinical
parameters -, in addition to enabling a more effective treatment and providing a better quality of life for the patient and his family. The objective of this study was to evaluate sleep quality and circadian rhythm alterations in patients with schizophrenia.

Methods: In this analytical cross-sectional study, 42 patients diagnosed with schizophrenia, regularly followed at the Psychiatric Outpatient Clinic of the Federal University of Paraná Hospital de Clínicas, were interviewed. Data was obtained using 6 questionnaires (PSQI, BRIAN, ESS, mMCTQ, IPAQ and PANSS), to evaluate sleep quality, biological rhythms, daytime sleepiness, physical activity and positive and negative symptoms.

Results: The sample consisted of 33 males (78.6%) and nine females (21.4%). The mean age was 39.98 years and the mean BMI of the sample was 27.57 kg/m2. All patients were in regular use of antipsychotics. It was demonstrated a negative correlation between sleep quality and changes in biological rhythms (r= 0.37 p=0.02); a negative correlation between sleep quality and symptom severity (r=0.41 p=0.01); a negative correlation between evening hours and the level of physical activity (r= -0.33 p=0.03); and a positive correlation between changes in biological rhythms and severity of symptoms (r=0.38 p=0.02).

Discussion: This study showed that patients with worse sleep quality had a higher amount of changes in biological rhythms and more severe symptoms. Eveningness was associated with lower levels of physical activity, indicating that patients with late chronotype tend to perform less physical activity compared to intermediate and early chronotypes. Thus, it is important that the factors that affect sleep be addressed for better monitoring of the disease and that mental health professionals be aware of these disorders and can treat them appropriately when necessary, given their impact on symptoms and on biological rhythms. Finally, we also note the importance of assessing the level of physical activity and sedentary lifestyle in schizophrenia - especially in patients with evening chronotype -, indicating interventions to improve this aspect of lifestyle, such as non-pharmacological measures that can bring significant benefits to these patients.

Depression, anxiety and stress association with sleep quality among people living with HIV/AIDS in Iran

S. Akbarpour[1], M. Shafaati[2], S. Mohammad nejad[3]
[1]Occupational Sleep Research Center, Baharloo Hospital, Tehran University of Medical Sciences, Tehran, Iran, Islamic Republic of, [2]Research Center for Antibiotic Stewardship and Antimicrobial Resistance, Imam Khomeini Hospital, Tehran University of Medical Science, Tehran, Iran, Islamic Republic of, [3]Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran, Islamic Republic of

Background: Depression, anxiety and stress and also sleep quality are considered separate disorders in people living with HIV (PLWH). Focusing on modifiable causes of psychological discomforts, specifically depression, may reduce suffering and improve HIV-related outcomes through primary or secondary prevention. The present national study is the first to examine the association between psychological discomfort and sleep quality as common problems in people with HIV in Iran.
Method: A national cross-sectional study was conducted using data from 1185 confirmed PLWH from 15 provinces in Iran from April to August 2019. Psychological discomfort and sleep quality were assessed using Pittsburgh Sleep Quality Index (PSQI) and DASS-21 as standardized versions of related Persian questionnaires. Logistic regression was used to assess the association between psychological discomfort and sleep quality in PLWH.
Results: The overall prevalence of poor sleep quality, depression, anxiety, and stress were 47.71%, 50.95%, 44.26%, and 41.77%, respectively. The weighted mean of depression, anxiety, and stress scores was higher in those with poor sleep quality than in those with good sleep quality (P<0.0001). depression, by adjusting for anxiety and stress (OR =5.40, 95% CI: 1.38- 2.88), anxiety, by adjusting for depression and stress (OR =6.54, 95% CI: 1.38- 2.88), and stress, by adjusting for depression and anxiety (OR =5.15, 95% CI: 1.38- 2.88) increased the risk of poor sleep quality.
Conclusion: A high prevalence of Depression, anxiety and stress was observed in PLWH that were strongly associated with sleep quality. PLWH needed more attention and social support in order to reduce sleep and psychological issues.

Evaluating machine learning algorithms for prediction of response to ramelteon for sleep disturbances in patients with schizophrenia

A. Mishra[1], R. Maiti[1], B.R. Mishra[2], M. Jena[1]
[1]All India Institute of Medical Sciences, Pharmacology, Bhubaneswar, India, [2]All India Institute of Medical Sciences, Psychiatry, Bhubaneswar, India

Introduction: Sleep and circadian rhythm disturbances are frequent in patients with schizophrenia in addition to the cardinal features, which are used to diagnose the disease and ascertain its severity. Antipsychotic therapy helps alleviate the positive and negative symptoms, but they are not effective in improving sleep disturbances. Melatonin is a robust biological marker of circadian rhythmicity. Augmentation therapy with melatonin receptor agonist ramelteon was found to improve sleep and circadian rhythm in schizophrenia. This analysis was planned to create and compare machine learning algorithms for the prediction of response to sleep disturbances in patients with schizophrenia who were randomized to ramelteon therapy.

Materials and methods: Post hoc analysis was done on a randomized controlled trial (NCT03075657) studying the effect of add-on ramelteon on sleep and circadian rhythm disturbances in 120 patients with schizophrenia. We created models using random forest, k-nearest neighbors, extreme gradient boosting machine, R part Classification and regression trees, and logistic regression algorithms. R language with *mlbench, caret, MASS, rPART* packages were used. Box plots and dot plots were plotted to visualize comparisons among the models. Finally, four dot plots and ROC curves were plotted to determine accuracy to assess predictions made on the test dataset.

Results: Though none of the models was significantly different from one other, the logistic regression algorithm was found to be the best-fit model with a specificity of 0.93 and sensitivity of 0.45, and ROC of 0.78. Predominant symptom domain (positive or negative), urinary melatonin, and global PSQI score at baseline were the most important variables when plotted in terms of mean decrease accuracy. These variables contributed significantly to the final model in the logistic regression algorithm, and the accuracy of this algorithm was found to be 90% for prediction.

Conclusions: Machine learning models are an emerging trend in clinical research and should be translated into clinical practice. The logistic regression model predicted responders with 90% accuracy.

Frequent nightmares, nightmare distress and depressive symptoms in adolescents, an integrative Review

G. Nobre Nogueira[1], A. Rêgo Barbosa[2]
[1]Federal University of Ceará, Medicine University, Fortaleza, Brazil, [2]Federal University of São Paulo, Neurology, São Paulo, Brazil

Introduction: Frequent nightmares are associated with depressive symptoms in adolescents. Little is known about the association between frequent nightmares and depressive symptoms. Previous studies have examined the mediating role of nightmare stress in the relationship between frequent nightmares and depressive symptoms in the general adolescent population. The frequency of nightmare and its related stress have been associated with psychotic experiences in young adults. Here we discuss about the association between frequent nightmares, nightmare distress, and depressive symptoms based on current literature.

Materials and Methods: We reviewed articles published from 2020 to 2023, using the DeCS/MeSH descriptors "Frequent nightmares," "Nightmare distress," and "Depressive symptoms" crossing with the Boolean operator "AND", at ScienceDirect platform. Seven articles were found and examined.

Results: Studies report a substantial correlation between frequent nightmares and nightmare distress with depressive symptoms. The relationship between frequent nightmares and depressive symptoms was fully mediated by nightmare distress. In particular, threat-based disorders may be lessened by treating nightmares, which also suggests a causal relation. In order to lower the risk of insomnia, depression, anxiety, and cognitive deficiencies in adolescents, it is important to maintain both their physical and mental development. Comprehensive analyses of nightmares and sleep disturbances in young people could aid in the early identification of those who are at risk and assist in focusing preventive interventions.

Conclusions: Depressive symptoms were linked to both frequent nightmares and nightmare discomfort; however, nightmare distress moderated the link between frequent nightmares and depressed symptoms. Reduction of depression symptoms require interventions to nightmare distress. Evaluating and treating the anguish due to recurrent nightmares may have significant therapeutic ramifications for lowering adolescent depression risk. New research data is fundamental to better understand and to lessen even more this harmful problem.

Acknowledgements: I would like to thank Adriel, M.D, for his contribution in reviewing the manuscript.

High trait anxiety is associated with worse sleep depth and more wake intrusions in the Wisconsin Sleep Cohort

M.K.P. Gratton[1,2], M. Younes[3], B. Gerardy[4], N.A. Hamilton[2], P.E. Peppard[5], L.A. Ravelo[5], A.T. Rasmuson[5], J.H. Barnet[5], E.W. Hagen[5], D.R. Mazzotti[1]
[1]University of Kansas Medical Center, Internal Medicine, Kansas City, United States, [2]University of Kansas, Social and Behavioral Sciences, Lawrence, United States, [3]Sleep Disorders Centre, Winnipeg, Canada, [4]YRT Ltd, Winnipeg, Canada, [5]University of Wisconsin-Madison, Madison, United States

Introduction: Trait anxiety is defined as a persistent proclivity towards experiencing negative affective states such as worry and fear. Individuals with elevated anxiety are predisposed to increased incidence of sleep disturbances. However, it is unclear whether trait anxiety is linked to insomnia symptoms through a biomarker or cognitive biases that lead trait anxious people to overestimate their symptoms. Widely used conventional metrics may not be sufficiently sensitive to capture the nuanced cognitive differences associated with sleep changes in people experiencing chronic anxiety. Our study employs the Odds Ratio Product (ORP), an objective metric of sleep depth, to characterize sleep in individuals with trait anxiety. We hypothesized that those with higher trait anxiety will have less deep and more fragmented sleep than healthier individuals.

Methods: We utilized high-quality ORP data from a cross-sectional sample (n = 1,122) of the Wisconsin Sleep Cohort (WSC). The WSC data was obtained via the National Sleep Research Resource. The ORP is a measure of sleep depth based on spectral analysis of the EEG. The ORP ranges from 0 (deep sleep) to 2.5 (full wakefulness). Mean ORP values based on sleep stage (NREM, REM, wake, full recording) and the wake intrusion index (WII), representing the number of times the ORP spiked above 2.0 per hour of sleep, were calculated. Trait anxiety was assessed using the Spielberger State-Trait Anxiety Inventory. We conducted linear regression adjusted for age, sex, apnea-hypopnea index, and Epworth Sleepiness Scale scores, to determine the association of anxiety with mean ORP values and WII.

Results: Adjusted linear regressions revealed significant associations between trait anxiety and several ORP markers, such as mean REM ORP (β [95%CI] = 0.06, [0.01, 0.10], p=0.016, mean NREM ORP (0.06 [0.03, 0.09], p<0.001), and mean full recording's ORP (0.07 [0.03, 0.11], p=0.002). However, there was no association between trait anxiety and mean ORP during epochs scored as awake (-0.02 [-0.05, 0.01], p=0.232). Adjusted linear regression examining trait anxiety and the WII showed a robust significant association (5.14 [0.03, 0.11], p=0.002), such that each unit increase in trait anxiety was associated with an increase of more than 5 wake intrusions per hour of sleep.

Conclusions: Our study demonstrates a significant relationship between trait anxiety and objective sleep characteristics with greater trait anxiety associated with less deep sleep during REM, NREM, and across the full recording. Individuals with higher trait anxiety had more wake intrusions during sleep. This research identifies an objective biomarker of poor sleep that is associated with trait anxiety and contributes to our understanding of the impact of anxiety on sleep patterns. Additionally, these findings underscore the potential utility of the ORP as an objective measure to evaluate the complex interactions between sleep depth, sleep fragmentation, and psychological factors such as trait anxiety.

Insomnia and circadian rhythms in patients who attempted suicide: potential correlations with inflammatory markers and suicidal lethality

L. Palagini[1], V. Caruso[1], G. Alfi[2], M. Miniati[1], A. Gemignani[2]
[1]University of Pisa, Department of Experimental and Clinic Medicine, Section of Psychiatry, University of Pisa, Pisa, Italy, [2]University of Pisa, Department of Surgical, Medical, Molecular, and Critical Area Pathology, University of Pisa, Pisa, Italy

Introduction: Suicide is a globally widespread problem. Among the possible proximal risk factors, the role of sleep disorders is emerging. In particular, insomnia and circadian rhythm disturbances can contribute to the dysregulation of different neurobiological systems involved in suicidal risk including inflammatory system. Accordingly, the aim of this study was to evaluate the relationships between insomnia, circadian rhythm disturbances over the 15 days preceding the suicide attempt in a retrospective was and then correlate these variables with psychopathology, inflammatory markers and suicidal lethality.

Materials and methods: Consecutive patients who were hospitalized at the University Hospital of Ferrara, Italy, following an attempted suicide from March 2022 to December 2022 were assessed at the emergency department. Accordingly, inflammatory parameters WBC (White Blood Cells), cut off > 10.000, NLR (neutrophil-lymphocyte ratio) cut off >3,07, PLR (platelet-lymphocyte ratio) cut off >144, and SII (systemic inflammation index/neutrophil-to-platelet ratio on lymphocytes) cut off >603, were considered markers of neuroinflammation. Psychiatric diagnosis (DSM-5, SCID-5), lethality of the suicide attempt (Intent Score Scale –ISS high letality $\geq$10), depressive and manic symptoms (Beck Depression Inventory-BDI-II,Mood Disorders Questionnaires MDQ), circadian rhythms disturbances (Biological Rhythms Interview of Assessment in Neuropsychiatry_BRIAN tot>44), Insomnia symptoms (Insomnia Severity Index-ISI tot >15) and Socio-demographic , clinical and pharmacological data were collected.

Results: The final sample included 52 suicide attempters mean age 52.8+17.8 years, N°34(65.3%) were females, N°28 previously attempted suicide (53.8%), n°33 (63.3%)unemployed, n° (82%) were affected by mood disorders, 47% presented depressive symptoms, 38.8% manic/hypomanic symptoms, N°38 (73.0%) committed a medium/high lethality attempt. WBC was elevated in 33%, NLR in 56.6%, SII in 46.6%. PLR in 46.6%. The 75.5% (N°39) presented a circadian dysregulation and the 78.9% (N°41) insomnia symptoms during the previous 15 days. Studies of the correlations showed that higher lethality was related to depressive symptom (Coeff: 0.33, p=0.03) insomnia symptoms (ISI coeff. 0.30 and p=0.005), circadian alterations (BRIAN coeff. 0.32 and p=0.004) NLR (coeff.0.46 and p=0.005), SII (coeff.0.35, p=0.45). BDI-II, ISI and BRIAN were mutually correlated (p<0.05), BDI-II was correlated with high levels of WBC (coeff.0.44 and p=0.003). ISI and BRIAN correlated with NLR respectively p=0.043 and p=0.004. Results of the linear regression analyzes showed that the high lethality of the gesture was best predicted by disturbances of circadian rhythms (OR=11.55, P=0.032), by insomnia symptoms (OR=7.88, p=0.008) and by NLR indices OR 6.9 p= 0.004, other factors also had high ORs without reaching significance.From the mediation analyzes it emerges that symptoms of insomnia and alterations of the circadian rhythms were related to the lethality directly or indirectly with indices of NLR playing a mediating effect (Z=2.2, p=0.002), (Z=2.1, p=0.04).

Conclusions: This pilot project may show that sleep disturbances may constitute a risk factor for suicidal lethality, as well as some indicators of inflammation. Because sleep plays a key role in regulating inflammatory indices, it is possible that sleep disorders contribute to neuroinflammation and dysregulation of neuroendocrine systems that promote suicidal risk. Evaluating and treating sleep disturbances in psychopathology could have a preventive value.

Kleine-Levin syndrome and bipolar affective disorder: a case report

L.F. Baioni Aylon[1], F.G. Stelzer[1], R. Hoffmann[1], T.L.G. Tavares[1], H.H. Sander[1], S.H.A. Santos[1], M.P. Milhomem[1], A.L. Eckeli[1]
[1]University of São Paulo, Faculty of Medicine of Ribeirão Preto, Neuroscience and Behavioral Science, Division of Neurology, Ribeirão Preto, Brazil

Introduction: Kleine-Levin Syndrome (KLS) is a rare disorder, characterized by recurring episodes of hypersomnia, and cognitive, behavioral, and psychiatric symptoms, interspersed with asymptomatic periods. Due to its fluctuating evolution and psychiatric manifestations, KLS imposes itself as an important diagnostic challenge, frequently misdiagnosed as a psychiatric disorder, including Bipolar Affective Disorder (BAD). Furthermore, KLS can be comorbid with psychiatric disorders, whose manifestations can begin even in asymptomatic periods.

Materials and Methods: We report a case of a 26-year-old white male with previous diagnosis of KLS, who, during a period of remission of the disease, developed symptoms of mania and psychosis, fulfilling DSM-V-TR criteria for BAD.

Results: The patient was previously referred to HCFMRP-USP Sleep Clinic in 2016 due to recurrent hypersomnia episodes The first episode of hypersomnia occurred in 2016, at 16 years of age, associated with hyperphagia. Since then, the patient has had two more episodes of hypersomnolence, associated with cognitive and behavioral changes (hyperphagia and mental confusion), interspersed with asymptomatic intervals of about three years. The last hypersomnia period occurred in 2022. During symptomatic periods, patient was treated with clarithromycin and methylphenidate. Sleepiness improved gradually, and the clarithromycin was maintained for 60 days.

Since 2018, the patient exhibited anxious symptoms and initiated escitalopram 10 mg, leading to increased behavioral disinhibition for a short period, followed by spontaneous remission. In 2018, a mild depressive episode, without sleep complaints, remitted after eight weeks without specific treatment. After a short period of time, there was a recrudescence of the anxious symptoms, that showed some improvement with escitalopram 20 mg and later with sertraline, 100 mg qd. In January 2023 the patient discontinued sertraline without medical advice. In July, the patient exhibited a reversed sleep-wake cycle and manic-like symptoms, including increased energy, decreased need for sleep, expansive mood, grandiose affect, increased psychomotor activity, and psychotic symptoms. After psychiatry evaluation, lithium (300 to 600 mg qd) and olanzapine (2.5 to 5 mg qd) were gradually started. First-episode psychotic laboratory exams were also collected to rule out other medical issues. There was a partial remission of psychotic symptoms after a few days. In follow up outpatient evaluations, the patient showed better mood regulation, partial decrease of psychomotor agitation, and increased total sleep, without daytime somnolence.

Conclusions: Psychiatric disorders should be included in the differential diagnosis of KLS. Also, sleep specialists must always consider the possibility of comorbidity between KLS and psychiatric disorders. In cases of association between KLS and BAD, lithium may be useful, to prevent new manic episodes and KLS recurrences.

Longitudinal disruption of sleep slow wave activity by electroconvulsive therapy

M. Kafashan[1,2], L. Lebovitz[3], S. Subramanian[3,4,5], A. Labonte[1,6], A. Luong[1,7], O. Hyche[1], Y.-E. Ju[2,8], N. Farber[3], B. Palanca[1,2,3,9,10]

[1]Washington University School of Medicine in St. Louis, Department of Anesthesiology, St. Louis, United States, [2]Center on Biological Rhythms and Sleep, Washington University in St. Louis, St. Louis, United States, [3]Washington University School of Medicine in St. Louis, Department of Psychiatry, St. Louis, United States, [4]Berenson-Allen Center for Noninvasive Brain Stimulation, Beth Israel Deaconess Medical Center, Department of Neurology, Boston, United States, [5]Beth Israel Deaconess Medical Center and Harvard Medical School, Department of Psychiatry, Boston, United States, [6]Washington University School of Medicine in St. Louis, Neuroscience Graduate Program, St. Louis, United States, [7]Columbia University, Department of Health Policy and Management, New York City, United States, [8]Washington University School of Medicine in St. Louis, Department of Neurology, St. Louis, United States, [9]Washington University in St. Louis, Department of Biomedical Engineering, St. Louis, United States, [10]Washington University School of Medicine in St. Louis, Division of Biology and Biomedical Sciences, St. Louis, United States

Introduction: Sleep plays an essential role in cognition and mood. During sleep, electroencephalographic (EEG) slow-wave oscillations are pronounced in non-rapid eye movement (NREM) sleep. A decrease in the EEG power of these slow oscillations (sleep slow-wave activity, SWA), has been observed in patients with major depressive disorder.

Materials and Methods: In this longitudinal study, we examined sleep macrostructure and microstructure in patients with treatment-resistant depression (TRD) undergoing an index course of electroconvulsive therapy (ECT). We employed wireless wearable Dreem devices (Beacon Biosignals, Massachusetts, USA) to collect sleep EEG data, overcoming previous technical impediments to studying longitudinal changes in SWA. Participants were asked to record their overnight sleep EEG before initial ECT and after each ECT session serially for up to 7 weeks. The sleep data was manually scored into REM and NREM stages N1-N3, based on modified American Academy of Sleep Medicine guidelines. We used the Quick Inventory of Depressive Symptomatology-16 (QIDS) to measure depression severity in the morning of each ECT treatment. SWA was measured by calculating the average 0.5-4 Hz frontal EEG power per minute for each 30-second epoch utilizing EEG derivative F7-F8 during N2 and N3 sleep.

Results: We analyzed 172 sleep records from 22 subjects with a median (IQR) of 8 (5.25) overnight sleep recordings per patient. Across all participants, regardless of their ECT response, the percentage of total sleep time (TST) in REM sleep was significantly decreased with treatment number (linear mixed-effects model, intercept, 16.21; 95% CI, 12.51 to 19.61; p<0.001; slope = -0.50; 95% CI, -0.91 to -0.10; p = 0.015). The percentage of TST in N2 (intercept, 74.82; 95% CI, 70.38 to 79.26; p<0.001; slope = 0.23; 95% CI, -0.20 to 0.67; p = 0.29) and N3 (intercept, 5.02; 95% CI, 2.45 to 7.59; p<0.001; slope = 0.20; 95% CI, -0.05 to 0.46; p = 0.11) was slightly increased but not significantly with treatment number. On the other hand, the SWA (log-transformed) increased significantly over the index course of ECT across all participants (intercept, 6.90; 95% CI, 6.63 to 7.18; p < 0.001; slope = 0.03; 95% CI, 0.01 to 0.05; p = 0.001). Finally, SWA was negatively correlated with the QIDS score (intercept, 1.20; 95% CI, 0.82 to 1.58; p<0.001; slope = -0.07; 95% CI, -0.13 to -0.02; p = 0.007). Multivariate analyses to include clinical variables are pending.

Conclusions: The percentage of REM sleep decreased significantly over the index course of ECT, while the percentage of N2 and N3 sleep increased slightly but not significantly across all patients, irrespective of their ECT response. Furthermore, SWA increased significantly over the index course of ECT, and it was negatively correlated with the QIDS score. In future investigations, with a larger sample size, our plan entails conducting mediation analyses to assess the direct and indirect effect of treatment number and SWA on depression outcome.

Methods for the evaluation of rem sleep density: a bibliometric analysis

T.T. Kishi[1], M.L. Andersen[1,2], Y.M. Luciano[1], V.A. Kakazu[1], S. Tufik[1,2], G.N. Pires[1,2]
[1]Universidade Federal de São Paulo, Psicobiologia, São Paulo, Brazil, [2]Sleep Institute, São Paulo, Brazil

Introduction: REM sleep density is the parameter proposed to explain the variability in the amount of eye movements during REM sleep. Alterations in REM sleep density have been proposed as a screening criterion for individuals with distinct mental health conditions, including depression, bipolar disorder, and schizophrenia. However, REM sleep density is not recognized as a diagnostic parameter, as its accuracy has not been properly clarified. An important limitation for the applicability of REM sleep density is the lack of consensus about its scoring criteria. The variability of the methods used to score it reduces the external validity of the results, hindering an adequate analysis of its diagnostic accuracy and clinical applicability. This scoping review aims to identify and quantify the methods used to score REM sleep density, describing their main characteristics.
Methods: This study was conducted according to the PRISMA Extension for Scoping Reviews (PRISMA-ScR) and its protocol was registered in PROSPERO (CRD42022345887). The literature search was conducted in PubMed, Scopus, PsycInfo and Web of Science. All articles were reviewed in 2 phases (abstracts, followed by full texts analysis) by 2 independent reviewers. Only studies with objective measures for REM sleep density analysis in individuals with depression were considered eligible. For each article, the following variables related to the calculation of REM sleep density were extracted: measurement parameter (absolute frequency, relative frequency, absolute time, relative time, or score), method of analysis (manual or automatic), REM estimation unit, denominator, unit of measurement, and polysomnographic definition of eye movements.
Results: The bibliographic search retrieved 745 unduplicated records. After eligibility analysis, the final sample was composed of 57 articles, covering a total of 64 analyses of REM sleep density. Most of the analyses were manual (70.44%). The polysomnographic definition of eye movements was presented only in 7 articles (12.28%), the most common being defined as an event with a minimum of 25mV and lasting at least 200ms (10.94%). The predominant measurement method for REM sleep density was relative frequency (56.25%). The most common REM estimation unit was number of REM events (50.00%), followed by mini-epochs containing REM sleep (22.44%) and the most common denominator was total REM sleep time (45.31%), followed by the number of REM sleep epochs (21.88%).
Conclusions: Our study demonstrates that there is no consistency in the methods used to calculate REM sleep density in the literature and a high percentage of studies do not describe their methods in detail. The methodological inconsistencies and omissions among studies limit the comparability and clinical applicability of REM sleep density. Future guidelines should discuss and include specific methodology for the scoring of REM sleep density, so it can be consensually implemented in clinical services and research.

Neural correlates of targeted memory reactivation in PTSD patients are associated with symptom reduction

A.C. van der Heijden[1,2], Y.D. van der Werf[1,3], O.A. van den Heuvel[1,3], H.J.F. van Marle[1,2,4], L.M. Talamini[5]
[1]Amsterdam UMC location Vrije Universiteit Amsterdam, Department of Psychiatry, Department Anatomy & Neuroscience, Amsterdam, Netherlands, [2]Amsterdam Neuroscience, Mood Anxiety Psychosis Stress Sleep, Amsterdam, Netherlands, [3]Amsterdam Neuroscience, Compulsivity Impulsivity and Attention, Amsterdam, Netherlands, [4]GGZ in Geest Mental Health Care, Trauma and personality disorders, Amsterdam, Netherlands, [5]University of Amsterdam, Dept. of Psychology, Amsterdam, Netherlands

Introduction: Post-traumatic stress disorder (PTSD) is a psychiatric disorder with traumatic memories at its core. Post-treatment sleep may offer a unique time-window to increase therapeutic efficacy through consolidation of therapeutically-modified traumatic memories. Advances in memory research show that memory consolidation can be enhanced by presenting reminder cues (e.g. sounds associated to a memory) during sleep, a technique called targeted memory reactivation (TMR).

Materials and Methods: Here, we apply TMR for the first time in PTSD patients, to strengthen therapeutic memories during sleep after a single treatment session with eye movement desensitization and reprocessing (EMDR). PTSD patients received either slow wave phase-targeted TMR, using closed-loop neurostimulation with EMDR clicks as reactivation cue (n=17), or sham stimulation (n=16). Outcome measures included subjective responses to script-driven imagery of the targeted traumatic memory, PTSD symptoms (both self-reported and clinically evaluated), as well as time frequency representations- and event related potentials of the sleep EEG.

Results: TMR led to an amplification of the slow oscillation relative to sham stimulation. The extent of the SO deepening was positively associated with a reduction of PTSD severity. We also observed an increase in slow sigma power (11-13.25 Hz) in response to the TMR reactivation cue, which was associated with a reduction in self-reported intrusive symptoms. While TMR did not augment the reduction of PTSD severity compared to EMDR alone, the induced changes in the sleep EEG, as reflected by increased SO and sigma activity, were associated to PTSD symptom alleviation.

Conclusions: Our findings support the applicability and safety of TMR in PTSD patients, providing a foundation for future research to unlock the full potential of TMR applications in PTSD.

Phenotyping sleep disturbances in children and adolescents with Autism Spectrum Disorder based on clinical assessment and SDSC scoring

C. Kuo[1], E. Keys[2], M. Braschel[3], O. Hill[4,5], S. Lewis[6,7], S. McWilliams[4,5], P. Pandher[3], H. Tesch[1], O. Ipsiroglu[4,5]
[1]University of British Columbia, School of Biomedical Engineering, Vancouver, Canada, [2]University of British Columbia - Okanagan, School of Nursing, Kelowna, Canada, [3]BC Children's Hospital Research Institute, Biostatistics, Vancouver, Canada, [4]BC Children's Hospital Research Institute, H-Behaviours Research Lab, Vancouver, Canada, [5]University of British Columbia, Department of Pediatrics, Vancouver, Canada, [6]BC Children's Hospital Research Institute, Autism Spectrum Interdisciplinary Research Program, Vancouver, Canada, [7]University of British Columbia, Department of Medical Genetics, Vancouver, Canada

Introduction: Sleep problems are common in children with ASD, with prevalence rates of approximately 50-80% compared with 9-50% in typically-developing children. Given some overlap of the clinical characteristics of ASD and ADHD, we applied the concept of ADHD-sleep phenotypes (narcoleptic-like, delayed sleep onset insomnia, OSA, RLS/PLMS, sleep EEG epileptiform discharges; doi: 10.1016/j.sleep.2018.08.026) to a cohort of children and adolescents with ASD using clinical information based on descriptions from both clinicians and parents/caregivers, as well as scoring from the Sleep Disturbances Scale for Children (SDSC).

Methods: The intake forms of 199 patients referred to the Pediatric Interdisciplinary Sleep Program at BC Children's Hospital were reviewed. The clinical information of assessment/diagnosis (insomnia, RLS, excessive daytime sleepiness, seizure disorder/epilepsy) and SDSC subscores (DIMS, SDB, DOES) were combined and used as a proxy for the sleep lab-based phenotypes. Clinical information was collected using the Mind-the-Gap-Logic-Model, which allows comprehensive clinical history taking (DOI 10.3389/fpsyt.2022.878356; https://doi.org/10.3389/fpsyt.2022.878356). Statistical analysis was conducted with odds ratios (OR) to identify risk factors ($p < 0.05$) and trends ($p < 0.1$) for each phenotype; 95% confidence intervals were reported.

Results: 89/199 patients aged 1-18 years (mean=10.9 years; 54 male) with a diagnosis of ASD were included in the analysis. EDS/DOES-cohort 23/89: only self-injurious behaviors as a trend (OR:0.32, p=0.0918). Insomnia/DIMS-cohort 57/89: familial iron deficiency (OR:4.77, p=0.0014), familial RLS (OR:3.44, p=0.0075), CRSD (OR:13.18, p=0.0147), ADHD (OR:0.38, p=0.0401), externalizing disorders (OR:0.37, p=0.0413), and a trend for RLS (OR:2.46, p=0.0771). SDB-cohort 42/89: non-restorative sleep (OR:2.87, p=0.0165).RLS/restless-cohort 72/89: familial iron deficiency (OR:5.83, p=0.0094), and trends for both externalizing disorders (OR:2.69, p=0.0732) and internalizing disorders (OR:2.57, p=0.0929). Further analyzes of the RLS, familial RLS, painful RLS, and restless-sleep: RLS sub-cohort 68/89: familial iron deficiency (OR:4.05, p=0.0137) and a trend for insomnia/DIMS (OR:2.46, P=0.0771); familial RLS sub-cohort 53/89: insomnia/DIMS (OR:3.44, p=0.0075), familial iron deficiency (OR:2.82, p=0.0214), painful RLS (OR:10.24, p=0.0291), and parasomnias (OR:5.53, p=0.0315); painful RLS sub-cohort 13/89: self-injurious behaviors (OR:6.00, p=0.0048) and familial RLS (OR:10.24, p=0.0291); restless sub-cohort 28/89: non-restorative sleep (OR:3.25, p=0.0144), internalizing disorders (OR:2.95, p=0.0277), SIB (OR:0.23, p=0.0271), and a trend for parasomnias (OR: 3.09, p=0.0520). Epilepsy-cohort:10/89: sample size insufficient for analysis.

Conclusions: The clinical application of the lab-based ADHD-phenotypes concept in a cohort of children and adolescents with ASD supported the identification of several "self-evident" but up to now not well described risk factors, such as the link between insomnia with familial iron deficiency and familial RLS. To our knowledge, the association of painful RLS with self-injurious behaviours and familial RLS has not been described in the literature. This might be due to the fact that taking family sleep history is unfortunately not a standard in clinical practice in sleep assessments of individuals with ASD. Further, a stunning result is that there were zero risk factors for EDS/DOES in this population, raising the question how we assess EDS/DOES. Overall, this data invites us to revisit our traditional sleep assessment concepts in individuals with ASD.

Physiological characteristics of trauma-related nightmares in military service members with PTSD

E. Saguin[1,2], D. Feingold[2,3], E. Catrin[1], J.-B. Roseau[4], D. Léger[2,5], D. Gomez-Merino[2,3], M. Chennaoui[2,3]
[1]Begin Military Teaching Hospital, Psychiatry, Saint-Mandé, France, [2]VIFASOM (Vigilance Fatigue Sommeil et Santé Publique) URP 7330, Université Paris Cité, Paris, France, [3]French Armed Forces Biomedical Research Institute, Bretigny-sur-Orge, France, [4]Clermont-Tonnerre Military Teaching Hospital, Pneumology and Sleep Medicine, Brest, France, [5]APHP, Hôtel Dieu, Centre du Sommeil et de la Vigilance, Paris, France

Introduction: Trauma-related nightmares (TRNs) are a core symptom of Post-traumatic Stress Disorder (PTSD), so much so that some authors consider them as a hallmark of PTSD or more, as a central physiological mechanism. The study of TRNs is of particular interest in clinical practice, as they generate fear of sleep, sleep fragmentation and poor sleep habits (i.e. alcohol consumption and screen use). Subjective descriptions from patients highlight a sudden awakening, accelerated heart rate, excessive sweating, and intense anxiety. However, laboratory studies are not always consistent with subjective complaints, probably due to methodological constraints. Indeed, changes in sleeping environment and schedule, as well as the clutter of polysomnography (PSG) recording, can alter the frequency and content of nightmares. Our team has developed an innovative methodological approach to study TRNs under ecological conditions, with the aim of establishing relationship between physiological responses before and after waking with patient complaints.
Material and Methods: We conducted a prospective, multicentric, national, observational study (SOMMEPT) involving the psychiatry departments of 5 French Military Teaching Hospitals. During this study, after two habituation nights, military service members suffering from PTSD had to record 5 nights at home using two ambulatory devices, an EEG headband (DREEM®, DH, Rythm Paris) in order to quantify and classify sleep stages, and a multi-sensor wristband (E4, Empatica® US) in order to measure electrodermal activity (EDA), skin temperature, heart rate and movement. E4 wristband is also equipped with a push-button to signal any arousal related to TRNs during the night.
Results: We recorded 367 awakenings associated with TRNs in 70 patients which were compared to 4,165 awakenings not associated with a nightmare. 31.06% (115) of awakenings associated with TRNs occurred after REM sleep, compared with 68.93% (252) after NREM sleep. Physiological analyses revealed higher EDA during the 10 minutes preceding awakenings when TRNs were associated with NREM sleep than when they occurred during REM sleep ($p<0.001$). Comparing the 10-min periods preceding awakenings associated with TRNs to those preceding awakenings without reported nightmares, we observed higher levels of movement and a localized increase in heart rate before TRNs ($p<0.001$).
Conclusions: The use of wearable devices enabled us to corroborate patients' complaints about TRNs. Our analyses showed physiological activations during TRNs that could be incorporated into a more complex predictive model taking into account the temporality of these activations. A better understanding of sleep disturbances and the physiological responses associated with TRNs would allow the development of targeted therapeutic strategies.

Sleep and circadian characteristics in eating disorders: a systematic review and meta-analysis

G. Degasperi[1], D. Meneo[2], S. Curati[2], V. Cardi[1], C. Baglioni[2,3], N. Cellini[1]
[1]University of Padova, Department of General Psychology, Padova, Italy, [2]University of Rome 'Guglielmo Marconi' Telematic, Department of Human Sciences, Rome, Italy, [3]University of Freiburg Medical Center, Department of Psychiatry & Psychotherapy, Freiburg, Germany

Introduction: Eating disorders (ED) are serious psychological disorders that mainly affect female adolescents. They are characterized by systematic unhealthy eating behaviours, including prolonged periods of fasting and frequent episodes of binge eating. Patients commonly report comorbidities, the most frequent of which include depression and anxiety, and often complain of poor sleep quality. Nevertheless, there is no clear literature on sleep difficulties in ED, leading to confusion among researchers and clinicians. In the present systematic review and meta-analysis, we investigated sleep quality, circadian preferences, and the extent of sleep disturbances in patients with ED compared to the general population. Furthermore, we investigated whether ED treatment may also affect sleep quality.

Materials and Methods: A wide search of the literature, on Pubmed, Web of Science, Medline, and PsychInfo, was performed. The inclusion criteria were mainly the presence of a diagnosis of ED and a healthy control group, the assessment of sleep or circadian parameters by polysomnography (PSG), actigraphy, or validated questionnaires. Random effect analyses were performed. Subgroup analyses have been conducted based on the different diagnoses, specifically, Anorexia Nervosa (AN), Bulimia Nervosa (BN), and Binge Eating Disorder (BED). The present work has been pre-registered on PROSPERO and it is available via the following ID: CRD42022350845.

Results: The analyses evidenced an impairment of sleep as assessed by PSG or actigraphy in the group of ED, specifically, patients showed a reduction of sleep efficiency (SE), total sleep time (TST) and slow wave sleep (SWS), and an increase of wake after sleep onset (WASO). On a subjective level, patients coherently reported poorer sleep quality compared to the general population. Considering the subgroup analyses, only patients suffering from AN showed alterations in the physiological sleep quality compared to controls, whereas BN and BED patients only differ from controls in lower perceived sleep quality. As for circadian patterns, only one paper emerged and assessed self-reported circadian preferences. The results showed a higher evening preference in ED patients compared to controls. Only two papers investigating insomnia were found, both related to BED patients. One of them found higher insomnia symptoms in patients, while the other did not find any difference. Another work assessed apnea in an ED group, but it did not find any difference compared to the general population. Finally, three studies investigated the effect of the treatment on sleep quality. The results seem to suggest that there is an improvement in sleep quality after the treatment, but not for all parameters.

Conclusions: The present work suggests that patients suffering from an ED, especially from AN, present an impairment of sleep quality, as physiologically and subjectively assessed. Nevertheless, the studies conducted so far are not sufficient and specific enough to have a clear idea about the underlying mechanisms. Therefore, future studies should investigate more detailed aspects of eating psychopathology that could explain sleep alterations and whether a sleep-centered intervention should be recommended for patients' optimal recovery.

Sleep complaints, suicidal behavior and somatic symptoms in children and adolescents with severe affective disorder

M.C. Lopes[1,2], M.A. Boarati[1], K. Spruyt[3], L. Fu-I[1]
[1]University of Sao Paulo/Childhood and Adolescence Affective Disorders Program Department and Institute of Psychiatry, Sao Paulo, Brazil, [2]Children´s Institute/University of Sao Paulo Medical School, Sao Paulo, Brazil, [3]Université de Paris, Paris, France

Introduction: The expression of sleep complaints, suicidal behavior and somatic symptoms has been described in children and adolescents with major depressive disorder. Before a suicide attempt, the youth may show somatic symptoms. Youth with suicidal ideation often develops a suicidal plan with a suicide attempt within 12 months, and the presence of suicidal ideation followed by an attempt being a strong predictor of subsequent death by suicide. The aim of this study was to describe the presence of sleep complaints, suicidal behavior and somatic complaints in youth who was severely depressed.
Materials and Methods: Clinic specialized in the evaluation of children and adolescents with mood disorders. The diagnosis of depression was evaluated using Diagnostic Interview for Children and Adolescents - DSM IV/ DICA IV. The frequency of sleep complaints was evaluate in four questions: initial insomnia, night awakening, early awakening, and hypersomnia. The description of suicidal behavior was: the presence at least one of the 4 questions: morbid ideation, desire to be died, suicidal ideation, suicide plan and suicide attempt.
Results: Our sample was aged 6-17 y.o. with 97 children (≤ 12 y.o) versus 117 adolescents (≥ 13 y.o.), and the mean age among was respectively: 9.5±1.8 y.o, and 15±1.3 y.o. The family history of disorder wasn't a marker of suicidal behavior in our patients. The description of our sample with sleep disturbance: depressive mood in 84.1%, anhedonia in 80.8%, appetite complaint in 79.4%, decreased concentration in 75.2%. The prevalence of sleep complaints and suicidal behavior: multiple sleep complaints in 66%, morbid ideation (42%), desire to die (31%), suicidal ideation (33%), 23% had planned suicide and 13% had suicide attempt. 44 patients (21%) with somatic complaints, however 5 patients had sleep complaint without suicidal behavior, 3 patients with suicidal behavior without sleep complaints. The association between suicidality and sleep complaints was significant (p<0.01) in children and adolescents who were severely depressed.
Conclusions: The suicidal behavior is a marker of severity for depression in youth, and sleep is a great risk factor of mental illness. We found a high prevalence of somatic complaint in patients who were severely depressed with sleep complaints and suicidal behavior. The anamnesis about sleep improved the preventive intervention of suicide in youth. Future studies are needed using a structural interview about mental health symptoms, including quality of life, affective symptoms and sleep quality, and they may help to reduce suicide rates in youth.

Sleep, depression and anxiety: analysis three years after the COVID-19 outbreak

S.M. Valiensi[1,2], A. Folgueira[1,2], D. Giardino[2], N. Enriz[3], A. Garay[2,4]
[1]Hospital Italiano de Buenos Aires, Buenos Aires, Argentina, [2]Asociación Argentina de Medicina del Sueño, Buenos Aires, Argentina, [3]Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Buenos Aires, Argentina, [4]Centro de Educación Médica e Investigaciones Clínicas "Norberto Quirno" (CEMIC), Buenos Aires, Argentina

Introduction: The World Health Organization (WHO) published that the global prevalence of anxiety and depression increased by 25% in the first year of the pandemic, mainly affecting women and young people but made no reference to sleep problems. The objectives of this study were to explore both the quality of sleep and symptoms of depression and anxiety in the Argentine population, three years after the start of the COVID-19 outbreak.

Materials and Methods: An observational cross-sectional study was carried out. A virtual, self-administered and anonymous questionnaire was used in a Google Forms survey format. The survey was launched from March 15 to April 15, 2023, using social networks and email for distribution. To evaluate variables related to sleep, the Pittsburgh Sleep Quality Index (PSQI) was used. To analyze mood disorders such as depression and anxiety, the Patient Health Questionnaire (PHQ-4) was used. Qualitative variables were expressed as frequencies and percentages. Quantitative variables were defined by mean and standard deviation. Measures of trend and distribution were used to describe the groups. The t-test and analysis of variance (ANOVA) were used for the analysis of continuous variables in different groups. Chi-square tests were used to compare qualitative variables and binary logistic regression for multivariate analysis. All data were analyzed for Statistical Package with Social Science (SPSS) version 18 (SPSS 18 Chicago, IL, USA; SPSS Inc.). P values less than 0.05 were considered statistically significant. The study was submitted to the Buenos Aires Health Research Computerized Registry Platform (PRIISA.BA) and approved by the CEMIC ethics committee.

Results: N=2081 responses were evaluated. The mean age was 37 ± 12 (16-86 years). We found that 56.5% of the responses were from the Metropolitan Area of Buenos Aires; 2.9% were over 65 years old and 70.7% were female. We observed that poor sleep quality was reported by 68.3% of the respondents. We found that 46.1% reported symptoms of depression and 28.3% symptoms of anxiety. The female sex ($p=0.00$) and residents of the metropolitan area ($p=0.01$) had worse sleep quality. At age <65 years old and female sex there were more symptoms of depression ($p=0.02$ / $p=0.00$) and anxiety ($p=0.00$/$p=0.00$). Nightmares at least once a week by PSQI, were related to anxiety symptoms ($p=0.00$). Symptoms of depression (odds ratio [OR] = 2.43; 95% CI = 1.96-3.02) and anxiety (OR = 2.68; 95% CI = 1.86-3.84), were associated with increased risk of poor sleep quality.

Conclusions: In this study, we observed an increase in poor sleep quality as well as depression and anxiety symptoms. The association between poor sleep quality and mood disorders was significant. The female sex and residents of the metropolitan area had worse sleep quality. Age < 65 years were more significant symptoms of depression. The female gender was significantly more affected by poor sleep quality and mood disorders. This article contributes to denote the impact of the poor quality of sleep, symptoms of depression and anxiety in the Argentinian population three years after the start of the COVID-19 pandemic.

Sleep disorders and cognitive behavioral therapy in children with autism spectrum disorder

G. Teran Pérez[1], R.E. Jiménez-Xolapa[1], D.Y. Arana-Lechuga[2], O. Sánchez Escandon[3], R.E. Mercadillo Caballero[4], J. Velázquez Moctezuma[2]

[1]Sleep and Neuroscience Center, Mexico City, Mexico, [2]Sleep Disorders Clinic, Universidad Autónoma Metropolitana, Iztapalapa Unit, Mexico City, Mexico, [3]Sleep Disorders Clinic, ABC Medical Center, Mexico City, Mexico, [4]Universidad Autónoma Metropolitana; National Council for Science and Technology, Mexico City, Mexico

Introduction: Autism Spectrum Disorder (ASD) is a common disease affecting one in 100 children in the world. It involves a deficit in neurological development that results in deficits in behavior and communication, as well as difficulties in the development of language and adaptive skills. It has been suggested that early interventions can significantly improve clinical symptoms. On the other hand, sleep plays an important role in the development of brain functions. However, some reports indicate severe sleep disturbances and a significant melatonin decrease in children with ASD. In this study we analyze the effects of improvements in sleep pattern on the clinical characteristics of children diagnosed with ASD.

Materials and methods: 49 children (age = 2 to 10 years old), with ASD diagnosis were polysomnographically studied overnight, and subsequently the parents were trained to obtain sleep diaries. Subsequently, the children received cognitive behavioral therapy in 8 sessions for 3 weeks. In addition, melatonin prologued-release oral melatonin (5-10 mg), was administered daily in the evening. After the training period, sleep dairies were analyzed and parents were interviewed about sleep habits. Also Criteria Diagnostic Interview for Autism Spectrum Disorder (CRIDI) and Autism Diagnostic Interview-Revised (ADI-R) instruments were applied before and after in order to evaluated clinical clinical symptoms of ASD.

Results: The results show significant improvements in several characteristics of the sleep pattern, mainly sleep latency and duration. Furthermore, the clinical features of ASD also showed significant improvements as behavioral assessments indicate better social abilities.

Conclusions: The results support the idea that improve sleep pattern as an early intervention for ASD induces beneficial effects on the clinical picture of ASD.

Sleep hygiene, mediating the association between circadian typology and psychological distress: an association elicited by mediation analysis model among young sudanese adults 2022

S.A. Mohamed Musa[1], A. Nogdalla[1], A. Abdelghyoum[1], M. Omer[1], R. Abdulmonem[1], M. Osama[1], A. Altayb[1], A. Izzaldin[1], F. Fathelrahman[1], A. Jafar[1], A. Abdullah[1]
[1]Al Neelain University, Khartoum, Sudan

Introduction: Circadian rhythms are regulated by genetic and environmental components. The association of intrinsic and extrinsic factor modulates physiological and individual sleep schedules sleep hygiene and even different chronotype. Evidence suggests evening-type individuals have a higher risk of reporting psychological distress than morning-type individuals. However, less is known regarding the underlying processes that might mediate this association among Sudanese young adults. This study aimed at assessing the mediating role of sleep hygiene on the relationship between circadian typology and psychological distress among young sudanese adults.

Materials and Methods: This is a cross sectional study. Conducted among medical students, graduates and medical interns of Alneelain University. Between April and August 2022. Morningness–Eveningness 19 items Questionnaire (MEQ) was used to assess chronotype preference. Kessler 10-item Questionnaire was used to assess Psychological Distress, and sleep hygiene index (SHI) was used to screen Sleep hygiene behaviors. Hayes PROCESS macro (model 4) was used to perform the mediation analysis.

Results: Among 303 medical students who complete the study questionnaire. Mean of age for study participants was (22.71±2.49). Sleep hygiene index mean score was (29.35±5.46) indicating poor sleep hygiene behaviors. Most of the population were Neutral in their circadian typology preference (58.1%) . (89.8)% of our population had psychological distress, there was strong relation between sleep hygiene and psychological distress(P<0.01). Individuals who were severely psychologically distressed mostly had higher sleep hygiene mean scores than normal individuals (29.35±5.46),(21.61 ± (6.42) . Multiple regression analysis results showed that Psychological Distress had a negative correlation with chronotype and was positively correlated with sleep hygiene (r=-.141, p=-.014), ,(r=.466, p=.000) respectively, the result also revealed a significant indirect effect of sleep chronotype on Psychological Distress (b=.0106, t=5.7144 ,se=.122) ,according to bias-corrected percentile bootstrap method the total effect was positively significant (b=.0534, p<0.05, SE=.0543, 95% CI [-.2280 -.0178) through full complimentary mediation between Psychological distress and chronotype through sleep hygiene behaviors. p<0.05).

Conclusion: Sleep hygiene was found to mediate the correlation between Chronotype and psychological distress, Improvement of Sleep hygiene behaviors is advised to enhance morning circadian typology as to prevent and reduce psychological distress. Interventions to enhance morning circadian typology should be prioritized to medical students, graduates and medical interns who are prone to eveningness to minimize the risk for psychological distress.

Sleep in PTSD: Interest of home sleep recording in military service members suffering from Post-Traumatic Stress Disorder

E. Saguin[1,2], D. Feingold[2], E. Catrin[1], J.-B. Roseau[3], A. Briquet[4], D. Léger[5,2], D. Gomez-Merino[6,2], M. Chennaoui[6,2]
[1]Begin Military Teaching Hospital, Psychiatry, Saint-Mandé, France, [2]VIFASOM (Vigilance Fatigue Sommeil et Santé Publique) URP 7330, Université Paris Cité, Paris, France, [3]Clermont-Tonnerre Military Teaching Hospital, Pneumology and sleep medicine, Brest, France, [4]Laveran Military Teaching Hospital, Pneumology and sleep medicine, Marseille, France, [5]APHP, Hôtel Dieu, Centre du Sommeil et de la Vigilance, Paris, France, [6]French Armed Forces Biomedical Research Institute, Bretigny-sur-Orge, France

Introduction: Military service members, due to their deployments in warzones, are particularly exposed to the risk of developing Post-Traumatic Stress Disorder (PTSD). Sleep disturbances, including trauma-related nightmares (TRNs) and insomnia, are the most frequent complaint of patients suffering from PTSD and are often a persistent symptom over the long term because they are resistant to the therapies classically used in this pathology. Different studies have shown that sleep disturbances are a contributing factor to the onset and chronicisation of PTSD. However, the study of these nocturnal manifestations is particularly difficult to carry out in the sleep lab and does not always corroborate the patients' complaints. Our aim is to investigate sleep disturbances using a wearable device at home in PTSD patients, and their relationship to the full spectrum of PTSD symptoms, which would make sleep a promising therapeutic focus in the treatment of PTSD.
Materials and Methods: We implemented a large observational study in several Military Teaching Hospitals on a population of military and ex-military patients suffering from PTSD. After two habituation nights, the patients wore for 5 nights an EEG headband (Dreem®, DH, Rhythm Paris) to record their sleep. The patients also completed several questionnaires concerning their sleep, the nature of their nightmares (TRNS-FR) and the symptomatic impact of their pathology (among them insomnia, depression, micro-arousals).
Results: We performed an accurate description of the sleep of 127 patients, showing alterations in sleep efficiency and sleep latency, and a decrease in the proportion of REM and slow wave N2 and N3 sleep in patients compared to a control group of 52 healthy individuals. The clinical relevance of wearable recording devices was demonstrated by the presence of positive correlations between the objective (DH device) and subjective (questionnaires) parameters such as Total Sleep Time (TST) (Spearman's $\rho=0.4782$, $p<0.001$) and Sleep Onset Latency (SOL) (Spearman's $\rho=0.4347$, $p<0.001$). The intensity of PTSD symptoms was incorporated into a predictive model taking into account sleep disturbances, insomnia and depression. This model indicates that sleep explains a significant proportion of the variability in PTSD symptoms (R=57.2%, $p<0.001$).
Conclusions: Taken together, these results illustrate the importance of considering sleep disturbances in the assessment and care of PTSD patients and pave the way for innovative exploratory and therapeutic approaches focused on sleep.

The pleiotropic and polygenic components of accelerometer-based sleep metrics among adolescents in a population birth cohort study

M. Carpena[1], k. Sanchez-Luquez[1], A. Matijasevich[2], I. Oliveira de Oliveira[3], I. Santos[3], L. Tovo-Rodrigues[3]
[1]Federal University of Pelotas, Medicina Social, Pelotas, Brazil, [2]Universidade Federal de Sao Paulo, Sao Paulo, Brazil, [3]Federal University of Pelotas, Pelotas, Brazil

Introduction: Genome-wide association studies (GWAS) has been providing new biological insights into sleep related mechanisms during the last decade. Polygenic scores (PGSs) based on GWAS results were then proposed as a helpful methodology in clarifying sleep traits and issues susceptibility. However, the transferability of those PGSs across populations from different ancestries background remains elusive. Moreover, whether the psychiatric genetic susceptibility might mediate the association between sleep-PGS and sleep traits is still unknown. This study aimed to test the effect of sleep-PGS and pathway-specific polygenic risk scores (PRSet) in a Birth Brazilian population Cohort to address these points.

Materials and Methods: We used data of the 2004 Pelotas (Brazil) Birth Cohort. DNA samples were extracted from saliva samples collected at 6 years of age and genotyped using the Infinium Global Screening Array v.2. The imputation of remaining non-genotyped variants was performed based on data from the overall population of the 1000 Genomes Project (phase 3). The sleep-PGSs were created based on the summary statistics of the most recent GWAS of accelerometer-based sleep measures (Jones et al., 2019), using the clumping and thresholding methods with cut-off threshold (PT) of 1. A set of 23 loci identified in the psychiatric cross trait GWAS as being pleiotropic among four or more psychiatric disorders (PGC, 2019) was used to calculated PSY-PRSet. The BMI-PRSet were created using the 941 near-independent SNPs associated with body mass index (BMI) in the most recent GWAS meta-analysis (Yengo et al., 2018). A 20 SNPs with functional annotation related to cortisol levels were used to created the Cortisol-PRSet.The scores were created using PRSice 2.2.1 software. Sleep durationand sleep efficiency were collected at the 11 years old-follow-up, using ActiGraph brand accelerometers, model wGT3X-BT, in the non-dominant wrist. Linear regression models were used to investigate the effect of sleep-PGS and sleep-PRSet on sleep phenotypes, adjusting for sex and the first 10 principal components of ancestry.

Results: 3,052 individuals were included in the analyses. The number of nocturnal sleep episodes-PGS was positively associated with sleep duration (B: 2.30, SE: 0.92, p=0.011). The Cortisol-PRSet explained the sleep duration- and number do sleep episodes-PGS association with sleep efficiency (B=0.002, SE: 0.001, p=0.003; B=0.002, SE: 0.001, p=0.013 respectively), and demonstrated that this set was enrichment for both (competitive-p=0.003; competitive-p=0.011 respectively). PRSet analyses also showed that the PRS specific for the BMI polymorphisms using the sleep efficiency GWAS as base sample was associated with sleep duration (B=2.680, SE:0.910, p=0.003, competitive-p=0.003). Other PRSets were associated neither with sleep efficiency nor with sleep duration (p>0.05).

Conclusions: Sleep polygenetic components documented for European adult might partially explain adolescent accelerometer-based sleep duration in our Brazilian Cohort. Cortisol-related SNPs were relevant to explain the association between sleep-PGS and sleep efficiency whereas BMI-PRSet explained the association between sleep-PGS and sleep duration, highlighting common pathways between comorbidities and sleep .

The role of the insula for sleep disturbances in depression

N. Denier[1], S. Breit[1], L. Soravia[1], N. Mertse[1], S. Walther[1], L. Krone[2], R. Wiest[3], T. Bracht[1]
[1]University Hospital of Psychiatry and Psychotherapy Bern, Bern, Switzerland, [2]University Hospital of Neurology, Inselspital, Bern, Bern, Switzerland, [3]Institute of Diagnostic and Interventional Neuroradiology, University of Bern, Bern, Switzerland

Introduction: Little is known about the neurobiology of sleep disturbances in depression. There is preliminary evidence for an association between insula dysfunction and sleep disturbances. This study aimed to explore structural and functional characteristics of the insula in major depression and its association with disturbed sleep patterns.

Materials and methods: We included 47 patients with major depressive disorder (MDD) and 15 healthy controls (HC) matched for age and sex and examined them using structural and functional resting-state MRI. Sleep characteristics were assessed with the Pittsburgh Sleep Quality Index (PSQI). Patients were classified into a subgroup with poor sleep (PAT-PS, PSQI > 8) and with normal sleep (PAT-NS, PSQI ≤ 8). We analysed cortical thickness of the bilateral insula and connectivity strength of each voxel within the insula to the rest of the brain using intrinsic connectivity. Group differences were assessed with a mixed-model MANCOVA controlling for age and gender.

Results: Patients had higher PSQI-scores than HC. PAT-PS (n=21) and PAT-NS (n=26) did not differ regarding sex, age and depression severity. Thinner insular cortical thickness was found in PAT-PS, in contrast to HC and PAT-NS. Additionally, PAT-PS had lower insular intrinsic connectivity than HC. There were no significant group differences between PAT-NS and HC. Across all subjects, PSQI-total was highly negatively associated with insular cortical thickness and insular intrinsic connectivity. Insular intrinsic connectivity within patients was negatively associated with depression severity.

Conclusions: In conclusion, our results suggest structural and functional impairments of the insula in patients with depression and sleep disturbances.

Urge to consume psychotropic substances is associated with changes in sleep quality: epidemiological and gender-specific findings

V. Dokkedal-Silva[1], J.C.F. Galduróz[1], L.F. Berro[2], S. Tufik[1], M.L. Andersen[1]
[1]Universidade Federal de São Paulo, Departamento de Psicobiologia, São Paulo, Brazil, [2]University of Mississippi Medical Center, Department of Psychiatry and Human Behavior, Jackson, United States

Introduction: Previous studies suggested a relationship between sleep quality and craving for the preferred substance in individuals with substance use disorders (SUD). This relationship may influence relapse and discontinuation of use. However, investigations of this possible association in large population samples are lacking. The aim of the present study was to evaluate the correlation between desire to consume psychotropic substances and objective and subjective sleep parameters in a sample from a large-scale epidemiological sleep study.
Materials and Methods: This study used data from 1,042 individuals from the 2007 EPISONO study, covering the sleep characteristics of the population of the city of São Paulo, Brazil. Participants underwent full-night polysomnography and completed questionnaires about their sleep quality and general health. For this analysis, we considered responses from the third question of the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) Questionnaire, assessing the urge to consume different types of substances in the last 3 months. Generalized Linear Models that also included age, gender and symptoms of anxiety and depression as covariates were performed.
Results: Our sample included individuals reporting a strong desire for tobacco (N=205), alcohol (N=112), cannabis (N=22) and cocaine (N=6) use in the last 3 months. Individuals who reported a strong desire to consume alcohol in the past months presented lower total sleep time than those who did not. Conversely, feeling a strong desire to consume tobacco recently was associated with increased REM sleep time and lower sleep onset latency. When controlling for gender, men who reported a strong urge to consume tobacco recently showed lower total sleep time, increased time spent in N1 sleep (indicating superficial sleep) and more wake after sleep onset (WASO) when compared to those who did not report this desire.
Conclusions: Our data demonstrate that, in general, there is an association between feeling a strong desire to consume a preferred substance and changes in sleep parameters. However, this association varies between substances, with a desire to use alcohol decreasing sleep time, while a desire to use tobacco being associated with specific changes in sleep architecture (increased REM sleep). Our tobacco association analyses exemplify the importance of considering gender when evaluating substance use, as gender may play an important role in mediating sleep changes in individuals with SUD.

REM Behavior Disorders

Abnormal nigral iron progression in Parkinson's disease and REM Sleep Behavior Disorder using quantitative magnetic resonance imaging

R. Gaurav[1,2], F.-X. Lejeune[3], R. Valabrègue[2], M.D. Santin[2], Z. Mao[1], N. Pyatigorskaya[1,2,4], G. Mangone[5,6], S. Leu-Semenescu[7], J.-C. Corvol[5,8], M. Vidailhet[1,8], I. Arnulf[1,7], S. Lehéricy[1,2,4]
[1]Sorbonne University, Paris Brain Insitute (ICM), Movement Investigations and Therapeutics (MOV'IT) Team, Paris, France, [2]Sorbonne University, Paris Brain Insitute (ICM), Center for NeuroImaging Research, Paris, France, [3]Sorbonne University, Paris Brain Insitute (ICM), The Data Analysis Core facility (DAC), Paris, France, [4]Pitié-Salpêtrière Hospital, Department of Neuroradiology, Paris, France, [5]Sorbonne University, Paris Brain Insitute (ICM), INSERM, Clinical Investigation Center for Neurosciences (CIC), Paris, France, [6]Rush University Medical Center, Department of Neurology, Movement Disorder Division, Chicago, United States, [7]Pitié-Salpêtrière Hospital, Sleep Disorders Unit, Paris, France, [8]Pitié-Salpêtrière Hospital, Department of Neurology, Paris, France

Introduction: Rapid Eye Movement (REM) Sleep Behavior Disorder (RBD) is a parasomnia characterized by abnormal behaviors during REM sleep and the loss of normal REM sleep muscle atonia. Patients with isolated RBD (iRBD) convert to α-synucleinopathies after 10-15 years such as Parkinson's disease (PD), dementia with Lewy bodies, and multiple system atrophy. PD patients may also manifest RBD after the onset of motor symptoms. The hallmark of PD is the progressive depletion of substantia nigra (SN) dopaminergic neurons. Nigral iron is also increased in the SN in PD. Quantitative susceptibility maps (QSM) can detect brain iron distribution and correlate with iron load in iron-rich brain regions. Regional progression of nigral iron increase in patients with PD and iRBD is debated.
Methods: We prospectively included healthy volunteers (HV), patients with iRBD, and early PD patients with RBD and without RBD analyzed at 3 visits (V1/V2/V3) separated by a 2-year interval each. Subjects were scanned using a 3T PRISMA scanner (Siemens). RBD status was confirmed by video-polysomnography. For QSM calculation, the gradient echo signal magnitude and phase from multiple channels of the receive coil were combined using an in-house optimized method. The reconstructed QSM images were used to build a mean QSM template obtained using a balanced representation of HV, iRBD, and PD using the Advanced Normalization Tools (ANTs). The nigral regions were manually delineated on the mean QSM template by an independent examiner and cross-validated by two other expert examiners in the form of anterior and posterior ventral SN and anterior and posterior dorsal SN. We computed quantitative mean susceptibility values in all regional nigral regions using ANTs. Baseline differences were tested across groups controlling for age and sex using analysis of variance (ANOVA) of multiple linear regression models. For iron evolution, we used linear mixed-effects modeling on the regional SN.
Results: We included 47/35/13 HV at V1/V2/V3 respectively, 41/16/7 iRBD, 25/25/12 PD with RBD (mean disease duration = 1.8 ± 0.9 years) and 99/43/15 PD without RBD (mean disease duration = 1.3 ± 1.0 years).
At baseline, ANOVA demonstrated a significant overall group effect (p = 0.032) with a 19.0% significant iron increase in the posterior ventral SN in PD without RBD with respect to HV. Participants with iRBD (+11.4%) and PD with RBD (+18.1%) did not differ from HV. Longitudinally, there was a highly significant group and visit effect in the posterior ventral SN iron (p < 0.001). Including all visits compared with HV, higher iron levels in the posterior ventral SN were 15.9% higher in PD patients with RBD and 21.5% higher in PD patients without RBD.
Conclusion: Iron levels were increased in the posterior ventral SN and not in the other regions of the SN in early-stage PD patients without RBD and in all PD patients at follow-up. The lack of significance in the other groups may be due to the lower number of subjects or the absence of abnormality. Iron deposition increased over time in all groups during follow-up.

A machine learning algorithm to predict short-term phenoconversion from polysomnography in isolated REM sleep behavior disorder

A. Portscher[1,2], R. Angerbauer[1], A. Ibrahim[1], S. Feuerstein[1,2], K. Egger[1], E. Brandauer[1], M. Bergmann[1], B. Högl[1], A. Stefani[1], A. Rodriguez-Sanchez[2], M. Cesari[1]
[1]Department of Neurology, Medical University of Innsbruck, Innsbruck, Austria, [2]Department of Computer Science, University of Innsbruck, Innsbruck, Austria

Introduction: Rapid eye movement (REM) sleep behavior disorder (RBD) is a parasomnia characterized by abnormal muscle activity and dream enactment during REM sleep. Isolated RBD (iRBD) is recognized as a prodromal alpha-synucleinopathy. In this context, progression and phenoconversion biomarkers identifying patients at high risk of progression of neurodegeneration and/or phenoconversion are useful, especially in view of future neuroprotective clinical trials. Although video-polysomnography (v-PSG) is mandatory to diagnose RBD, investigations of sleep neurophysiological phenoconversion biomarkers are quite limited. The aim of this study was to develop a machine learning algorithm that, using features extracted from sleep structure (evaluated by means of hypnodensity), electroencephalography (EEG), and electromyography (EMG) signals recorded during a baseline v-PSG, could discriminate iRBD patients that phenoconverted to an overt alpha-synuclenopathy in a short-term timeframe from patients who did not.

Materials and Methods: We included one-night baseline v-PSG of 66 iRBD patients (mean age 68.5±7.2 years, 92.4% male). Eighteen (27%) of them converted to an overt alpha-synucleinopathy within 2.7±1.0 years (range 1.0-4.3 years) after the baseline v-PSG (13 converted to Parkinson's disease, 4 to dementia with Lewy bodies and one to multiple system atrophy), while 48 remained isolated in the same timeframe. No difference in demographic, sleep architecture, sleep respiratory parameters, sleep comorbidities, and medications was found between the two groups at baseline v-PSG. A total of 232 features were extracted from central EEG, occipital EEG, chin EMG, tibialis EMG and from the hypnodensity. EEG and EMG features were extracted during REM and NREM sleep, while hypnodensity features from whole-night recording. A pipeline consisting of several feature selection algorithms (recursive feature elimination using Shapley values, recursive feature elimination using AdaBoost feature selection) and classification algorithms (k-Nearest Neighbors, AdaBoost, SVM, Gaussian Processes) was built. The classification algorithms were evaluated with 5-fold cross-validation. Several combinations of features were evaluated (i.e. all possible combinations of EMG features in REM and NREM sleep, EEG features in REM sleep and NREM sleep, and hypnodensity features).

Results: Gaussian Process Models achieved the best performances when considering only EMG features from the chin and tibialis muscles in REM sleep. Features were selected with Recursive Feature Elimination with Shapley values. The algorithm had a test precision of 68.3%±17.4%, a test recall of 64.1%±12.0%, and a test F1-score of 63.7%±13.4%. Conversely, features extracted from hypnodensity, EEG (during REM and NREM sleep), and EMG during NREM sleep did not improve the classification performance.

Conclusions: The machine learning algorithm could successfully distinguish iRBD patients converting to overt alpha-synucleinopathies from the ones not converting in a short-term timeframe. Motor activity during REM sleep holds significant potential as an early biomarker for identifying iRBD patients with a higher likelihood of short-term phenoconversion to overt alpha-synucleinopathies.

A neurophysiologic study of the effect of clonazepam and melatonin on REM sleep without atonia in isolated REM sleep behavior disorder

M.P. Mogavero[1], R. Ferri[2], S. Marelli[1], A. Castelnuovo[1], G. Lanza[2], M. Terzaghi[3], L.M. DelRosso[4], C.H. Schenck[5], L. Ferini Strambi[1]
[1]Vita-Salute San Raffaele University, San Raffaele Scientific Institute, Division of Neuroscience, Sleep Disorders Center, Milan, Italy, [2]Oasi Research Institute-IRCCS, Sleep Research Center, Troina, Italy, Troina, Italy, [3]IRCCS Mondino Foundation, Unit of Sleep Medicine and Epilepsy, Pavia, Italy, [4]University of California San Francisco-Fresno, Fresno, United States, [5]University of Minnesota Medical School, Department of Psychiatry, Hennepin County Medical Center, Minneapolis, United States

Introduction: Although very few prospective clinical trials are available assessing the benefits of drugs in isolated REM sleep behavior disorder (iRBD), clonazepam and melatonin are considered as the first-line treatment options. However, while evidence supporting the efficacy of these two compounds on the clinical behavioral outcomes seems to be clear, it is not clear if they are able to significantly modify the main polysomnographic (PSG) feature of iRBD, i.e. REM sleep without atonia (RSWA). For this reason, we carried-out an observational cross-sectional retrospective PSG study of the effects of clonazepam and melatonin on RSWA.

Materials and methods: A total of 96 iRBD patients (82 males and 14 females, age range 50.9-83.2 years) were enrolled in this study: 43 drug-free, 21 patients taking at bedtime chronically ($\geq$6 months) clonazepam (0.5-2 mg), 20 patients taking melatonin extended-release alone (1-4 mg), and 12 taking a combination of clonazepam and melatonin extended-release (same doses as above). PSG studies were assessed for all subjects, including the measurement of the automatic REM sleep atonia index (RAI) and periodic leg movements during sleep, as well as a series of demographic and clinical variables, such as age, age at onset, disease duration, clinical global impression scale (severity and improvement), mini-mental state evaluation, and RBD severity scale.

Results: Among outcomes considered in this study only the clinical global impression scale-severity showed significant differences between the groups considered. All groups showed low average values of RAI, as expected, and there were no differences between patients taking clonazepam, melatonin, or a combination of them (drug-free 0.778±0.184, clonazepam 0.797±0.183, clonazepam+melatonin 0.692±0.224, melatonin 0.689±0.220; ANOVA F = 1.806, NS; however, the clinical global impression scale-improvement was reported to be "much improved" or "minimally improved" in all treated patients and the clinical global impression scale-severity was significantly different between the different groups with those taking melatonin alone (2.9±1.95) showing significantly better scores than both those drug-free (3.9±0.52) and those taking clonazepam+melatonin (3.8±0.75).

Conclusion: This study confirms our previous findings in smaller patient series taking only clonazepam and suggest that both clonazepam and melatonin might be beneficial on some clinical manifestations of iRBD but are unable to modify its underlying neurophysiology. This might also indicate that these agents do not seem to interfere with the core mechanisms of this disease and other disease modifying drugs need to be discovered for iRBD.

Beta band functional connectivity increases prior to dream enactment behavior in patients with idiopathic/isolated REM sleep behavior disorder

S. Date[1], Y. Sumi[2], K. Fujiwara[1], M. Imai[3], K. Ogawa[4], H. Kadotani[2]
[1]Nagoya University, Nagoya, Japan, [2]Shiga University of Medical Science, Otsu, Japan, [3]Shiga University of Medical Science / Shiga Sleep Clinic, Otsu, Japan, [4]Hiroshima University, Higashi-Hiroshima, Japan

Introduction: REM sleep behavior disorder (RBD) is a sleep disorder characterized by a dream enactment behavior (DEB) which may be caused by REM sleep without atonia. DEB tend to occur during phasic REM sleep. If the state-markers prior to DEB are found, patients' anxiety to falling asleep or injuries would be relieved. We analyzed electroencephalogram (EEG) data of patients with idiopathic/isolated RBD (iRBD) to find such biomarkers.

Materials and methods: We collected the EEG data from fifteen patients (Men: 12, median age: 74.0 years) with iRBD who represented movements or behaviors during REM sleep on PSG at the Shiga University of Medical Science Hospital. The measured EEG channels were F3, F4, C3, C4, O1, O2, and the references were M1 and M2. All study patients provided informed consent, and the study design was approved by the ethics review board of Shiga University of Medical Science (R2017-160). The EEG data were re-referenced using the average reference before analysis. 60 second-epochs prior to DEB period (pre-DEB) and 60 second-epochs in REM sleep periods with no DEB and the least submental EMG activity (non-DEB) were extracted for analyzed intervals. Spectral analysis and connectivity analysis were conducted among the EEG channels in the following six frequency bands: delta (0.5-4.0 Hz), theta (4-8 Hz), alpha (8-12 Hz), sigma (12-15 Hz), beta (15-30 Hz), gamma (30-50 Hz). In the connectivity analysis, coherence and phase locking value (PLV) were used as connectivity metrics, which evaluates the consistency between two different signals considering the phase delay. We adopted a Wilcoxon signed-rank test for comparison, and corrected significance level by a false discovery rate to deal with a multiple testing problem. A two-tailed $p < 0.05$ after the multiple testing correction was considered statistically significant.

In addition, patients were classified into two groups following their severity of DEB: with fierce and complicated behaviors (demonstrative group) and with calm and simple behaviors (non-demonstrative group). The ratio of the functional connectivity metrics of pre-DEB to non-DEB interval was compared between the two groups.

Results: The significant increases of the powers at F3 delta ($p = 0.006$), F4 gamma ($p = 0.011$), and O2 gamma ($p = 0.015$) were found in pre-DEB. The coherences of F4-O2 ($p = 0.005$), C3-C4 ($p = 0.009$), and C4-O1 ($p = 0.020$) in the beta band and F3-C3 ($p=0.005$) in the gamma band, and the beta band PLVs of F4-C3 ($p = 0.002$), F4-O1 ($p = 0.012$), F4-O2 ($p = 0.023$), C3-C4 ($p = 0.009$), and C4-O1 ($p = 0.036$) were significantly increased. The ratio of PLV in beta band of F4-O2 ($p = 0.019$) in pre-DEB to non-DEB interval was significant in non-demonstrative group than demonstrative group.

Conclusion: The EEG analysis of patients with iRBD revealed that the beta band connectivity was increased in pre-DEB, and the level of the increase was more pronounced in the non-demonstrative group. The findings of this study may contribute to identify DEB and prevent injuries.

Characterization of gait patterns in prodromal Parkinson's disease in free-living conditions using wrist-worn actigraphy

A. Brink-Kjaer[1], S.D. Wickramaratne[2], S. Marwaha[2], P. Jennum[3], E. Mignot[4], A. Parekh[2], E. During[2,5]
[1]Technical University of Denmark, Department of Health Technology, Kongens Lyngby, Denmark, [2]Mount Sinai School of Medicine, Department of Medicine, New York City, United States, [3]Glostrup University Hospital, Danish Center for Sleep Medicine, Glostrup, Denmark, [4]Stanford University, Department of Psychiatry and Behavioral Sciences, Stanford, United States, [5]Mount Sinai School of Medicine, Department of Neurology, New York City, United States

Introduction: Motor impairment manifests early in Parkinson's disease (PD) and can often be detected in people with isolated REM sleep behavior disorder (iRBD). However, practical assessment of motor impairment has thus far been limited to clinical settings, utilizing procedures that are not transferable to home environments. These tests have primarily relied on hip-worn smartphones with gyroscopes or invasive sensors attached to the lower back, which are neither practical nor scalable. Free-living, passive actigraphy recording with wrist-only sensor(s) can differentiate patients with PD versus controls; however, no studies have been conducted in patients with iRBD, a population with more subtle motor deficits. In this study, we aimed to detect and characterize ambulation patterns in iRBD using continuous wrist actigraphy over several days in a home setting.

Materials and Methods: We first developed a reliable model for detecting ambulation bouts using a triaxial wrist accelerometer (Axivity-6, recording at 25-100Hz) in a sample of 8 healthy volunteers. Participants wore the device for 24-48 hours and marked each walking or running bout. A model was then developed using data from 7 subjects and tested on one. The model provides a walking score in successive 10-second periods based on the autocorrelation of acceleration magnitude. For all detected bouts, the average and within-bout standard deviation of cadence and arm swing amplitudes were derived. Walking and running cadences were defined as $60 - 119$ and $120 - 199$ steps/min, respectively. We then applied this automated pipeline to a dataset that included ≥ 5 days of continuous actigraphy in 38 polysomnography-confirmed iRBD patients (68.0 ± 6.5 years) from the Stanford Sleep Center and 109 age- and sex-matched controls (66.2 ± 7.0 years) from the UK Biobank.

Results: In a carefully annotated independent test actigraphy recording, the walking detector achieved 77 % sensitivity and 90 % precision. Patients with iRBD spent on average less time walking (13.5 ± 15.0 min, 18.2 ± 15.0 min, $p = 0.014$) and running (0.7 ± 1.7 min, 2.5 ± 4.8 min, $p = 0.00013$) daily. In the iRBD group, the walking cadence was significantly lower (96.3 ± 8.7 steps/min, 101.7 ± 6.4, $p = 0.0004$), as well as arm swing amplitudes, both during walking (0.82 ± 0.16 g, 0.92 ± 0.15 g, $p = 6.1e-05$) and running (1.07 ± 0.58 g, 1.29 ± 0.73 g, $p = 0.027$). The variation in running cadence was higher in iRBD (26.2 ± 24.9, 17.3 ± 14.3, $p = 0.034$).

Conclusions: Passive gait monitoring using wrist actigraphy is feasible and can detect subtle motor changes in iRBD that may reflect parkinsonism and early-stage PD. This approach is cost-effective, scalable, and could be used in combination with other actigraphy features or biomarkers to predict neurodegenerative progression. Future studies will evaluate the validity of this approach by comparing it to gold-standard in-clinic motor/gait testing, and measure sensitivity to changes in longitudinal cohorts.

Fully automated detection of isolated rapid-eye-movement sleep behavior disorder using actigraphy

A. Brink-Kjaer[1], J. Winer[2], J.M. Zeitzer[3], H.B.D. Sorensen[1], P. Jennum[4], E. Mignot[3], E. During[5]
[1]Technical University of Denmark, Department of Health Technology, Kongens Lyngby, Denmark, [2]Stanford University, Department of Neurology, Stanford, United States, [3]Stanford University, Department of Psychiatry and Behavioral Sciences, Stanford, United States, [4]Glostrup University Hospital, Danish Center for Sleep Medicine, Glostrup, Denmark, [5]Mount Sinai School of Medicine, Department of Neurology, New York City, United States

Introduction: Isolated rapid-eye-movement sleep behavior disorder (iRBD) is caused by motor disinhibition during REM sleep and is a prodromal stage of α-synucleinopathy, more often Parkinson's disease or dementia with Lewy bodies. Screening questionnaires for RBD lack specificity due to other sleep disorders causing abnormal movements or behaviors at night. Nocturnal wrist actigraphy has shown potential for detecting iRBD by measuring sleep-related twitching activity. This approach requires knowledge of sleep timing and thus relies on sleep diaries, which are not always available or convenient. Our aim was to detect iRBD exclusively using actigraphy data via an automated pipeline combining two sets of actigraphy features of iRBD, one related to abnormal nighttime twitching activity and another associated with 24-hour rhythm disruption.

Materials and Methods: In a subsample of 8 individuals with iRBD measured with concurrent actigraphy and polysomnography, a sleep period detector was optimized based on activity measures. Moreover, heuristic rules were used to identify non-wear or quiet resting based on skin temperature, timestamp, and imputed sleep periods. The nighttime actigraphy model was optimized using 1, 30, or 60-second resolutions for activity counts with automated detection of sleep periods in a dataset of 42 polysomnography-verified individuals with iRBD and 42 controls recruited at the Stanford Sleep Center. The 24-hour rhythm disruption features were extracted using the biobankAccelerometerAnalysis, nparACT, and cosinor2 software packages and combined in a model that was optimized using a subset of 38 individuals with iRBD using continuous actigraphy (including daytime) data and 110 age-, sex-, and body-mass-index-matched controls without a diagnosis of Parkinson's disease or dementia from the UK Biobank.

Results: In comparison to sleep diary-defined sleep periods, sleep onset was detected with a mean absolute error of 44.6 ± 35.1 minutes, showing more accurate detections than a set of previously proposed methods using these data. The iRBD and controls could be distinguished by both the nighttime (area under the receiver operating characteristic curve [AUC] of 0.916, 0.897, and 0.910 for the 1, 30, and 60-second resolution, respectively) and 24-hour rhythm features (AUC of 0.856). The most discriminative 24-hour rhythm feature was the ratio of the most and least active consecutive 10- and 5-hour periods, respectively. When the iRBD classifiers were fused using logistic regression, they achieved 73.7 % sensitivity, 98.2 % specificity, and an AUC of 0.954. Moreover, our results indicated that at least 4 nights were necessary for the nighttime model for optimal performance.

Conclusions: These findings support the feasibility of a fully automated method for the detection of iRBD using wrist wearables in the general middle-aged and elderly population. Future studies should investigate if heart rate measurements could improve diagnostic performance and validate this screening method using in-lab polysomnography and established biomarkers of α-synucleinopathy.

Influence of REM sleep behavior disorder on the risk of falls in the older adult: a systematic review

A.R. Silva[1], M. Meira e Cruz[2,3,4], C. Villa Nova Aguiar[1], C.M. Guimarães[1], C. Salles[1,5,6]
[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]University of Lisbon, Sleep Unit, Cardiovascular Center, Faculty of Medicine in Lisbon, Lisbon, Portugal, [3]European Sleep Center, Lisbon, Portugal, [4]College Sao Leopoldo Mandic, Campinas, Brazil, [5]Federal University of Bahia, Salvador, Brazil, [6]Jorge Amado University Center, Salvador, Brazil

Introduction: Population aging is a global phenomenon, and by 2025 the population worldwide is expected to reach 9.7 billion people, with an older adult population growth rate higher than 3% per year. Falls are one of the leading causes of mortality in the older adult, with an annual incidence ranging from 30% to 50% in this age group. REM sleep behavior disorder (RBD) is a parasomnia characterized by dream representation behaviors that arise during the loss of REM sleep atonia. RDB is a common disorder in the older adult population, affecting more than 6% of this age group, and may be associated with motor manifestations such as falls. Despite its prevalence in the older adult, the existing evidence on the relationship between RBD and falls is still inconsistent. The objective of this study was to evaluate the influence of REM sleep behavior disorder on the risk of falls in the older adult.

Materials and Methods: This is a systematic review that was carried out according to the PRISMA 2020 protocol. The search in the databases (PubMed, Embase, Cochrane) included the following DeCS/MeSH terms: "Rapid eye movement sleep behavior disorder"; "elderly", "falls". This review included cross-sectional studies, older adult aged 65 years or older, and studies that evaluated REM sleep behavior disorder assessed through questionnaires and the occurrence of unintentional falling on the floor or lower in the previous 5 years. Studies involving sleep inducers, letters, abstracts, and proceedings were excluded.

Results: The total sample of this systematic review consisted of 7,978 older adult people. The results showed that the older adult with RBD had a 2.57 times higher risk of falls compared to the older adult without this condition (OR=2.57, 95% CI: 1.46-4.31). In addition, the research revealed a higher prevalence of falls among women (61.4%), single seniors (72%), and individuals living alone (89.2%). Factors correlated with the incidence of falls were identified, including difficulty falling asleep, poor sleep quality, difficulty maintaining sleep, daytime sleepiness, and shorter sleep duration.

Conclusions: This study revealed robust evidence supporting the adverse effects of RBD in increasing fall risk in the older adult population. These findings highlight the importance of incorporating sleep-related assessments and interventions into fall prevention strategies for this demographic group. It is essential to consider that RBD and the risk of falls in the older adult require efforts by the scientific/medical community to attempt to understand and prevent either RBD or episodes of falls in this population.

Insights into different pathways of motor events and vocalization during REM sleep in Parkinson's disease

Y. Shen[1], H.-X. Li[1], C.-F. Liu[1]
[1]The Second Affiliated Hospital of Soochow University, Suzhou, China

Objective: The aim was to analyze the correlates of REM events and related factors in Parkinson's Disease.

Methods: 100 polysomnographic records of Parkinson patients were analyzed. The effect of gender, disease duration, age, medication, clinical symptoms and polysomnographic variables on events during REM sleep was assessed.

Results: Motor or vocalization events during REM sleep were observed in 88(88%) patients and REM motor events were observed in 76(76%) patients. Among patients with motor events, 44 (58%) showed elementary movements only, while 32 (42%) showed complex behavior. Male(P=0.006), higher H-Y stage(P=0.049), lower levodopa equivalent dose(P=0.035), were related to higher probability of REM motor events. RBD-HK showed no significant difference between patients with and without motor events during REM sleep. Vocalization were not affected by factors above.

Conclusion: There may be different pathways for movement and vocalization during REM sleep in patients with RBD, while motor pathway can be inhibited by anti-PD drugs. Shorter REM latency may induce abnormal behaviors during REM sleep.

Keywords: Parkinson's disease; REM sleep; movement, vocalization.

Isolated REM sleep without atonia in early-stage Parkinson's disease is not synonymous of REM sleep behavior disorder

P. Dodet[1,2], M. Houot[3,4,5], S. Leu-Semenescu[1,2], R. Gaurav[1,6], J.-C. Corvol[1,4,3], S. Lehéricy[1,6], M. Vidailhet[1,4], E. Roze[1,4], I. Arnulf[1,2]
[1]Sorbonne University and Paris Brain Institute, Paris, France, [2]Sleep Unit, Pitié-Salpêtrière Hospital, Paris, France, [3]Clinical Investigation Centre (CIC) Neuroscience, Paris, France, [4]Center of Excellence of Neurodegenerative Disease, Paris, France, [5]Institute of Memory and Alzheimer's, Department of Neurology, Paris, France, [6]Department of Neuroradiology, Paris, France

Introduction: In patients at early-stage of Parkinson's disease (PD), REM sleep without atonia (RSWA) is observed on sleep recording in half of cases but is associated with reports of nocturnal agitation confirming REM sleep behavior disorder (RBD) in only half of these cases. In the other cases, RSWA does not meet the criteria for RBD and might be considered as isolated, even if gentle motor behaviors can be associated. While RBD predicts poor cognitive and motor outcome, the clinical significance of isolated RSWA (iRSWA) has been poorly studied in early-stage PD patients. In a prospective cohort of participants with early PD, we evaluated whether iRSWA could be considered as a mild form of RBD and evolve similarly over time.

Materials and Methods: Participants (n= 159) with early PD were prospectively recruited and followed from November 2014 to March 2021. They underwent clinical interviews every year for 4 years and a videopolysomnography at baseline. Isolated RSWA was defined as a REM sleep without atonia on chin greater than 9% and no history or video-based violent behaviors. The clinical characteristics and the signal intensity of locus coeruleus/ subcoeruleus complex (LC/LsC) were compared at baseline. Additionally, the clinical course over 4 years of follow-up was compared between groups with normal REM sleep, with isolated RSWA and with RBD at baseline.

Results: 76 PD patients (47.8%) had no RSWA or RBD (normal REM sleep), 42 (26.4%) had isolated RSWA and 41 (25.8%) had RBD. The signal intensity of LC/LsC was higher and non-motor symptoms were less prevalent in participants with isolated RSWA than with RBD. Participants with normal REM sleep and with isolated RSWA had a similar cognitive and motor course after 4 years of follow up, whereas participants with RBD had greater cognitive and motor decline.

Conclusions: iRSWA are frequent in early PD but is not a milder form of RBD. Patients with iRSWA and RBD have distinct baseline characteristics and clinical trajectories and should thus be distinguished in clinical routine and research protocols.

Logistic regression model for orthostatic hypotension detection in REM sleep behavior disorder using heart rate variability

S. Saeda[1], K. Fujiwara[1], T. Yamakawa[2], Y. Sumi[3], H. Kadotani[3]
[1]Nagoya University, Nagoya, Japan, [2]Nara Institute of Science and Technology, Ikoma, Japan, [3]Shiga University of Medical Science, Otsu, Japan

Introduction: Orthostatic hypotension (OH) is a typical autonomous dysfunction in patients with idiopathic REM sleep behavior disorder (iRBD). OH leads to cause dizziness and falls. Disability due to falls should be avoided because it leads to a decrease in quality of life. The orthostatic challenge test evaluates the severity of OH and the autonomous nervous dysfunction by measuring blood pressure (BP) decreases between the supine and standing positions. However, it is difficult to perform the orthostatic challenge test in daily life since it requires medical staffs and safety ensuring during the test. Thus, a new method for evaluating the severity of OH that can be performed easily and safely should be developed. Heart Rate Variability (HRV) is a physiological phenomenon that reflects the autonomous nervous function. A previous study showed that supine position HRV has the potential to distinguish 3 groups: healthy controls, iRBD with or without OH. In this study, we developed machine learning models that estimate the presence of OH in patients with iRBD from HRV features measured in the supine position.

Method: We recruited healthy subjects and patients with iRBD between December 2017 and August 2019. Experiments were conducted at Shiga University of Medical Science. We used a wearable heart rate sensor to measure R-R interval (RRI) data of iRBD patients during the orthostatic challenge test. The criteria of OH in this study were as follows: (1) a decrease of systolic BP ≥20 mm Hg, or a decrease of diastolic BP (dBP) ≥10 mm Hg in comparison with the baseline BP at one or three min after standing, (2) a decrease in systolic BP to <90 mm Hg, or (3) manifestation of any clinical symptom including falling, dizziness, blurry vision, syncope, and nausea. The numbers of patients with OH (-) and OH (+) were thirteen and nine, respectively. This data collection and analysis were approved by the ethical committee at the Shiga University of Medical Science (R2017-199). The six HRV features were extracted from the measured RRI data for five minutes in the supine position. We trained machine learning models that classify patients into OH (-) or OH (+) from the HRV features. The training and validation data were randomly exchanged ten times to verify the classification performance. We tried a Logistic Regression Model (LRM), a Neural Network (NN), and a Support Vector Machine (SVM).

Result: The average classification performances were as follows: the accuracy of 0.78, the F-measure of 0.73, and the AUC of 0.85 in LRM, the accuracy of 0.72, the F-measure of 0.60, and the AUC of 0.83 in NN, and the accuracy of 0.72, the F-measure of 0.62, and the AUC of 0.60 in SVM.

Conclusion: In this study, we developed machine learning models that estimate the presence of OH in iRBD patients using HRV. The developed model will enable to avoid the orthostatic challenge test when the autonomous nervous dysfunction of patients is evaluated, which reduces the burdens in hospitals. In future works, we will develop a model including the healthy controls.

Low-dose trazodone for REM behavior disorder: report of three cases

J. Barrow[1], M. Vendrame[2]
[1]University of South Florida Health Morsani College of Medicine, Tampa, United States, [2]Lehigh Valley Fleming Neuroscience Institute, Allentown, United States

Introduction: Rapid Eye Movement Sleep Behavior Disorder (RBD) is a sleep disturbance characterized by the absence of regular paralysis during REM sleep, accompanied by dream enactment behavior. REM sleep without atonia (RSWA) is characterized by increased phasic or tonic muscle activity seen on polysomnographic electromyogram channels. The available pharmacotherapy options for treating RBD are limited, and the utilization of antidepressants is a subject of controversy.

Materials and methods: We reviewed three cases of RBD which showed improvements of symptoms after starting therapy with trazodone. The three patients were diagnosed with isolated RBD, confirmed with RSWA on PSG, and on exam had no features suggesting Parkinson's disease or other alpha-synucleopathies.

Results: Patient 1 is a 74-year-old man referred to our clinic because of a 12-month history of refractory RBD. Prior treatments were melatonin, clonazepam and rivastigmine transdermal patch. Trazodone 100mg every night reduced the frequency of events to 1 per week or less, and this benefit was maintained at 4-month follow up.

Patient 2 is a 56-year-old man with the only history of mild depression who presented with a 4-month history of RBD after starting fluoxetine. Symptoms improved after stopping fluoxetine, but two months later he experienced recurrent symptoms at least twice a week. He was started on trazodone 50 mg. A dose of 100mg provided a decreased in episodes to 1 per month noted at his 4-month follow up.

Patient 3 is a 38-year-old man with the only history of post-traumatic stress disorder (PTSD) who was referred by psychiatry for a 6-month history of possible nightmares refractory to prazosin therapy. Patient had video-monitor himself and provided multiple video recordings showing himself kicking and shouting for about 5 to 15 minutes, occurring about 3 times per week. He started trazodone 50mg nightly. Psychiatry services followed him monthly and increased trazodone to 100mg at night. At this dose, there were no reported events during the nocturnal video-recordings. This benefit was still noted after 6 months.

Conclusions: These three cases with likely isolated RBD showed amelioration of their symptoms with therapy with nightly low-dose trazodone. Doses of trazodone 50-100 mg per night over 4-6 months resulted in significant clinical improvement. These cases highlight that trazodone could serve as a treatment for isolated RBD that does not respond to traditional therapies.

Preliminary data on the Prodromal Synucleinopathy Rating Scale among patients with REM sleep behavior disorder

B. Boeve[1], Q. Bui[2], H. De La Cruz[2], A. Avidan[3], D. Bliwise[4], M. Campbell[2], S. Criswell[5], A. Davis[2], J. Elliott[6], K. Ehgoetz-Martens[7], T. Ferman[8], J. Fields[1], L. Forsberg[1], J.-F. Gagnon[9], Z. Gan-Or[9], M. Howell[10], M. Hu[11], D. Huddleston[4], K. Kantarci[1], P. Kotzbauer[2], J. McLeland[2], M. Lim[6], V. Lowe[1], M. Miglis[12], E. Mignot[12], T. Miyagawa[1], A. Pelletier[9], O. Ross[8], W. Singer[1], E. St. Louis[1], A. Videnovic[13], C. Xiong[2], R. Postuma[9], Y.-E. Ju[2]

[1]Mayo Clinic, Rochester, United States, [2]Washington University, St. Louis, United States, [3]University of California, Los Angeles, Los Angeles, United States, [4]Emory University, Atlanta, United States, [5]Barrow Neurological Institute, Phoenix, United States, [6]Oregon Health and Science University, Portland, United States, [7]University of Waterloo, Waterloo, Canada, [8]Mayo Clinic, Jacksonville, United States, [9]McGill University, Montreal, Canada, [10]University of Minnesota, Minneapolis, United States, [11]University of Oxford, Oxford, United Kingdom, [12]Stanford University, Palo Alto, United States, [13]MGH/Harvard University, Boston, United States

Introduction: Clinical trials involving patients with REM sleep behavior disorder (RBD) are anticipated in the near future, in which interventions to delay the onset or prevent the development of an overt synucleinopathy such as Parkinson's disease (PD), dementia with Lewy bodies (DLB) or multiple system atrophy (MSA) will be tested. There is no clinical rating scale that adequately captures the spectrum and degree of cognitive, neuropsychiatric, motor, autonomic, sleep and sensory abnormalities that occur prior to or upon phenoconversion to PD, DLB or MSA. The Prodromal Synucleinopathy Rating Scale (PSRS) has been developed to capture the breadth and evolution of clinical burden in those with RBD.

Materials and methods: North American Prodromal Synucleinopathy (NAPS) Consortium investigators developed the PSRS, in which ratings for no symptoms/signs (score of 0) to more severe symptoms/signs (maximum score of 4 for the cognitive or COG, neuropsychiatric or NP, motor-axial or MAX, motor-appendicular or MAP, and the autonomic or AUT domains, and maximum score of 2 for the sleep or SLP and sensory or SEN domains) are determined based on clinical judgement. PSRS ratings were generated on consecutive participants (pts) at the most recent visit conducted 8/2022 to 5/2023, which includes some pts who have progressed since initial NAPS enrollment. Spearman correlations were generated between the ratings for each domain, and the total score (SUM), with several measures that reflect similar constructs.

Results: Data from 102 pts in NAPS with RBD (82% male, mean age 66±10 yrs, mean education 16±2 yrs) were analyzed. The clinical diagnoses from the cognitive perspective were normal cognitive functioning (53%), mild cognitive impairment (24%), DLB (5%), or other (18%); motor diagnoses were normal motor functioning (38%), mild motor impairment (31%), parkinsonism but not PD (9%), PD (5%), or other (17%); diagnoses from the autonomic perspective were normal autonomic functioning (59%), mild autonomic impairment (24%), autonomic dysfunction related to pure autonomic failure or PD or DLB or MSA (12%), or other (5%). The following correlations were determined: COG and Montreal Cognitive Assessment score (r=-0.35), Clinical Dementia Rating Sum of Boxes score (r=0.76) and cognitive diagnosis (r=0.76, p<0.001 for each); NP and modified Neuropsychiatric Inventory (r=0.26, p<0.05); both MAX and MAP and the MDS-UPDRS Motor score (r=0.62, 0.69) and motor diagnosis (r=0.58, 0.67, respectively, p<0.0001 for each); AUT and Scales for Outcomes in Parkinson's Disease-Autonomic Dysfunction (r=0.21, p<0.05) and autonomic diagnosis (r=0.67, p<0.0001); and SEN and Brief Smell Identification Test (r=-0.74, p<0.0001). The PSRS SUM was correlated with Functional Assessment Scale score (r=0.44), Schwab and England Activities of Daily Living score (r=-0.56), Clinician Global Impression Severity score (r=0.64), and NAPS General Staging Severity score (r=0.59, p<0.0001 for each).

Conclusions: The data from this preliminary cross-sectional analysis suggest strong correlations between the PSRS ratings and many other measures of clinical burden. Additional work is needed in a larger number of patients, particularly longitudinally, to determine if the PSRS will be a useful marker of synucleinopathy clinical burden for future trials in those with RBD.

Prevalence of rem sleep without atonia in the São Paulo Epidemiologic sleep study

G.N. Pires[1,2], M. Cesari[3], A. Stefani[3], M.L. Andersen[1,2], D. Poyares[1,2], B. Högl[3], S. Tufik[1,2]
[1]Universidade Federal de São Paulo, Departamento de Psicobiologia, São Paulo, Brazil, [2]Sleep Institute, São Paulo, Brazil, [3]Medical University of Innsbruck, Department of Neurology, Innsbruck, Austria

Introduction: REM sleep behavior disorder (RBD) is a parasomnia characterized by dream enactment behaviors and lack of muscle atonia during REM sleep. Its main polysomnographic feature is REM sleep without atonia (RWA), consisting of phasic muscle activity during REM sleep. Isolated RWA has been reported as an early biomarker of RBD, but its prevalence in the general population has not been established. This study aimed to assess the prevalence of RWA in São Paulo Epidemiologic Sleep Study (EPISONO) 4th edition, a population-based sleep study performed in the city of São Paulo, Brazil, between 2018 and 2019.

Materials and Methods: All participants underwent a full-night type-I polysomnography, with the addition of bilateral electromyogram (EMG) electrodes into the flexor digitorum superficialis (FDS) muscles. FDS EMG phasic activity was scored automatically. Each 30s-epochs of REM sleep were considered as positive for FDS phasic activity if they contained at least 5 3s-miniepochs of phasic muscle activity. Individuals were considered as positive cases of RWA whenever at least 7.7% of the total number of REM sleep epochs were positive for phasic FDS activity. The prevalence of RWA was adjusted for artifacts based on sensitivity values from clinical studies, by using the following correction indexes: 85% for REM-related apnea hypopnea index (REM AHI) <15 and 60% for REM AHI≥15.

Results: From EPISONO total sample (n=769), 632 participants were considered eligible for FDS analysis (men: 39.9%). EMG analysis identified 68 RWA positive cases, resulting on an adjusted prevalence of 8.06% [CI95%: 6.98%-9.14%]. Among these, 52.9% were men and the average age of cases was 50.87±15.57. The prevalence among men was 10.48% [CI95%: 8.55%-12.41%] and among women was 6.46% [CI95%: 5.20%-7.72%]. Positive cases of RWA were associated with both male sex (X^2=5.43, p=0.020) and older age (X^2=15.3, p=0.009), with a prevalence of 25.0% in those with 70 years old or more. Positive RWA cases presented decreases in total sleep time (RWA: 337.48±82.74; control: 358.02±72.09, t=6.52, p=0.011), REM sleep time (RWA: 65.13±31.60, control: 77.28±32.23, t=9.52, p=0.002), and REM sleep percentage (RWA: 18.65±7.24, control: 21.04±6.65, t=7.00, p=0.008), and increases in wake after sleep onset (RWA: 98.18±60.49, control: 83.78±52.29, t=5.24, p=0.022) and total awake time (RWA: 132.53±81.05, control: 112.42±66.55, t=5.69, p=0.017).

Conclusions: The prevalence of RWA on the EPISONO sample was estimated in 8.06%, being more common among men and older adults, corroborating the traditional RBD profile observed in clinical settings. Polysomnographic alterations in RWA cases include reduced REM sleep and increased wake after sleep onset. This study is the first population-based study to use FDS EMG analysis to estimate RWA, and the results contribute to characterize RWA as an early marker of RBD.

REM sleep without atonia comorbid with obstructive sleep apnea after positive airway pressure treatment

G. Benbir Senel[1], A. Tunali[1], O. Demirel[1], D. Karadeniz[1]
[1]Istanbul University-Cerrahpasa, Faculty of Medicine, Department of Neurology, Sleep and Disorders Unit, İstanbul, Turkey

Introduction: It was proposed that rapid eye movement (REM) sleep without atonia (RSWA) may play a protective role against obstructive sleep apnea (OSA).[1] Nevertheless, RSWA or REM sleep behavior disorder (RBD) may be combined with OSA,[2] and the pattern of temporal association between RSWA and apnea-hypopnea events was reported to be related with the improvements in RBD symptomatology following positive airway pressure (PAP) therapy.[3]

Methods and Results: In this study, we reviewed all 13,392 polysomnographic (PSG) recordings performed within the last 15 years in our Sleep and Disorders Unit, since the American Academy of Sleep Medicine (AASM) Manual for the Scoring of Sleep and Associated Events was first released in 2007. Of these, 5705 were titration night, and 7687 of them were the first night diagnostic PSG. RSWA were reported in 810 patients. Among them, patients with known neurodegenerative diseases (such as Parkinson's disease or multiple system atrophy), history of stroke, or those diagnosed as having narcolepsy, parasomnia overlap syndrome were excluded. Patients with isolated RSWA (or isolated REM sleep behavior disorder) were also excluded. We collected 516 patients with OSA and RSWA at the first diagnostic night. One hundred and twenty-two patients with OSA+RSWA had mild OSA (apnea-hypopnea index (AHI) <15/hour), and 394 had moderate-to-severe OSA (AHI$\geq$15/hour). Of these, 309 patients had a second night PSG for the manual titration of the positive airway pressure (PAP). It was observed that RSWA persisted in 98/309 patients with OSA+RSWA.

Conclusions: In this study, we aimed to further investigate the peculiar clinical and PSG characteristics in patients with persisting RSWA, and to analyze the patterns of temporal association between REM atonia and apnea-hypopnea events.

Acknowledgements:

1. Jo S, Kim HW, Jeon JY, Lee SA. Protective effects of REM sleep without atonia against obstructive sleep apnea in patients with idiopathic REM sleep behavior disorder. Sleep Med. 2019;54:116-120.
2. McCarter SJ, St Louis EK, Duwell EJ, Timm PC, Sandness DJ, Boeve BF, Silber MH. Diagnostic thresholds for quantitative REM sleep phasic burst duration, phasic and tonic muscle activity, and REM atonia index in REM sleep behavior disorder with and without comorbid obstructive sleep apnea. Sleep. 2014;37(10):1649-62.
3. Lee WJ, Sunwoo JS, Byun JI, Kim HJ, Lee ST, Jung KH, Park KI, Chu K, Kim M, Lee SK, Schenck CH, Jung KY. Isolated rapid eye movement sleep behavior disorder combined with obstructive sleep apnea: response to treatment and its associated factors. Sleep Med. 2022;91:75-83.

Sex affects REM sleep behavior disorder identification: a comparative analysis of clinical data, screening questionnaires and REM sleep without atonia in women and men

A. Ibrahim[1], M. Serradell[2], M. Cesari[1], C. Gaig[2], E. Holzknecht[1], P. Marrero[2], E. Brandauer[1], L. Pérez-Carbonell[2], M. Bergmann[1], A. Fernández-Arcos[2], N. Matos[2], J. Santamaria[2], B. Högl[1], A. Iranzo[2], A. Stefani[1]
[1]Medical University of Innsbruck, Department of Neurology, Innsbruck, Austria, [2]Hospital Clinic de Barcelona, IDIBAPS, CIBERNED, Neurology Service, Barcelona, Spain

Introduction: Accurate REM sleep behavior disorder (RBD) diagnosis is essential due to the risk of injuries, and as isolated RBD is an early alpha-synucleinopathy. Although RBD is more frequently reported in men, some epidemiological studies reported equal prevalence in both sexs, suggesting underdiagnosis in women. This study investigated sex differences in RBD identification by evaluating clinical data, the performance of three validated RBD screening questionnaires, and REM sleep without atonia (RWA).

Materials and Methods: In this bicentric prospective study, 300 subjects (159 men and 141 women) referred to a sleep center for the first time, completed three RBD screening questionnaires, i.e. RBD screening questionnaire (RBDSQ), RBD single question (RBD1Q), and Innsbruck RBD inventory (RBD-I) before sleep expert interview, and underwent 8-hour video polysomnography (V-PSG) to confirm/exclude RBD diagnosis. Clinical history, questionnaires, and RWA were compared between men and women with and without RBD.

Results: Among RBD patients (N =30 (10.0%), women: 12(8.5%), men: 18(11.3%), P= 0.446), women were less likely to have bed partners (P=0.002) and to report abnormal sleep behaviors (P=0.006). Additionally, women had a higher SINBAR score compared to men (P =0.035). In the whole cohort, more women than men were above the cut-off for at least one RBD questionnaire (74.5% vs. 63.5%, P=0.046) and RWA quantification revealed lower flexor digitorum superficialis activity in women (P=0.003). Only for men, being above the published cut-off for all three RBD questionnaires was associated with RBD diagnosis (RBD1Q: Log odds ratio (LOR) 95% CI 2.837 (1.716 - 4.347), p <0.001; RBDSQ: LOR 3.076 (1.671 - 5.362), p= 0.003; RBD-I: LOR 3.076 (1.671 - 5.362), p= 0.003). For women, only being above the RBD-I was associated with RBD diagnosis (LOR 1.812 (0.635 - 3.347), p= 0.023). All RWA scores, except chin tonic, had a higher identification performance for women compared to the questionnaires (AUC >0.82 for all variables) and comparable identification performance for men.

Conclusions: This study demonstrated sex-related variability in RBD screening questionnaires, probably related to sex-specific differences in RBD awareness, likely affecting referral to V-PSG. These findings emphasize the need for sex-specific approaches for RBD screening and diagnosis.

Stratification of patients with idiopathic Rem Behavior Disease patients (iRBD) based on principal component analysis and multivariate machine learning models: an useful statistical tool for clinical decision making in Parkinson's disease

A. Garay[1], D.L. Giardino[1], C. Huck-Iriart[2], P.M. Gonzalez[3], P.A. Aguirre[3], J.P. Fededa[3], C. Peralta[1], S.M. Valiensi[4], V. Barrachina[1]
[1]Centro de Educación Médica e Investigaciones Clínicas "Norberto Quirno" (CEMIC), Unidad de Medicina del Sueno-Sección Neurología, Buenos Aires, Argentina, [2]Universidad Nacional de San Martín (UNSAM), Buenos Aires, Escuela de Ciencia y Tecnología (ECyT), San Martín, Argentina, [3]Universidad Nacional de San Martin (UNSAM)-CONICET, Buenos Aires, Instituto de Investigaciones Biotecnológicas-Escuela de Ciencia y Nanotecnologías (EByN), San Martín, Argentina, [4]Hospital Italiano, Medicina del Sueño, CABA, Argentina

Introduction: According to countless clinical studies on rates and predictors of phenoconversion, more than 80% of patients diagnosed with RBD will eventually develop some form of synucleinopathy, with a conversion rate from iRBD to neurodegenerative disease of 6.3% by year. To date, however, there is no reliable pool of biomarkers that predict the phenoconversion into α-synucleinopathy, the timing in which this can occur, and the phenotype of α-synucleinopathy. In this study, we analyzed clinical and laboratory variables in patients with Parkinson's disease, iRBD, and healthy volunteers and performed principal component analysis (PCA) and multivariate models (PCA-MV) as a statistical strategy for stratification of patients at risk of phenoconversion to PD.

Materials and Methods: We analyzed baseline clinical and laboratory data (neurological assessment (Hoehn and Yhard scale-HY and Unified Parkinson's Disease Rating Scale-UPDRS III), cognitive assessment scales (MOCA, MMSE, SCOPA cog), autonomic assessment scales (SCOPA-AUT), assessment of depressive symptoms (BECK Depression Inventory), Color vision test (Farnsworth Munsell 100 Hue), assessment of wakefulness and sleep (Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS) and Hong Kong Screening Questionnaire (RBDQ-HKQ), positive polysomnographic and/or video-polysomnographic evaluation and plasma detection of micro RNAs (miRNA27/29), in 56 patients (Parkinson's disease group (n=16), iRBD group (n=22) and healthy volunteers (n=18). Demographic and clinical measures were compared using factorial analysis of variance (ANOVA) using one-way ANOVA or two-way ANOVA test as appropriate. Logistic regressions and ANOVA were done using Python Libraries. P-values of less than 0.05 were considered statistically significant. Principal Component Analysis (PCA) algorithms were used for reducing the dimensionality of the data set and supervised machine learning algorithms such as support vector machines (VM) and f1 scores were used for stratification.

Results: We classified by using supervised machine learning algorithms as logistic regression and PCA+MV. The correlation between them was first verified using Spearman's correlation for four selected variables (SCOPA AUTO/x miRNA/MMS/PSQI) where the p-value of the logistic regression was 8×10^{-5}. Through the Vector Machine method (VM) four different functions were used to evaluate the ability to separate between them where evaluated (f1-score = 0.92). Thus, the VM method showed that the Kernel radial functions predicted that 69% of patients with RBD belong to the same Parkinson's region.

Conclusions: The use of multivariate models of automatic learning by reducing the dimensionality of the data, allows to add multiple variables, classifying with greater precision similarities and differences between groups. The selected model predicted that 69% of iRBD patients are classified in the same region of the Parkinson's group. The use of this type of statistical method is proposed since they are adaptable to the clinical environment and will help in the determination of key variables and patient stratification in large data sets. Furthermore, this study proposes a "diagnostic fast track" for patients with iRBD and their inherent risk of Parkinson's disease.

[18F]FDG-PET as a biomarker for phenoconversion trajectories in idiopathic REM behavior disorder

B. Orso[1], P. Mattioli[1], E.-J. Yoon[2], Y.K. Kim[3], H. Kim[3], J.H. Shin[4], R. Kim[5], F. Famà[1,6], A. Donniaquio[1], F. Massa[1], A. Chiaravalloti[7,8], M. Fernandes[9], M. Spanetta[9], F. Placidi[9,10], M. Pardini[6,1], M. Bauckneht[6,11], S. Morbelli[6,11], J.-Y. Lee[12], C. Liguori[9,10], D. Arnaldi[6,1]

[1]University of Genoa, Department of Neuroscience, Rehabilitation, Ophthalmology, Genetics, Maternal and Child Health (DINOGMI), Genoa, Italy, [2]Seoul National University, Memory Network Medical Research Center, Seoul, Korea, Republic of, [3]Seoul National University Boramae Medical Center, Department of Nuclear Medicine, Seoul National University College of Medicine and Seoul Metropolitan Government, Seoul, Korea, Republic of, [4]Seoul National University College of Medicine, Department of Neurology, Seoul, Korea, Republic of, [5]Inha University Hospital, Department of Neurology, Incheon, Korea, Republic of, [6]IRCCS Ospedale Policlinico S. Martino, Genoa, Italy, [7]IRCCS Neuromed, Pozzilli, Italy, [8]University of Rome "Tor Vergata", Department of Biomedicine and Prevention, Rome, Italy, [9]University of Rome 'Tor Vergata", Department of Systems Medicine, Rome, Italy, [10]University Hospital "Tor Vergata", Sleep Medicine Center, Neurology Unit, Rome, Italy, [11]University of Genoa, Department of Health Science (DISSAL), Genoa, Italy, [12]Seoul National University Boramae Medical Center, Department of Neurology, Seoul, Korea, Republic of

Introduction: Rapid eye movement (REM) sleep behaviour disorder (RBD) is a parasomnia characterized by dream-like actions that emerge during REM sleep as a result of the loss of physiological muscle atonia. During follow-up, at least 70% of individuals with iRBD would eventually develop parkinsonism and/or dementia. Most iRBD patients show biological signs of synucleinopathy in the skin nerves and/or in cerebrospinal fluid, making this population the ideal target for testing disease-modifying therapies, once available. The possibility of knowing the phenoconversion diagnosis once the diagnosis of iRBD is confirmed might represent a crucial step for designing clinical trials. Therefore, here we studied the [18F]FDG PET imaging data of both de novo PD patients with RBD (PDRBD) and DLB with RBD (DLBRP) at baseline. Subsequently, we determined a denovoPDRBDRP and a DLBRBDRP, and explored their capability of differentiate between iRBD-PD converters, iRBD-DLB converters and iRBD who did not convert at follow-up, to gain insight into the phenoconversion trajectories, as well as their prediction power, in iRBD patients.

Materials and Methods: From 32 *de novo* PD (age 73.12±5.86, 22 males) and 30 *de novo* DLB patients (mean age: 78±4.4; 18 males) patients with polysomnographic evidence of RBD at diagnosis, we derived the PDRBD-related pattern (RP) and the DLBRBD-RP, using spatial covariance analysis (Scaled Subprofile Model Principal Component Analysis; SSM-PCA). We then applied these two patterns, separately, on a group of iRBD patients to explore [18F]FDG-PET phenoconversion trajectories prediction power.

Results: Visually the PDRBD-RP and the DLBRBD-RP showed areas of overlap, involving the putamen, middle temporal gyrus, inferior frontal gyrus, occipital areas, cerebellum and brainstem, all of the above bilaterally. Although the DLBRBD-RP had a more extensive pattern of posterior hypometabolism, and higher metabolism in the cerebellum. We enrolled 115 iRBD patients. At follow-up (time: 25.59±17.17), 42 patients (age 72.2±5; 31 males) developed overt neurodegenerative diseases (20 PD-converters and 22 DLB-converters), while 73 patients (age 68.9±6; 50 males; follow-up time: 43.2±27.6) remained free from parkinsonism/dementia. Receiver operating characteristic analyses showed that DLBRBD-RP expression significantly discriminated DLB-converters from PD-converters (Area Under the Curve, AUC=0.66, sensitivity=0.77, specificity=0.55), while the expression of the PDRBD-RP had a lower discriminating power (AUC=0.61, sensitivity=0.73, specificity=0.5). At survival analysis, both patterns significantly predicted the phenoconversion trajectories (PDRBD-RP adjusted Hazard Ratio, aHR=3.21, p=0.029, C.I.95%: 1.12-9.18; DLBRBD-RP aHR=3.52, p=0.034, C.I.95%: 1.09-11.27).

Conclusions: Both patterns showed a high sensitivity in discriminating iRBD phenoconversion trajectories. The association between DLBRBD-RP and DLB phenoconversion is stronger than PDRBD-RP and PD phenoconversion, underlying the power of the former in predicting DLB phenoconversion trajectory. [18F]FDG-PET could be a promising biomarker for studying phenoconversion trajectories in iRBD patients.

Towards fully automatic quantification of REM sleep without atonia according to the Sleep Innsbruck Barcelona (SINBAR) scoring method

I. Rechichi[1], G. Olmo[1], A. Stefani[2], A. Heidbreder[2,3], E. Holzknecht[2], M. Bergmann[2], A. Ibrahim[2], E. Brandauer[2], B. Högl[2], M. Cesari[2]
[1]Politecnico di Torino, Dept. Control and Computer Engineering, Torino, Italy, [2]Medical University of Innsbruck, Department of Neurology, Innsbruck, Austria, [3]Johannes Kepler University, Department of Neurology, Linz, Austria

Introduction: Rapid eye movement (REM) sleep without atonia (RWA) is the polysomnographic hallmark of REM Sleep Behavior Disorder (RBD). The state-of-the-art methods to score RWA are visual-based. Recent international guidelines recommended the Sleep Innsbruck Barcelona (SINBAR) method for scoring RWA in 3-s mini-epochs. This method calls for scoring phasic EMG activity in the flexor digitorum superficialis (FDS) and "any" (i.e., tonic and/or phasic) EMG activity in the mentalis muscle. A semi-automatic algorithm scoring RWA according to this method is currently available in a commercial polysomnographic system (BrainRT, OSG, Belgium), however it still requires manual removal of EMG artifacts from expert scorers.

This work proposes a novel method that, based on morphological aspects of EMG activity and machine learning (ML), discriminates activity from artifacts in the evaluation of RWA, thus allowing automatization for artifact correction.

Materials and Methods: We included video-polysomnography studies of 25 participants (8 RBD, 17 controls, aged 57.2 ± 14.9 years). An expert scorer selected 3-s mini-epochs for RWA scoring (956 ± 70) and the BrainRT for scoring phasic and "any" EMG activity was applied. Four independent expert scorers manually removed artifacts; probabilistic consensus of the four scorers was obtained.

The algorithm for automatic removal of artifacts consisted in the following. First, wavelet transform (biorthogonal mother wavelet, matching EMG activity waveform) was applied to the selected 3-s mini-epochs in the mentalis and FDS EMG signals. Second, the coefficients at the third level of decomposition were employed in the signal reconstruction process. Third, an index of correlation, expressed as ratio between the wavelet-reconstructed signal and the original signal, was computed. Fourth, an energy-based metric, expressed as the 90th percentile of the EMG activity, was computed. The correlation index and the energy-based metric were subsequently employed as features in a binary classification task, to automatically differentiate artifacts from the phasic and "any" activity; gold standard was the consensus scoring. Supervised ML models (support vector machine, K-nearest neighbour, linear discriminant analysis, and adaptive boosting) were explored. Seventeen participants were included in the training set and eight in the test set. The models' performances were evaluated with accuracy and F1-score.

Finally, RWA metrics – i.e., phasic mentalis, phasic FDS, any mentalis, SINBAR (i.e., any mentalis and/or phasic FDS – were computed on the automatically corrected EMG signals and compared with Pearson's correlation to the ones obtained by the consensus manually scoring.

Results: The explored ML models scored fairly good results. The best models yielded a F-1 score of 89.59% for phasic activity (mentalis and FDS muscles combined) and 76,56% for any.

Finally, score agreement between manually and automatically corrected data had Pearson's rho of 0.96, 0.82, 0.76 and 0.71 for phasic mentalis, phasic FDS, any mentalis and SINBAR indices on the test subjects, respectively.

Conclusions: The proposed method, based on EMG activity morphology and ML, showed promising results in discriminating artifacts from real phasic and any EMG activity for RWA quantification. This method promises fully automatic RWA quantification according to the SINBAR method.

Restless Legs Syndrome (RLS)

Association between restless legs syndrome and Alzheimer disease: a systematic review

C. Ribeiro[1], B. Cunha[1], A. Silva[2], M. Pereira[1], A. Silva[1], C. Salles[3]
[1]Bahiana School of Medicine and Public Health (EBMSP), International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]Bahiana School of Medicine and Public Health (EBMSP), Salvador, Brazil, [3]Bahiana School of Medicine and Public Health (EBMSP); Federal University of Bahia, Jorge Amado University Center, International Center of Clinical Sleep Medicine and Research, University Hospital Professor Edgar Santos, Salvador, Brazil

Introduction: An increase in the incidence of alzheimer disease (AD) has been observed, and restless legs syndrome (RLS) may be an early sign of the risk of this dementia.
Materials and Methods: This systematic review was conducted using the following descriptors: "Restless legs syndrome" and "Alzheimer disease". Inclusion criteria: studies evaluating the association between Alzheimer disease and restless legs syndrome. Studies involving secondary causes of RLS, abstracts, systematic reviews and conference proceedings were excluded.The objective of this study is to investigate the association between restless legs syndrome and Alzheimer disease.
Results: By searching the databases, 725 articles were found. Of these, 03 studies met the inclusion criteria. The main results observed were: Kim et al. conducted a Korean cohort study involving individuals aged ≥ 60 years, covering 12 years up to 2013. RLS was defined using ICD-10 code: G25.8. For diagnostic accuracy, patients with RLS were defined as those diagnosed at least twice with this code (n = 5,940); from these, the authors excluded those with a diagnosis of dementia before the first diagnosis of RLS (n = 586). In addition, all-cause dementia was defined as AD (ICD-10: F00 or G30). The study showed that the risk of all-cause dementia was 1.74 times higher in the RLS group than in the control group. Furthermore, the presence of RLS was significantly associated with an increased risk of AD (HR 1.38, 95% CI 1.11-1.72). The Kaplan-Meier survival curve with Gray's test revealed that the RLS group had a higher incidence of all-cause dementia than the control group during the observation period. In the study by Guarnieri et al., RLS was clinically defined when patients responded positively to four questions representing the criteria for the clinical diagnosis of RLS according to the International RLS Study Group. The diagnosis of dementia was made according to the DSM-IV-TR criteria. A total of 431 patients participated in the study, of whom 204 (47.3%) had AD, an average age of 70 years, and 6.1% had RLS. Guarnieri et al. found no association between RLS and AD. Lin et al. conducted a retrospective study to investigate the association between sleep-related movement disorders (SRMD) and the risk of dementia using data from the Longitudinal Health Insurance Database (Taiwan National Health Research Institute). A total of 604 patients diagnosed with SRMD and 2,416 controls matched by gender and age for comparison were included in this cohort study. Lin et al. reported a 5.769 higher risk (95% CI=2.01-6.12) of developing AD in individuals with sleep-related movement disorders (p<0.05).
Conclusions: This systematic review demonstrated that RLS is associated with an increased risk regarding the development of dementia. In this sense, further prospective studies investigating the actual association between these two conditions are essential. However, this study points out the need for preventive measures for AD in patients with RLS.

A transcriptome analysis of mRNAs in patients with Restless Legs syndrome

M.P. Mogavero[1], M. Salemi[2], G. Lanza[2], M.G. Salluzzo[2], A. Rinaldi[3], G. Marchese[3], L.M. DelRosso[4], O. Bruni[5], L. Ferini Strambi[1], R. Ferri[2]

[1]Vita-Salute San Raffaele University, San Raffaele Scientific Institute, Division of Neuroscience, Sleep Disorders Center, Milan, Italy, [2]Oasi Research Institute-IRCCS, Sleep Research Center, Troina, Italy, [3]Genome Research Center for Health-CRGS, Baronissi, Italy, [4]University of California San Francisco-Fresno, Fresno, United States, [5]Sapienza University of Rome, Developmental and Social Psychology, Rome, Italy

Introduction: Genetic studies of RLS, mostly based on genome-wide association studies, provided important clues on its biological basis; however, the transfer of information from genes to functions involves mRNAs, usually translated into protein. The analysis of the transcriptome, assessing the set of all RNA molecules in a biological material is also expected to provide important and complementary information on the genetics of RLS. For this reason, we carried out an exploratory study with the aim to analyze up- and down-regulated mRNAs in the blood of patients with RLS.

Materials and methods: For this study 17 drug-free patients (13 F and 4 M, mean age 55.8 years, range 24-76; mean IRLS severity scale 21.1; mean disease duration 6.6 years) were enrolled, along with age- and sex-matched controls. RNA sequencing was used to perform this transcriptome study using the Illumina Novaseq 6000 System. The quantification of genes regulated for each sequenced sample was computed using the featureCount algorithm. Coding RNA expression profiling was performed by next-generation sequencing in RLS patients and controls, to evaluate their possible de-regulation in RLS. The analysis involved a total of 12,857 gene transcripts.

Results: Nine main different network groups were significantly dysregulated in RLS, closely interconnected with each other: infections, inflammation, immunology, neurodegeneration, cancer, neurotransmission and different biological, blood and metabolic mechanisms. In RLS, the following genes were significantly up-regulated, among others: RPS4Y1, OLIG2, and SHISA7. The most implicated infections were those of the TORCH complex, while the pathways inherent to the inflammatory/immune mechanisms most involved were: NF-KB, IL-17, TRP channels and NOD-like receptor (NLR). The networks of neurodegeneration, carcinogenesis and neurotransmitters highlighted an overexpression of the mechanisms of mitophagy, ferroptosis, MAPK and p53, also involved in the metabolism of iron, dopamine and lipids. A Principal Component Analysis (PCA) of mRNA expression data using the top two principal components was able to separate patients from controls with 100% accuracy.

Conclusions: The high involvement of infectious agents could represent the trigger for inflammatory and immune reactions in genetically predisposed subjects and activate a series of biological pathways (especially IL-17, TRP, NF kappaB, NLR, MAPK, p53, mitophagy and ferroptosis) involved in neurotransmitter mechanisms, synaptic plasticity and axon guidance, as well as neurodegeneration, carcinogenesis and metabolism. OLIG2 is important for prethalamus development and thalamocortical projections. Interestingly, also SHISA7 was up-regulated and is implicated in the regulation of synaptic plasticity and in enabling GABA and glutamate receptor binding. We found a dysregulation of genes and mechanisms involved in neurogenesis and neuroplasticity, especially of crossroad structures in the limbic system and cortical thalamus projection. Our study contributes to expand the knowledge, in the light of biological mechanisms, on why some pharmacological agents worsen the symptoms of RLS, unlike others and, above all, provides important insights on future therapeutic targets to be considered in this disorder. These data indicate the complexity of the pathophysiology of RLS, to which numerous biological mechanisms contribute, all equally important for the understanding of the disease.

Clinical and autonomic characteristics of coronary artery disease patients with restless legs syndrome: a nested case control study

A. Gupta[1], S. Mohanty[1], V. Chhabra[1], G. Sharma[2]
[1]All India Institute of Medical Sciences, Centre for Integrative Medicine and Research, New Delhi, India, [2]All India Institute of Medical Sciences, Department of Cardiology, and Centre for Integrative Medicine and Research, New Delhi, India

Introduction: Restless leg syndrome (RLS) and cardiovascular disease both are associated with autonomic dysfunction and frequently occur together. The prevalence of RLS in coronary artery disease (CAD) is higher than that in the general population. There is a paucity of data on the clinical and autonomic characteristics of CAD patients with or without RLS. This study aims to study the clinical and autonomic characteristics of restless leg syndrome in CAD patients who have undergone percutaneous coronary intervention (PCI).

Materials and methods: This is a Nested Case-control Study, conducted at the "Department of Cardiology, Cardio-Neuro Centre", and "Centre for Integrative Medicine and Research", All India Institute of Medical Science, New Delhi, between February 2020 and December 2022. CAD patients who had undergone PCI and been diagnosed with RLS according to the International Classification of Sleep Disorders (ICSD-3), were enrolled in the study. Patients with severe LV dysfunction, heart failure, accelerated hypertension, contraindications to yoga and exercise training, or incomplete revascularization, were excluded from the study. Age and sex matched CAD patients who underwent PCI without RLS constituted the control group. All cases and controls underwent detailed clinical and sleep evaluations through a pre-structured questionnaire, Pittsburgh sleep quality Index, berlin questionnaire, Epworth sleepiness scale, 24-hour Holter and ambulatory blood pressure monitoring. Patients diagnosed with RLS were evaluated in detail using the ARQIP and IRLSSG rating scales. All clinical, sleep, blood pressure, and HRV parameters were compared with age and gender match controls.

Results: Of the 116 patients, 25(21.55%) had RLS. The mean age of RLS patients was 54.0 ± 7.2 years and 22(88%) were males. The mean age of the onset of RLS symptoms was 48.5 ± 10.2 years, and the median duration of RLS symptoms was 24 (8-42) months. The mean IRLSSG score was 17.2 ± 7.3. On comparison, CAD patients with RLS had significantly more hypertensive patients [15(60) vs 8(32), $p = 0.047$]. On 24-hour Holter monitoring, overall HRV was significantly decreased in the RLS group [2870.30 ± 2459.85 vs 4021.01 ± 2137.3, $p = 0.01$]. Additionally, the presence of RLS has significantly higher odds (OR= 6.84, $p=0.04$) of having SDNN < 50 in CAD patients. Non-pharmacological therapy, such as yoga, massage, and hot water, relieved RLS symptoms in seven cases.

Conclusions: Late onset RLS is common in CAD patients, and dysautonomia linked with RLS may have an impact on the clinical outcomes of cardiovascular disease.

Clinical features, polysomnography, and genetics association study of Restless Legs syndrome in a Chinese population: a multicenter observational study

W. Zhu[1], F. Han[1], R. Liang[1]
[1]Department of Respiratory and Sleep Medicine, Peking University People's Hospital, Beijing, China

Introduction: This study investigated the clinical features and explored the distribution characteristics of single-nucleotide polymorphisms in a Chinese population with primary restless legs syndrome (RLS).

Materials and Methods: Patient clinical data, polysomnography (PSG) data, and laboratory examination findings of patients with RLS were collected according to the diagnostic criteria. A total of 32 single-nucleotide polymorphisms (SNPs) in 24 loci were detected using the Asian Screening Array chip.

Results: Among 645 recruited patients with primary RLS. 48.9% (234/479) of patients showed an age of onset of < 45 years. Moreover, 33.0% (213/645) of patients had a family history of the disease, and 25.4% (164/645) of patients had insomnia. The typical symptom of RLS is leg discomfort, which is dominated by indescribable discomfort and accounted for 53.3% of the cases in our study. PSG indicated that 57.1% and 39.1% of RLS patients had periodic leg movement index (PLMI) of >5/h and >15/h, respectively. The apnea-hypopnea index in the RLS patients with obstructive sleep apnea (OSA) was mild (33.8%). The laboratory examinations revealed serum ferritin levels <75 μg/L and transferrin saturation (TSAT) of <45% in 31.6% and 88.7% of patients with RLS, respectively. 7 SNPs showed a significant allelic association with RLS.

Conclusions: Compared with Western studies, we reported lower insomnia rates, lower PLMI, and lower heritability. OSA with RLS is common, and atypical RLS requires attention. The key genes related to RLS were consistent between Chinese and European populations. Rs113851554 located in MEIS1, is specific to Europe and has a low mutation rate in the Chinese population.

Correlates of Restless Legs syndrome in older people

M. Szklarek[1], J. Kostka[2], T. Kostka[1]
[1]Medical University of Lodz, Department of Geriatrics, Łódź, Poland, [2]Medical University of Lodz, Department of Gerontology, Łódź, Poland

Introduction: Keywords: Restless legs syndrome, alcohol consumption, number of medications used
Our study aimed to examine the association between Restless Legs Syndrome (RLS) and potentially related factors such as smoking, alcohol consumption, medications used, some aspects of nutrition and physical activity.

Materials and Methods: The study population comprised 246 subjects (63 males and 183 females, median age 79 years); 104 subjects living in a Polish Housing Society in Penrhos, North Wales, and 142 outpatients of the Geriatric Clinic of the Medical University of Lodz, Poland. We applied the diagnostic criteria of the International Restless Legs Syndrome Study Group (IRLSSG) in the form of four questions. The analysis of factors coexisting with RLS based on a Comprehensive Geriatric Assessment (CGA) was conducted. All subjects were interviewed to obtain a full medical history including regular medication taken. Information about alcohol intake and smoking was gathered. Blood pressure and BMI were measured as well as the circumference of the left calf.

Results: Seventy-seven (31.3%) subjects suffered from RLS, significantly more often in the UK (39.4%) than in Poland (25.4%) (p=0.019). People from the Polish group smoked more cigarettes per day but consumed less alcohol (both p<0.001). Sex, number of medications per day and alcohol consumption were identified as independent predictors of RLS. Female sex [OR (CI) = 3.29 (1.51-7.21); p=0.0014], number of medications per day [OR (CI) = 1.11 (1.02-1.20); p=0.011] and alcohol consumption [OR (CI) =5.41 (2.67-10.95); p<0.001] increased the probability of RLS. Consumption of alcohol was significantly higher in the group with symptoms of RLS (39.0%) than in those without RLS (16.0%), similarly when analysed separately in women and men (p<0.001). Forward and backward stepwise regression models gave the same results. Country of residence, RLS, presence of chronic heart failure, osteoarthritis and urinary incontinence as well as low physical activity level (kcal/kg/day) were selected as independent predictors of mobility dimension problems of the EuroQol 5D questionnaire. Residing in Poland was related to higher probability of mobility problems [OR (CI) = 3.06 (1.36-6.88); p=0.005]. Presence of RLS [OR (CI) = 2.90 (1.36-6.17); p=0.004], chronic heart failure, [OR (CI) = 3.60 (1.75-7.41); p<0.001], osteoarthritis [OR (CI) = 2.85 (1.47-5.49); p=0.0016], and urinary incontinence [OR (CI) = 4.74 (1.87-11.9); p<0.001] were associated with higher probability of mobility problems. Higher physical activity was related to lower probability of mobility problems – 15% lower probability for an increase of energy expenditure of 1 kcal/kg/day [OR (CI) = 0.85 (0.78-0.92); p<0.001].

Conclusions: Female sex, number of medications taken per day and alcohol consumption are independent predictors of RLS in older adults.

Determinants of restless legs syndrome during pregnancy: focus on iron status and hormones

S. Riccardi[1], C. Garbazza[2,3], S. Baiardi[4], S. Mondini[4], A. D'Agostino[5], F. Cirignotta[6], A. Cicolin[7], M. Manconi[2,8,9]
[1]Neurocenter of Southern Switzerland, Università della Svizzera Italiana, Sleep Medicine Unit, Lugano, Switzerland, [2]Sleep Medicine Unit, Neurocenter of Southern Switzerland, Ospedale Civico, Lugano, Switzerland, [3]Centre for Chronobiology, University of Basel, Basel, Switzerland, [4]IRCCS Istituto delle Scienze Neurologiche di Bologna, Bologna, Italy, [5]Università degli Studi di Milano, Department of Mental Health and Addiction, ASST Santi Paolo e Carlo, Department of Health Sciences, Milano, Italy, [6]University of Bologna, Bologna, Italy, [7]Sleep Medicine Center, Department of Neuroscience, University of Turin, Turin, Italy, [8]Università della Svizzera Italiana, Lugano, Switzerland, [9]University Hospital, Inselspital, Bern, Switzerland

Introduction: Pregnancy is a well-known risk factor for restless legs syndrome (RLS), especially during late pregnancy. Pathophysiology of RLS during pregnancy is unclear, with iron and hormonal status as possible implicated factors. We investigated the potential role of iron and hormones on RLS occurrence in a sample of pregnant women.

Materials and Methods: The main aim of the "Life-ON Study", a prospective observational multicentric study, was to evaluate chronobiological and sleep-related risk factors for perinatal depression in women recruited in early pregnancy and followed-up to 1-year post-delivery. A sleep expert evaluated the participants through structured interviews, validated scales and questionnaires. At the 23-25th week of pregnancy women underwent a full night ambulatory polysomnography (PSG). Blood samples were collected once per trimester and about one month after delivery, to evaluate iron, serum ferritin, transferrin, estradiol, progesterone, prolactin, luteinizing hormone (LH), follicle-stimulating hormone (FSH) and thyroid stimulating hormone (TSH). RLS status was established based on the standard diagnostic criteria at least once during follow-up. A cut-off value of PLMS index >15/h was used to define participants with PLMS.

Results: We recruited 439 pregnant women (33.7± 4.2 years). There were no significant differences among patients with and without RLS regarding baseline socio-demographic features except a higher prevalence of multiparity among RLS patients (p 0.023). Prevalence of RLS during pregnancy was 29.6% (130 out of 439), with a peak during the second and third trimester. Mean PLMS index (PLMSI) was 10.5±17.3; 22.4% of women had a PLMSI higher than 15/h and 8.5% of them had a PLMSI>30/h. Serum Ferritin levels showed a trend towards higher values in RLS-patients compared to those without RLS, not reaching statistical significance. Transferrin was lower in RLS patients, with significant difference during the third trimester (p 0.004).

Hormonal status did not differ between participants with and without RLS. Only during the third trimester, progesterone levels were higher in patients with RLS, even if of borderline significance (p 0.048).

Serum ferritin did not differ between PLMSI >15/h group and the group without PLMS. We did not find significant differences in participants with PLMSI regarding progesterone and estradiol with only slightly higher estradiol values during the second trimester.

There were no significant correlations among ferritin level, serum transferrin, hormonal levels and RLS symptoms severity.

Conclusions: Results from our prospective assessment of iron and hormonal status in pregnant women do not confirm a clear etiopathogenic role for systemic iron depletion or difference in serum hormones in RLS during pregnancy.

As we did not measure CSF iron, ferritin and transferrin, we cannot exclude a role of iron transportation through the brain-blood barrier or availability in different brain regions, not necessarily linked to pregnancy per se. Further information is needed about possible predisposing factors for RLS during pregnancy.

Development and validation of RLS Diary

C. Sharma[1], R. Gupta[2], K. Kundu[2], V. Krishnan[1], L. Saini[3], N. Kumar[4]
[1]All India Institute of Medical Sciences, Psychiatry, Rishikesh, India, [2]All India Institute of Medical Sciences, Psychiatry and Division of Sleep Medicine, Rishikesh, India, [3]All India Institute of Medical Sciences, Pulmonary Medicine and Division of Sleep Medicine, Rishikesh, India, [4]All India Institute of Medical Sciences, Neurology, Bibinagar, India

Introduction: International RLS Severity Rating Scale (IRLS) measures symptoms based on memory for past one month and thus responses may be affected by recall biased. Hence, to assess and quantify symptoms of RLS across time, RLS diary was developed.

Materials and Methods: RLS Diary was developed and shared with 5 international experts in dealing with RLS for content validation. Based on the feedback, some items were added. Three indices of content validation- item, scale-average and scale by universal agreement were assessed. Then it was given to patients presenting with RLS in sleep clinic. Instructions were provided to them regarding completing the data. It had asked about severity of daytime and nighttime symptoms of RLS every day which were to be reported in evening and morning, respectively on a 4 point Liker's scale. Sleep Quality was also assessed on a 4 point lakers scale every day in the morning. Sleep-onset-latency and total sleep time was calculated every day. In addition, time of onset of RLS symptoms, period of the day when they were most severe and topography of RLS was marked every day. Patents having RLS completed the diary for 4 weeks. Severity of RLS using IRLS was assessed at baseline and at 4 weeks.

Results: RLS Diary attained score of 1 on content validation by universal agreement and . Interim Analysis included 25 participants. 60% were female and average age of participants was 45.8 ± 10.7 years. 36% had comorbid insomnia, 16% has systemic hypertension, 8% reported migraine, 4% diabetes mellitus and 24% participants had obstructive sleep apnea. Only 36% participants were free from other co-morbidities.

Items of RLS diary (Nighttime severity of RLS, Daytime severity of RLS, frequency of RLS during night as well as day, reported subjective sleep quality, total sleep time, sleep onset latency had good correlation over four weeks for each participant showing good internal consistency ($r > 0.80$). However, weekly assessments of sleep quality, total sleep time and sleep onset latency had poor correlation with Insomnia Severity Index score (at week 4) as well as with item 4 of IRLS that assess sleep quality. Similarly, total IRLS score and items 1 and 7 of IRLS that assess severity and frequency of RLS had poor correlation with severity and frequency of RLS reported in the RLS diary for week 1 to week 4. Some trends for recency effects were observed while reporting on the IRLS by the participants. In addition, RLS diary also showed temporal change in time of onset, severity of RLS as well as topography of RLS symptoms that could help in identification of end of dose phenomenon and augmentation.

Conclusions: RLS diary could be a better tool for the assessment of RLS symptoms, its impact on sleep, end-of-dose phenomenon and augmentation of symptoms.

Drugs and exercise as treatment of restless legs syndrome in an animal model with iron deficiency

A.S.d.S. Holanda[1], B. Franco[1], M.A.d. Morais[1], A.C.C. Veras[2], M.A. Torsoni[1], A. Torsoni[1], A.M. Esteves[1]
[1]University of Campinas, Faculty of Applied Sciences, Limeira, Brazil, [2]Federal University of Pernambuco, Recife, Brazil

Introduction: Restless legs syndrome (RLS) is a common sleep-related movement disorder. An uncomfortable and overwhelming need characterizes RLS or the urge to move the legs with an unpleasant and sometimes painful sensation. The cause of RLS is not fully understood, but evidence suggests that it is related to low brain iron levels and dopamine regulation. In patients with RLS, positive physiological effects linked to performing physical exercise were identified as the improvement in the sleep pattern. The aim was to verify the effect of different drugs (dopaminergic agent (DOPA); opioid (OPI); α2δ gabapentin ligand (GABA)) and exercise in the treatment of RLS in an animal model with iron deficiency.

Materials and Methods: The study was approved by the Ethics Committee on Animal Use at UNICAMP (5561-1/2020). Wistar rats were randomly distributed into five groups: Control (CTRL); Iron Deficiency (ID); and treatments with DOPA; OPI; GABA and Exercise (EXE). The experimental design induced the animals to RLS through an iron-restricted diet from the 30th day of life. With 80 days of life, the interventions were started for 4 weeks, and the open field behavioral test was performed before and after the beginning of the interventions (one each week). After euthanasia and tissue collection (striatum and spinal cord), qPCR and expression of proteins referring to PTPRD, DAT, TH, and D2. Molecular data analysis occurred by one-way or two-way ANOVA. Post hoc by Duncan or Bonferroni was used. $P < 0.05$ was considered significant).

Results: The gene expression of the striatum in the DOPA group was different in the targets D2, DAT, and TH, compared to the treated and ID. In Western Blotting, the marrow showed a difference in D2 protein for GABA and DOPA treatments compared to ID. The ambulation behavior differed between CTRL, ID, and OPI. The DOPA treatment presented lower total ambulation compared to the OPI. EXE treatment reduces ambulation and improves symptoms after 28 days ($p < 0,05$). The locomotor parameter improvement was observed in the DOPA treatment. Grooming behavior was reduced in the before and after comparison in the EXE group. The DOPA group showed increased striatal gene expression in DAT, TH, and D2 targets. All groups except the ID control showed high TH expression. The EXE group showed DAT expression close to the healthy control group and DOPA.

Conclusions: The results indicated that the drugs DOPA and GABA had a better effect on the treatment. Exercise can be a significant treatment or adjunct in controlling and improving SPI symptoms.

Effects of acute exposure to altitude on restless legs syndrome

A. Ibrahim[1], E. Holzknecht[1], M. Faulhaber[2], H. Gatterer[3], T. Wild[1], N. Seelose[1], P. Sorschag[1], B. Resch[1], S. Sevborn[4], H. Hackner†[1], J. Ulfberg[5], M. Burtscher[2], B. Högl[1], A. Stefani[1]
[1]Medical University of Innsbruck, Department of Neurology, Innsbruck, Austria, [2]University of Innsbruck, Department of Sport Science, Innsbruck, Austria, [3]Eurac Research, Institute of Mountain Emergency Medicine, Bolzano, Italy, [4]Swedish RLS Association, Stockholm, Sweden, [5]Uppsala University, Uppsala, Sweden

Introduction: Restless Legs Syndrome (RLS) pathogenesis involves several factors, including brain iron dysregulation, dopaminergic dysfunction, and genetic variants. Some studies suggested a role of hypoxia, supported by an upregulation of the vascular endothelial growth factor in the leg muscles of RLS patients, a correlation between RLS severity and peripheral tissue hypoxia, and increased RLS prevalence in high-altitude regions. We aimed to investigate the effect of acute exposure to high altitude on discomfort/urge to move and periodic leg movements (PLM) in patients with RLS compared to healthy controls.

Materials and Methods: Fifty-six individuals, 28 with RLS diagnosed according to the International RLS Study Group criteria, and 28 matched healthy controls were included. For two consecutive nights, 1-hour Suggested Immobilization test (SIT) was followed by 8-hour polysomnography in an altitude chamber. In randomized order and double-blinded, one night was spent in normobaric hypoxia corresponding to 3000 (9842,5 ft) m above sea level, while the other night was spent at the local Innsbruck altitude (574m, 1883,2 ft). During the SIT, PLM during wakefulness (PLMW) and subjective symptoms (discomfort and urge to move the legs) were recorded at baseline and every 15 minutes, utilizing a visual analog scale from 0 to 10. Sleep stages and associated events were scored according to the AASM criteria.

Results: Fifty-six participants aged 45.1±10.8 years were included, 51.8% female. At both altitudes, RLS patients had more severe discomfort and urge to move during SIT at any time point, compared to controls (all p<0.01). In RLS patients, the urge to move during SIT was higher after 30 and 45 minutes at 3000 meters compared to Innsbruck altitude (p=0.048 and p=0.031, respectively), this was not significant in controls. PLMW during SIT and PLM during sleep (PLMS) did not change relevantly with exposure to high altitude in both RLS patients and controls (p =0.689). When stratifying for sex, in male RLS patients PLMS index increased at high altitude (8.1 (IQR 2.1-29.4)/h at Innsbruck altitude vs 20 (IQR 2.5-42.9)/h at 3000 m, p = 0.032).

Conclusions: In RLS patients, the urge to move the legs during SIT is stronger at high-altitude, and in male patients with RLS also the PLMS index increases at high-altitude. These data support a role of peripheral hypoxia in the pathogenesis of RLS. Further studies assessing the influence of high-altitude on RLS symptoms with larger sample size, as well as studies investigating pathophysiological mechanisms underlying the interaction between sex and hypoxia are needed.

Hypothalamic inflammation analysis in an animal model of iron deficiency for Restless Legs Syndrome

B. Franco[1], V.D. Rocha[2], L.M. Dias[2], W.F. Chaves[2], Y. Li[3], A.S. Torosni[2], M.A. Torsoni[2], A.M. Esteves[2]
[1]University of Campinas (UNICAMP), School of Physical Education (FEF), Limeira, Brazil, [2]University of Campinas (UNICAMP), School of Applied Sciences (FCA), Limeira, Brazil, [3]University of Florida, Department of Neurology, Norman Fixel Institute for Neurological Diseases, Gainesville, United States

Introduction: Restless Legs Syndrome (RLS) is a common sensorimotor disorder. The pathophysiology of RLS involves brain iron deficiency (BID) and dopaminergic and adenosinergic systems dysfunction. The symptoms generate discomfort in the lower limbs, especially at night, causing difficulty in initiating and continuing sleep. RLS is closely related to inflammation due to impaired sleep and may activate pro-inflammatory cytokines, hyperglycemia, and hyperlipidemia. There are few studies that address central inflammation and iron deficiency, however, none addresses the specific model of RLS.

Objective: To analyze the sleep pattern and the dopaminergic profile in the striatum and the inflammatory profile in the hypothalamus of the BID rodent model for RLS.

Materials and methods: Male C57 mice, 28 days old, were distributed into two groups: Control (CTRL) and iron deficiency (ID). Both groups received AIN93M, and the mineral mix was manipulated for iron deficiency (<4mg/kg of iron). After 8 weeks of diet, hematocrit, locomotor behavior, insulin tolerance test (ITT), and glucose tolerance test (GTT) were performed and analyzed. After 10 weeks of diet, electrode implantation surgery was performed, and after 7 days of recovery, the 12-hour sleep (light period) was recorded. At the end of the experiments (after 12 weeks of diet), the striatum and hypothalamus tissues were collected for analysis of the dopaminergic and inflammatory systems, respectively. Data were analyzed by T-Test or by the linear mixed model (LMMs), with *post hoc* Sidak.

Results: The iron deficiency group showed a reduction in hematocrit (p=0.002; T-Test). In the ITT and GTT tests, a difference was found for the group, with an increase for the iron deficiency group (ITT p=0.002; GTT p=0.003; LMMs). No difference was found in locomotor behavior. In the sleep analyses (T-Test), the ID group showed a reduction in sleep efficiency (p=0.002) and in slow wave sleep time (p=0.026) and REM (p=0.013) and increased paw movements (p=0.027) and time awake (p=0.004). In the protein content (Western blotting; T-Test) of the striatum, the ID group showed a reduction in protein levels of D2-Receptor (p=0.002), Dopamine Transporter (DAT) (p=0.005) and Transferrin-Receptor (Tr-R) (p=0.027). In the hypothalamus, no differences were found in the protein content of NFKb, TLR4, IKK, JNK46, and JNK54.

Conclusions: Our iron-deficient rodent model for restless legs syndrome has features consistent with other studies and disease symptoms. Different behaviors were found in the ITT and GTT tests between the groups, which may indicate insulin resistance in the ID group. However, until now, no alterations related to the protein contents that were analyzed in the hypothalamus were found.

Metagenomic analysis in Restless Legs Syndrome

A. Montini[1], C. Pellegrini[2], G. Loddo[3], F. Ravaioli[2], L. Baldelli[1,2], M.G. Bacalini[2], G. Mainieri[1,2], C. Pirazzini[4], E. Mazzotta[1], S. De Santis[2], F. Provini[1,2]
[1]University of Bologna, Department of Biomedical and NeuroMotor Sciences (DIBINEM), Bologna, Italy, [2]IRCCS Istituto delle Scienze Neurologiche di Bologna, Bologna, Italy, [3]Azienda AUSL di Bologna, Department of Primary Care, Bologna, Italy, [4]University of Bologna, Department of Medical and Surgical Sciences (DIMEC), Bologna, Italy

Introduction: The microbiome-gut-brain axis contributing to sleep regulation plays a critical role in the etiology of sleep disorders. Restless Legs Syndrome (RLS) is a sleep-related disorder with multifactorial pathogenesis since environmental factors may trigger symptoms onset in predisposed subjects. The composition of gut microbiota, altering this balance, could influence the RLS phenotype and severity.

Materials and Methods: We compared 30 idiopathic RLS patients (RLS; 23 females, age 65± 12,74 years) and 29 controls (CTR; 22 females, age 64 ± 10,73 years). RLS were consecutively recruited from December 2022 and March 2023, and the diagnosis was confirmed by sleep experts in our sleep center. CTR comparable for age and sex were recruited among unrelated patients' caregivers or volunteers coming to our independent cohort of control of the IRCCS-ISNB after the exclusion of the presence of concomitant sleep-interfering drugs, sleep disorders, severe neurological, psychiatric and systemic comorbidities, ongoing acute inflammatory disease or pregnancy. For both RLS and CTR, the physiological, family, pathological and pharmacological history was collected; specific validated questionnaires (IRLS and ISI) were administered in the RLS group. Stool samples were collected in tubes containing DNA stabilizing reagent. Microbial DNA was extracted using the repeated bead beating method, amplified by PCR for V3-V4 region of 16S rRNA gene and sequenced on MiSeq Platform according to metagenomics standard procedures. Dada2 pipeline was used to process sequencing data, while DESeq2 pipeline was used to calculate differential genera abundance, correcting for age, sex and Body Mass Index (BMI).

Results: RLS presented a median disease duration of 19 years (range 5-72) with early onset (<45 yo) in 15 patients, of which 6 in pediatric age. All patients presented a chronic course with mainly moderate-severe symptoms (26 patients had a IRLS scale score >10) and 17 patients complained of sensory symptoms. The sleep-related comorbidities in RLS group were insomnia (25), OSA (6) and SRED/NES (6). Insomnia was mild in 22 patients (ISI scale score <15) and it preceded (9), appeared at the same time (8) or followed (8) the RLS onset. Mood disorders were frequently reported in RLS group (60%) and these include anxiety (2), depression (5) or both (11) while only 2 CTR reported depression and 1 anxiety. Compared to CTR, RLS showed a significant decrease in the levels of *Lachnoclostridium* genus, whose abundance tended to be lower in RLS with a disease duration ≥15 years and in RLS phenotype without sensory symptoms. *Clostridium sensu stricto 1* abundance tended to be negatively associated with IRLS score. No significant association with early/late onset, ISI score and the presence of mood disorders was found.

Conclusions: To the best of our knowledge, this is the first study reporting differential abundance of gut microbial taxa in RLS. The *Lachnoclostridium* genus has already been associated with sleep quality as it correlated positively with sleep efficiency in older insomnia patients. Further studies are needed to validate this finding and explain the role of this genus in RLS comparing its abundance with a control group of insomnia patients.

National RLS Opioid Registry: three-year safety, dose stability, and efficacy

J. Winkelman[1], J. Zackon[1], A. Kilty[1], B. Wipper[2]
[1]Massachusetts General Hospital, Psychiatry, Boston, United States, [2]Harvard University, Harvard Medical School, Boston, United States

Introduction: Low-dose opioids are used to treat patients with treatment-resistant or augmented restless legs syndrome (RLS). The National RLS Opioid Registry is a longitudinal, observational study which assesses the long-term safety, efficacy, and stability of opioid treatment for RLS.

Methods: Five hundred participants from 44 US states and 4 countries, with a history of a therapeutic response to dopamine agonists and who were prescribed opioids for RLS were extensively interviewed at baseline. The majority of participants had a history of dopamine agonist augmentation. Self-administered biannual online surveys tracked opioid dosage, side effects, other RLS treatments, RLS severity, and other relevant health and lifestyle factors. No clinical guidance or interventions were provided by the study staff to participants or their providers. Review of state-controlled substance records corroborated opioid dosing.

Results: The present analysis consists of 438 participants; 94.4% of the original enrollees who continued on opioids and had not died at the time of the 3-year surveys. 97.9% of participants are white, 57.4% female, and the mean age was 65.1 years. Participants were taking opioids for a median time of 1-3 years at baseline at a median daily dose of 30 MME (equivalent to methadone 7.5 mg or oxycodone 20 mg), with 54.7% taking methadone and 21.9% taking oxycodone formulations at that time.

RLS severity remained stable over the 3-year period (BL IRLS=13.0; 3-year IRLS=13.7). Similarly, sleep disturbance was stable (BL ISI=10.5, 3-year ISI=9.9). The median change in daily opioid dose from baseline to 3 years was 0 MME (median 3-year MME = 30). 45.9% of participants increased their opioid dosage since baseline data collection (median increase = 10.6 MME) and 19.2% decreased their dose (median decrease = 10 MME). Only 5.3% and 5.0% increased their dose by 25-50 MME and >50 MME, respectively. Several factors were independently associated with these larger dose increases from baseline, including switching specific opioid medications (OR=6.39, 95% CI [3.28-12.61]), concurrent use of opioids for comorbid pain (OR=4.31, 95% CI [1.32-12.80]), introduction of dopamine agonist medications in the 3 years since registry entry, baseline diagnoses of major depressive disorder, and significant baseline insomnia (Insomnia Severity Index > 10).

Conclusions: Our findings demonstrate that low-dose opioid medications effectively control refractory and augmented RLS symptoms over 3 years of observation. While nearly half of participants increased opioid dose over this period, most dosage adjustments were modest. Larger dose increases in a minority of participants were associated with specific factors, most notably changes in specific opioid medication and use of opioids for comorbid pain disorders. Continued longitudinal observation of National RLS Opioid Registry participants will provide clinicians and patients with insights into the long-term safety, efficacy, and stability of low-dose opioid medications for severe cases of RLS.

Pediatric Restless Legs Syndrome: presentations & comorbidities

O. Ipsiroglu[1,2], O. Hill[1], S. McWilliams[1], P. Pandher[1], C. Kuo[3]
[1]H-Behaviours Research Lab, BC Children's Hospital Research Institute, Department of Pediatrics, University of British Columbia, Vancouver, Canada, [2]Interdisciplinary Sleep Clinic, Divisions of Developmental Pediatrics, Child and Adolescent Psychiatry and Respirology, BC Children's Hospital, Department of Pediatrics, University of British Columbia, Vancouver, Canada, [3]University of British Columbia, School of Biomedical Engineering, Vancouver, Canada

Introduction: RLS is a neurological sensorimotor disorder associated with an urge-to-move and discomfort. In some instances, RLS can be familial and inherited via variations/mutations in specific genes, highlighting the importance of obtaining family history as part of the sleep assessment. The neurodevelopmental disorders ADHD and autism spectrum disorder (ASD), have overlapping features with RLS, and therefore we reviewed RLS presentations in ADHD and ASD patient cohorts.
Methods: Available qualitative descriptions and quantitative questionnaires (SDSC doi: 10.1111/j.1365-2869.1996.0 0251.x and ADHD-Rating Scale) and clinical assessment results of patients who were diagnosed with ADHD and/or ASD were analyzed. All patients and parents took part in an in-depth family sleep history with an exploratory suggested clinical immobilisation test and blood work. Clinical information was collected using the comprehensive Mind-the-Gap-Logic-Model (DOI 10.3389/fpsyt.2022.878356; https://doi.org/10.3389/fpsyt.2022.878356). Statistical analysis was conducted with odds ratios (OR) and 95% confidence intervals on the two patient cohorts of ADHD and ASD looking for RLS related risk factors (blood work data is not presented).
Results: From 199 patients that were referred to our clinic, 92 of those diagnosed with ADHD (4-18 years, 56 males), and 89 of those diagnosed with ASD (1-18 years, 54 males). The only significant risk association found with RLS/restless sleep was internalizing disorders within the ADHD-cohort (OR:4.53, p=0.0345) and familial iron deficiency within the ASD-cohort (OR:5.83, p=0.0094). Additional risk factors were identified when RLS, familial RLS, painful RLS, and restless sleep were analyzed independently. For the ADHD-cohort, RLS with familial iron deficiency (OR:7.00, p=0.0138); familial RLS, with familial iron deficiency (OR:5.98, p=0.0002), painful RLS (OR:5.64, p=0.0308), and insomnia/DIMS (OR:2.57, p=0.0322); for painful RLS with SIB (OR:5.41, p=0.0218) and familial RLS (OR:5.64, p=0.0307); lastly, restless sleep alone with non-restorative sleep (OR:2.96, p=0.0198). For the ASD-cohort, RLS with familial iron deficiency (OR:4.05, p=0.0137); familial RLS with insomnia/DIMS (OR: 3.44, p=0.0075), familial iron deficiency (OR:2.82, p=0.0214), painful RLS (OR:10.24, p=0.0291), and parasomnias (OR:5.53, p=0.0315); for painful RLS with self-injurious behaviours (OR:6.00, p=0.0048) and familial RLS (OR:10.24, p=0.0291); lastly, restless sleep alone with non-restorative sleep (OR:3.25, p=0.0144), internalizing disorders (OR: 2.95, p=0.0277), and self-injurious behaviours (OR:0.23, p=0.0271).
Conclusion: Gaining comprehensive familial sleep history allowed us to identify familial ID as an additional risk factor aggravating the presentation of patients. The diagnosis of painful RLS, which occured in the setting of the Self-Injurious Behaviour Clinic setting is retrospective and based not only on history, clinical observations, but significant improvement of self-injurious behaviour symptoms with/after iron therapy. Further, familial RLS and familial iron deficiency have been utilized as supportive criteria. Based on this data, our clinical take home messages are (1) familial ID and RLS should be considered in all assessments, and (2) further self-injurious behaviours seem to be associated with painful RLS. Therefore, in-depth history taking and standardized blood work analysis may help to optimize our understanding of familial RLS and painful RLS for improving patient outcomes.

Previous dopaminergic augmentation of RLS symptoms reduces the therapeutic response to non-dopaminergic treatments: the case of DORAs

D. Garcia-Borreguero[1], A. Garcia Aragon[1], B. Moncada[1], S. Romero[1], J.J. Granizo[1], S. Quintas[1], M. Castillo[1]
[1]Sleep Research Institute/Instituto del Sueño, Madrid, Spain

Introduction: One of the main complications of long-term treatment with dopaminergic medication is iatrogenic augmentation (AUG) of RLS symptoms. It is calculated that approx. 60-70% of the RLS patients experience an increase in the severity of symptoms after 8-10 years of treatment with available dopaminergic agents. Augmentation of symptoms can be severe and the response to any further increase in the dose of the dopaminergic medication is frequently reduced or leads to even more severe symptoms. Thus, a change to medications with a different mechanism of action is often necessary. Previous studies have shown that patients with a history of previous episodes of AUG show a reduced response to glutamatergic alpha-2 delta ligands, or even to the adenosinergic dipyridamole. In order to investigate whether such an impaired response following long-term treatment with dopaminergic is shared by drugs with other mechanisms of action, we investigated the response of RLS symptoms to the dual orexin receptor antagonist suvorexant in patients previously that previous experienced dopaminergic Augmentation treated vs. to treatment-naive RLS.

Materials and Methods: We performed a randomized, double-blind, crossover, and placebo-controlled study on 41 RLS patients. Following washout from any previous CNS-active drugs, patients were randomized to receive either suvorexant or placebo for two consecutive two-week treatment periods. Treatment was administered at 9pm at a fixed dose of 10mg/day during the first week, and 20mg on the second. RLS severity was measured weekly using the International RLS Scale (IRLS) and Clinical Global Improvement (CGI). Multiple suggested immobilization tests (m-SIT) were also performed between 8pm and midnight at the end of each treatment phase and were followed by a sleep study.

Results: 41 participants were randomized, 40 of whom completed the study. Nine patients had been previously treated with dopaminergic medication and had suffered in the past a mean of 1.7 episodes of dopaminergic augmentation (AUG). In contrast, 31 patients were treatment naive (TN). No differences were found on their baseline IRLS scores (mean [SD]: (25.4 [4.6] vs 26.6 [5.21], n.s.). Following a two-week treatment with suvorexant, there was a greater placebo-corrected improvement on the IRLS score than in the TN group [-12.7 (SD: 6.55) vs -4.5 (SD: 3.57), ($p < 0.05$)]. Similarly, PLM-index, sleep onset latency and sleep efficiency improved more in the TN than in the AUG-group.

Conclusions: Our results provide a first proof-of-evidence of the therapeutic efficacy of DORAs in improving RLS sensory and motor symptoms. The response was more pronounced in treatment-naive patients than in patients that had experienced in the past previous episodes of augmentation. Thus, dopaminergic augmentation involves a fundamental change in the pathophysiology of RLSby which the response not only to dopaminergic medication is impaired, but also to non-dopaminergic drugs such as glutamatergic, adenosinergic or as shown here, orexinergic agents. This implies a clinical problem, but also a challenge to our understanding of the pathophysiology of RLS. Potential mechanisms of action of suvorexant are discussed.

Restless Legs Syndrome in children under 6 years of age – study in Georgia

S. Kasradze[1,2], L. Maisuradze[3], B. Högl[4]
[1]Caucasus International University, Medicine, Tbilisi, Georgia, [2]Institute of Neurology and Neuropsychology, Neurology, Tbilisi, Georgia, [3]Institute of Neurology and Neuropsychology, Sleep Lab, Tbilisi, Georgia, [4]Medical University of Innsbruck, Innsbruck, Austria

Introduction: Restless Legs Syndrome (RLS) is a highly prevalent sensory-motor disorder characterized by an irresistible urge to move to suppress uncomfortable feeling in the legs that often disturb sleep. There is a Pediatric Sleep Questionnaire for Parents (PSQP) for the identification of RLS and sleep problems in children, but the high prevalence of co-morbidity and the presence of various mimics, cause significant difficulties for parents for timely and effective detection of RLS symptoms a specially in Children with Learning and Developmental Delay (LDD).

Aim: To estimate RLS symptoms in children less than six years of age considering their neurodevelopmental profile.

Materials and Methods: A longitudinal cohort study was conducted using a sleep-wake questionnaire (SWQ) developed for parents based on the PSQP and included 38 questions about assessment of sleep duration, behavior during sleep, morning behavior and other possible problems. RLS was determined by using the pediatric RLS diagnostic criteria, as updated by the IRLSSG. The frequency of RLS symptoms was defined as rare (once per week), occasionally (twice per week), frequently (3-4 times per week) and almost always (>4 times per week).

Data from 3628 SWQ completed at admittance between the 2015-2020 were analyzed. Neurological, psychiatric and neuropsychological assessments were performed in all children (Female -1371) in INN within the Georgian State Program "LDD in Children of 1-6 years old". All surveys were conducted by pediatric neurologists during the assessment of children and with face-to-face interviews with parents/caregivers. Patients were stratified according to age: 12-24 months (n=791), 25-36 months (n=896), 37-48 months (n=758), 49-60 months (n=621), and 61-72 months (n= 562); according to neurodevelopmental status –the children with LDD and with/without neurological disorders (LDD group, n=2213) and with normal developmental and neurological rates (Controls, n=1415). The comparisons between the variables were assessed by the age groups between the children with RLS and controls.

Results: Overall, 251 (6.9%) had RLS-like restlessness (RLS-lr) and only two of them were diagnosed as possible-RLS prior to referral. There was no significant differences in distribution of RLS-lr between the LDD and control (7,1% and 6,6% accordingly) as well as between the male (6,7%)/female (6,9%) groups. Out of 251 children with RLS-lr 176 (70%) experienced severe/very severe impact of its symptoms and 174 of them have had the significant difficulties falling asleep. High co-morbidity of RLS-lr symptoms were revealed in children with ADHD (12,1%) and Epilepsy (12,2%).

Conclusions: RLS-lr seems to be a significant problem in children under 6 years of age, regardless of gender, neurodevelopment, and neurological problems. It is most common in epilepsy and ADHD, and is accompanied by difficulty falling asleep. Despite the significant negative effect on sleep quality the majority of children with possible RLS or RLS-lr are undiagnosed in Georgia. It is necessary to raise knowledge of health care professionals for identification and differentiation of restlessness, possible RLS and RLS-like symptoms in children.

Risk factors associated with restless legs syndrome in older adult: a systematic review

L. Rebouças[1], M. Meira e Cruz[2,3,4], A.C. Silva Santos[1], C. Souza[1], M. Rosa[5], M. Pereira[6], C. Salles[1,7,8]
[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]University of Lisbon, Sleep Unit, Cardiovascular Center, Faculty of Medicine in Lisbon, Lisboa, Portugal, [3]European Sleep Center, Lisboa, Portugal, [4]College Sao Leopoldo Mandic, Campinas, Brazil, [5]Faculty of Medicine of Lisbon, Lisboa, Portugal, [6]Bahiana School of Medicine and Public Health, Salvador, Brazil, [7]Federal University of Bahia, University Hospital Professor Edgar Santos, Salvador, Brazil, [8]Jorge Amado University Center, Salvador, Brazil

Introduction: Restless Legs Syndrome (RLS) is characterized by an uncontrollable urge to move the legs during the night, impairing sleep and affecting daily life. Approximately 2 to 3% of the general population has severe RLS, and most require long-term medication treatment. The cause of this condition is unknown. The pathogenesis of RLS is also uncertain in general, especially in older adults, although it is believed to involve both peripheral and central mechanisms. People with RLS experience impaired sleep quality, leading to reduced quality of life and increased risk for depression, anxiety disorders, systemic arterial hypertension, and cardiovascular diseases.

Materials and Methods: A systematic review was conducted by searching the descriptors (Restless Legs Syndrome, risk factors, and elderly) in the electronic database PubMed Central. Cross-sectional or cohort studies with participants aged 65 years or older of both sexes who responded to a questionnaire on RLS were included. Abstracts, conference proceedings, review articles, and letters were excluded.

Results: A total of 312 studies were selected from the database, and an additional 7 were added through manual search. Finally, only 3 studies were included. One of the studies identified gender as a risk factor, demonstrating a significantly higher prevalence of RLS in women (10.2%) compared to men (5.7%), with an Odds Ratio of 1.85. No statistics significant were found in hemoglobin levels, serum iron, ferritin, transferrin, total iron-binding capacity (TIBC), or other biochemical markers related to inflammation, renal function, endocrine, hormones, or vitamins between the groups with and without RLS ($P>0.1$). The frequencies of anemia, hypertension, diabetes mellitus, and renal insufficiency also did not show significant differences ($P>0.05$). Another study observed a significantly higher prevalence of iron deficiency in patients with RLS (31%) compared to those without RLS (6%), with statistical significance ($P<0.025$). These patients experienced symptom improvement after treatment with ferrous sulfate. Furthermore, patients with RLS and vitamin B12 deficiency reported complete resolution of symptoms after supplementation with vitamin B12. The third study identified a higher prevalence of RLS in women (13.9%) compared to men (6.1%), with a P value of 0.012. Among men only, a significant decrease in RLS risk with increasing age was observed.

Conclusions: Based on the analyzed studies, there is a significant association between RLS in older adult and iron deficiency, as well as vitamin B12 deficiency. These conditions can be easily treated with supplementation, resulting in a significant improvement in symptoms. Additionally, RLS is more prevalent in women, especially older ones, and it may be associated with postmenopausal estrogen replacement. A parallel can be drawn with the last trimester of pregnancy when estrogen levels are elevated, considering the increased occurrence of RLS during this period. Awareness of RLS in older adults needs to be enhanced, including early diagnosis and improvement in screening methods.

RLS in high-intensity exercise athletes: biomarker, iron cicle, life quality

S.B.R. Fagundes[1], D.J.L. Fagundes[2]
[1]Hospital Santa Casa, São Paulo, Brazil, [2]Governo do Estado de São Paulo, Guarulhos, Brazil

Introduction: Street runners rise in all world and specifically marathon has a lot of practitioners. These conditions make the trainers, physical educators and athletes try to understand the body function to reach better results. The research shows that marathon runners have more prevalence of Restless Legs Syndrome, around 12,96%, than in the general population in Brazil (6,40%) or in the world (5 - 15%). Why could the prevelance increase? What would they have different beyond the practice of high intensity exercise? Would they suffer with these symptons? All these interrogations give us forces to try understanding more about RLS.

Materials and Methods: We studied 35 amateur athletes who participated in marathon running(42.195m) and finished the proof until 5h . IL6, IL8, TNF, iron, ferritine were analized before the race (basal level), immediately after the marathon and 72h after the proof. IRLSSG criteria; questionary about RLS severity and life quality were applied.

Results: We found 12.96% of athletes met criteria of RLS based on IRLSSG. The basal level of IL-6 before the running =16,46; immediately after= 43,93 and after 72h =52,95 -RLS group . The control group - basal=28,24; immediately after=109,76 and after72h=15,53. Plasma levels of IL-8 : basal=35,39; immediately after=151,26; 72h after=32,56 in RLS group ; no RLS group : basal=37,95; immediately after=82,70 and after 72h = 46,87 (p<0.05). We had 1.5% of RLS athletes with iron < 50µg/dl and the other runners normal values. Iron RLS group : basal= 97,12 ; immediately after=109,63; after 72h= 86,71. Iron no RLS group : basal= 94,68; immediately after=105; after 72h= 82,14. Ferritine RLS group : basal=119,65; immediately after= 148,19; after 72h= 139,41. Ferritine no RLS group : basal= 104,5 immediately after= 121; after 72h= 121,36. TNF in RLS group: basal= 2,83 ; immediately after= 27,99; after 72h= 3,48 . TNF no RLS group : basal 8,47; immediately after= 32,18; after 72h= 5,62 . The quality of life was based on RLS severity also life quality questionary and the athletes demonstrated good results. The research showed in RLS runners, 28,57% runners had severe RLS while 57,14% had moderate RLS. The athletes refered symptom improvement with running in 71,43% of cases.

Conclusions: The study revealed an increase of the prevalence of RLS in high- intensity exercise athetes in this sample in Brazil. These marathoners showed elevation of IL-6 levels . In spite of the runners lost iron after the running, the most of them maintained nomal levels. The other biomarker didn't show diferences as well as iron and ferritine. It could be explained for trigger that phisical activity does in the IL-6. IL-6 is one of the responsible for restoration of body equilibrium when exposed to unbalance like a marathon or other high-intensity phisical activity. But the research showed that in RLS there are an unbalance. IL6 is elevated maybe trying to resolve this regulation. Then, more IL is released and delayed to reach the basal levels. Anyway IL 6 is altered in marathoners with RLS. Further studies must be done to the better understanding of this mechanism.

Socio-behavioral factors associated with suggestive symptoms of restless legs syndrome in adolescence

K.I. Yang[1], J.P. Park[1], J.-S. Sunwoo[2], J.H. Kim[3], D. Kim[4], S.B. Hong[5]
[1]Soonchunhyang University College of Medicine, Cheonan Hospital, Sleep Disorders Center, Department of Neurology, Cheonan, Korea, Republic of, [2]Kangbuk Samsung Hospital, Department of Neurology, Seoul, Korea, Republic of, [3]Ewha Womans University Seoul Hospital, Ewha Womans University, College of Medicine, Department of Neurology, Seoul, Korea, Republic of, [4]Chungnam National University College of Medicine, Department of Neurology, Daejeon, Korea, Republic of, [5]Samsung Medical Center, Sungkyunkwan University School of Medicine, Department of Neurology, Seoul, Korea, Republic of

Introduction: Epidemiological studies on restless legs syndrome (RLS) show that prevalence rates vary in different populations, which is due to differences in use of RLS definition, study methods of data collection (questionnaire survey vs. face to face interview), and inconstant age distribution. The studies linking the socio-behavioral factors related to RLS have not been well investigated. Moreover, these studies of adolescence are scarce relatively compared to adult. This study aimed to determine the prevalence of suggestive symptom of RLS and its related factors in among Korean adolescence.
Materials and Methods: A total of 25,789 students (female: 13,279) in middle and high schools (7th ~ 12th school grade) were investigated across the 15 nationwide districts of Korea by applying an online self-reported questionnaire. Symptoms regarding to RLS and periodic limb movement (PLM) were evaluated by the Global Sleep Assessment Questionnaire. The each question had "over the past four weeks, did you have restless or "crawling" feeling in your legs at night that went away if you moved your legs?" and "did you have repeated rhythmic leg jerks or leg twitches during your sleep?" Responses to each question of "usually" or "always" were considered as the presence of RLS and PLM symptom. Sleep characteristics included snore, witnessed apnea, perceived sufficiency sleep, and Epworth-Sleepiness Scale (ESS). The variables regarding socio-behavioral factors were internet addiction (Internet Addiction Proness Scale for Youth, continuous score and quartiles), consumption of coffee and alcohol, smoking, nocturnal eating, sleeping with another person, a doll or pets, and keeping TV or radio during sleep. Logistic regression was applied to estimate the odds ratio (OR) of RLS symptom associated with social behaviors by adjustment for relevant covariates.
Results: The mean age of the participants was 15.76 ± 0.11 years old. The prevalence of RLS symptom was 5.1% (n = 1,311) (RLS with PLM, n = 399; RLS without PLM, n = 912). The analyses of multivariate logistic regression of the adjusted OR for RLS symptom were significantly associated with male (OR, 1.52; 95% CI, 1.334–1.729), usually/always snoring (OR, 2.46; 95% CI, 2.036–2.968), usually/always witnessed sleep apnea (OR, 5.74; 95% CI, 4.480–7.351), perceived insufficient sleep (OR, 1.61; 95% CI, 1.397–1.848), ESS ≥ 11 (OR, 1.62; 95% CI, 1.292–2.039), increased internet addiction (OR, 1.03; 95% CI, 1.024–1.036), often coffee consumption (OR, 1.29; 95% CI, 1.036–1.609), often alcohol consumption (OR, 1.81; 95% CI, 1.037–3.164), often smoking (OR, 1.38; 95% CI, 1.063–1.795), often nocturnal eating (OR, 1.21; 95% CI, 1.011–1.446), sleeping with a doll or pets (OR, 1.22; 95% CI, 1.056–1.411), and keeping TV or radio during sleep (OR, 1.38; 95% CI, 1.171–1.632).
Conclusions: Male, usually/always snoring and witnessed apnea, perceived insufficiency sleep, and excessive daytime sleepiness as well as various socio-behavioral factors were found to be associated with suggestive symptom of RLS in this study.

The iron deficiency conundrum – limitations of existing clinical practice guidelines and next steps

S. McWilliams[1], O. Ipsiroglu[1,2], O. Bruni[3], M. Chen[4], J.R. Connor[5], L.M. DelRosso[6], C.J. Earley[7], B.T. Felt[8], R. Ferri[9], M. Manconi[10], A. Mattman[4], R. Silvestri[11], N. Simakajornboon[12], S.M. Smith[13], S. Stockler[1,14], A. Walters[15], J.W. Winkelman[16]
[1]H-Behaviours Research Lab, BC Children's Hospital Research Institute, University of British Columbia, Department of Pediatrics, Vancouver, Canada, [2]Interdisciplinary Sleep Clinic, Divisions of Developmental Pediatrics, Child and Adolescent Psychiatry and Respirology, BC Children's Hospital, Department of Pediatrics, University of British Columbia, Vancouver, Canada, [3]Sapienza University of Rome, Department of Developmental Neurology and Psychiatry, Rome, Italy, [4]University of British Columbia, Department of Pathology and Laboratory Medicine, Vancouver, Canada, [5]Pennsylvania State University College of Medicine, Department of Neurosurgery, Hershey, United States, [6]University of Washington, Seattle Children's Hospital, Seattle, United States, [7]Department of Neurology, Johns Hopkins University School of Medicine, Baltimore, United States, [8]University of Michigan, Department of Pediatrics, Ann Arbor, United States, [9]Sleep Research Centre, Department of Neurology IC, OASI Research Institute (IRCCS), Troina, Italy, [10]Sleep Medicine Unit, Neurocenter of the Southern Switzerland, Regional Hospital of Lugano, Faculty of Biomedical Sciences, Università della Svizzera Italiana, Lugano, Switzerland, [11]Sleep Medicine Center, University of A.O.U.G. Martino, Department of Clinical and Experimental Medicine, Messina, Italy, [12]Sleep Center, Cincinnati Children's Hospital Medical Center, Cincinnati, United States, [13]Nutrition Research Institute, University of North Carolina at Chapel Hill, Department of Nutritional Sciences, Madison, United States, [14]Division of Biochemical Genetics, BC Children's Hospital, University of British Columbia, Department of Pediatrics, Vancouver, Canada, [15]Department of Neurology, Vanderbilt University Medical Center, Nashville, United States, [16]Departments of Psychiatry and Neurology, Massachusetts General Hospital, Boston, United States

Introduction: Iron deficiency (ID) is the most common micronutrient deficiency in the world, disproportionately affecting children and females of reproductive age. In 2020, the World Health Organization (WHO) published a guideline with particular focus on the use and measurement of serum ferritin (SF) as a marker of iron stores and inflammation. This guideline supports harmonization of the approaches to ID, but does not consider the concept of brain iron deficiency (BID). Current evidence suggests BID plays a key role in the pathogenesis of conditions presenting with hypermotor-restlessness and hyperarousability, such as RLS and ADHD. In clinical practice, ID and iron supplementation are not routinely considered in the diagnostic work-up and/or as a first-line treatment option; therefore, we reviewed ID guidelines including, (1) recommended biomarkers; (2) interactions with inflammation; and (3) inclusion of conditions presenting with day-/nighttime associated hypermotor-restlessness and hyperarousability, as a clinical proxy for potential BID.
Materials and methods: We conducted a scoping literature review in Medline, CINAHL, and Embase (English, full text available) and searched websites of medical organizations. Guidelines were included if they were (1) general, pregnancy-specific, or disease-specific ID guidelines, and (2) if the guideline or consensus paper was created by/on behalf of a larger governing body. Opinion papers or reviews of guidelines were excluded.
Results: A total of 56 ID guidelines were identified: (a) 30/33 of the general ID guidelines utilized SF and 3/33 used Hb only; 29/33 included CRP/or referred to SF as an acute phase reactant; 4/33 included RLS and 2/33 included ADHD; (b) 9/9 pregnancy-specific guidelines utilized SF and none used Hb only, 7/9 included CRP/or referred to SF as an acute phase reactant; 3/9 included RLS and none included ADHD; (c) 14/14 disease-specific guidelines included SF and none used Hb only; 10/14 included CRP/or referred to SF as an acute phase reactant; 2/14 included RLS and 1/14 included ADHD.
Conclusions: The updated WHO recommendations create a new momentum for the harmonization of methodologies for iron deficiency investigations, but misses the incorporation of the BID concept, and with that the clinical approach to ID-syndromes presenting with hypermotor-restlessness and hyperarousability. The heterogeneity of biomarkers and SF cutoff values in this review raises questions about the application of current ID-guidelines in clinical practice and thus, missed diagnostic and treatment opportunities. ID is a paraphysiological state that precedes anemia and is associated with restlessness affecting day- and nighttime behaviours. Given this, the ID-Conundrum Working Group is investigating (a) how iron status, as part of a homeostatic system (affected by age, sex, pregnancy, inflammation, comorbidities), should be interpreted, (b) how to incorporate clinical conditions that present with hypermotor-restlessness and hyperarousal during sleep into the conceptual ID discussion, and (c) development of screening criteria for conducting iron studies.

Timescales of response to Tonic Motor Activation (TOMAC) therapy for refractory Restless Legs Syndrome (RLS)

R. Bogan[1], A. Roy[2], J. Ojile[3], R. Rosenberg[4], J. Kram[5], J.D. Hudson[6], J. Olin[7], H.S. Scheuller[7], J. Charlesworth[8]
[1]Bogan Sleep Consultants, LLC, Columbia, United States, [2]Ohio Sleep Medicine Institute, Dublin, United States, [3]Clayton Sleep Institute, St. Louis, United States, [4]NeuroTrials Research Inc., Atlanta, United States, [5]California Center for Sleep Disorders, San Leandro, United States, [6]FutureSearch Trials of Neurology, Austin, United States, [7]Delta Waves, Inc., Colorado Springs, United States, [8]Noctrix Health, Clinical Research, Pleasanton, United States

Introduction: There is a large population of individuals with refractory restless legs syndrome (RLS), partially due to augmentation to dopaminergic medications. TOMAC is a safe and efficacious device treatment for refractory RLS that bilaterally stimulates the peroneal nerve to evoke isometric leg muscle activation. Here, we characterize the timescales of response to TOMAC.

Materials and methods: We analyzed data from the 8-week RESTFUL randomized controlled trial (n=133; NCT04874155) and the treatment arm of its 24-week open-label extension study (n=44; NCT05196828), which studied adults with primary moderate-severe medication-refractory RLS. Participants self-administered 30-minute TOMAC sessions whenever they experienced RLS symptoms. Duration of acute symptom relief was assessed specifically for TOMAC sessions administered >2 hours before bedtime. Responders were defined as Clinical Global Impressions of Improvement (CGI-I) rating of very much improved or much improved at the end of the RESTFUL study. Improvement in sleep quality was assessed based on reduction in the Medical Outcomes of Sleep Scale Sleep Problems Index II (MOS-II) score. Frequency of RLS symptoms was based on response to question 7 on the International RLS Rating Scale (IRLS).

Results: Following 30-minute TOMAC sessions, 86% of responders (95% CI: 75 to 97%) reported acute RLS symptom suppression continuing for >30 minutes and 67% (95% CI: 51 to 82%) reported acute RLS symptom suppression continuing for >2 hours. During long-term TOMAC usage, MOS-II score changed by -18.2 points during the 8-week RESTFUL study and an additional -1.6 points over the 24-week extension study (95% CI: -5.3 to 2.2); 93% of the reduction in sleep problems occurred during the first 8 weeks. The frequency of RLS symptoms decreased by 1.47 days/week during RESTFUL and an additional 1.25 days/week during the extension study (95% CI: 0.60 to 1.90); 46% of the reduction in symptom frequency occurred after the first 8 weeks. During the extension study, 57% of RESTFUL study responders (95% CI: 39 to 75%) and 38% of RESTFUL study non-responders (95% CI: 14 to 61%) reported further reduction in RLS symptom frequency.

Conclusions: We found evidence of three distinct timescales of response to TOMAC; acute RLS symptom relief lasting for >2 hours, sleep improvement that plateaus within the first 8 weeks of treatment, and reduction in frequency of RLS symptoms that continues to improve after several months of treatment. These responses should be considered when administering TOMAC in clinical practice.

Sleep Breathing Disorders

12-years follow-up: relationship among cardiovascular, cerebrovascular diseases and obstructive sleep apnea based on Karamay Health Study Cohort

X. Jiang[1], Q. Zhang[1], Y. Sun[2], D. Chen[1], S.-l. Ma[1], M.-r. Han[1], J. Shi[1], M. Li[1], Y. Wu[1], F. Han[3], X. Dong[3]
[1]Xinjiang Second Medical College/Karamay Central Hospital, Department of Respiratory and Critical Care Medicine, Karamay, China, [2]Xinjiang Medical University, Health Management Center, Urumchi, China, [3]Peking University People's Hospital, Sleep Medicine Center, Peking, China

Introduction: Obstructive sleep apnea (OSA) is a global health problem related to the decline of quality of life and the increase of cardiovascular incidence rate and mortality. It is a respiratory disease that can cause cardiovascular (CV) complications and increased mortality risk, especially in patients with moderate to severe OSA. The Cohort study based on population and sleep clinic shows that there is an association between obstructive sleep apnea and cardiovascular events, especially stroke.this study to investigate the incidence of hypertension, coronary heart disease, cerebrovascular disease, diabetes mellitus and death in patients with and without obstructive sleep apnea (OSA) in the Karamay Health Study Cohort during 12 years. Materials and

Methods: From Oct. 2008 to Apr. 2021, 1005 patients with snores aged over 40 years in Karamay community included in this Health Study Cohort, Home Sleep Apnea Testing (HSAT) was performed using the Apnea Link Plus TM (Resmed, Australia) twice (2008 and 2021). Telephoned follow-up was conducted every year, with the occurrence of hypertension, coronary heart disease, diabetes, cerebrovascular disease and death as the follow-up end points.

Results: Among 1005 patients enrolled in 2008, There were 410 han people, average age (66±10)years old,524 Uygur people ,average age (55.0±11) years old, and 71 other ethnics, average age (55.0±10) years old. There were 428 males, average age(62.0±12.8) years old, 577 females, average age (58.0±11.5) years old. There were 639 patients with OSA, average age (61.9±11.5) years old, including 309 males with average age (63.6±11.9) years old, and 330 females with average age (59.7±10.5) years old. The 366 patients with Non-OSA, average age (57.0±12.4) years old, including 120 males with average age (57.3±13.0) years old, and 246 females with average age (55.4±12.1) years old. A total of 767 patients were enrolled from Jun. 2020 to Apr. 2021, including 415 patients with OSA,average age (73±13) years old, and 352 patients with Non-OSA average age (69±12) years old. 232 patients deaths during 12 years, 157 in OSA and 75 in Non-OSA groups. At the end of follow-up, the incidence of hypertension [34.7% (266/767) vs 16.4% (126/767),P=0.001], coronary heart disease[17.0% (62/767) vs 7.4% (57/767)P=0.024] and cerebrovascular disease [13.5% (104/767) vs 4.7% (36/767) P=0.001] were significant difference between the OSA and non-OSA groups respectively, There was significant difference in the incidence of cerebrovascular disease between Han and Uygur OSA groups [6.6% (29/440) vs.14.1% (62/440) P=0.000].There were no significant difference in the incidence of diabetes mellitus [14.0% (107/767) vs 6.9% (53/767) P=0.112] and mortality [15.6% (157/1005) vs 7.5% (75/1005) P=0.08] between OSA and Non-OSA groups respectively.

Conclusions: During 12 years, the incidence of hypertension, coronary heart disease and cerebrovascular diseases in patients with OSA was higher than that in the normal population, the incidence of cerebrovascular diseases is higher in Han patients with OSA than Uygur patients with OSA, Sleep apnea was closely related to cardiovascular and cerebrovascular diseases.

3D airway dimensions and its effects on sleep and breathing of individuals with cleft lip and palate and obstructive sleep apnea

I. Trindade Suedam[1], S. Trindade[2], L. Domingues Campos[1], M.N. Marzano-Rodrigues[1], A. Fischer Drake[3], L.A. Freire Pimenta[3], J. Kimbell[3], I.E. Kiemle Trindade[1]
[1]University of São Paulo - Hospital for Rehabilitation of Craniofacial Anomalies, Laboratory of Physiology, Bauru, Brazil, [2]University of São Paulo, Laboratory of Physiology, Bauru, Brazil, [3]University of North Carolina, Craniofacial Center, Chapel Hill, United States

Introduction: Individuals with cleft lip and palate (CLP) are at high risk for obstructive sleep apnea (OSA). It is known that the severity of OSA might be associated with the dimensions of the upper airway (UAW) and the airflow patterns. This study aimed at investigating, by means of computational fluid dynamics (CFD) and polysomnography (PSG), the airway dimensions and its impact on the occurrence of OSA in adults with CLP and skeletal class III discrepancy.

Materials and Methods: Among the 21 individuals analyzed, 29% presented with OSA (mild in 83% of the cases). According to the results of type I polysomnography tests (EMBLA N7000 system - Broomfield, CO, USA) , the sample (n=21) was allocated in two groups: 1) without OSA (N-OSA, n=6) and 2) with OSA (OSA, n=15). 3D reconstructions were performed on cone-beam computed tomography (ISI-i-CAT Imaging System, cone beam, Next Generation i-CAT®) scans using Mimics Software (Materialize Medical, Leuven, Belgium), and variables assessed corresponded to UAW volume (V) and minimal cross-sectional area (mCSA). CFD simulations were used to assess key airflow variables such as Resistance of the Airway to airflow (R) and Inspiratory Pressure on the airway walls (P) (Ansys Workbench, ANSYS, Inc. Canonsburg, PA - U.S.A). Values of $p \leq 0,05$ were considered significant. This study was carried out at the Sleep Studies Unit of the University of São Paulo, Hospital for Rehabilitation of Craniofacial Anomalies (USP/HRAC), Brazil, and at the University of North Carolina at Chapel Hill, Craniofacial Center (UNC/CC), USA, after approval of the Institutional Review Board (protocol number 389.425).

Results: The UAW volumes of the N-OSA an OSA groups corresponded to $43 \pm 9 cm^3$ and $36 \pm 5 cm^3$ ($p \leq 0,05$), respectively. mCSA of the N-OSA an OSA groups corresponded to $145 \pm 84 mm^2$ and $94 \pm 19 mm^2$, respectively. Despite the 36% dimensional reduction of the mCSA observed in the OSA group compared to the N-OSA group, this difference was not considered significant. UAW P values corresponded to -19 ± 11 Pa (N-OSA) and -22 ± 9 Pa (OSA). UAW R values were $0,11 \pm 0,05$ Pa(ml/s) (N-OSA) and $0,13 \pm 0,04$ Pa(ml/s) (OSA). P and R values did not differ between groups, but there was a tendency for more negative pressures (26%) and greater resistance (19%) in the OSA group. V and mCSA showed a negative correlation with R and P.

Conclusions: CLP individuals with Class III malocclusion and OSA have an upper airway significantly smaller than individuals without OSA. UAW dimensions (V and mCSA) exerted effects on the airway-airflow resistance and pressure. However, key airflow characteristics did not differ between subjects with CLP, affected or not by OSA.

A comparative study of compliance: standard model CPAP Follow-up with telemonitoring and a cost-effective subscription monthly model with periodic accessories supply

S. Furlan[1], I. Fragoso da Silva Cruz[2], L. Daiana Maiorano[2], A. Pierini Martins[2], I. Carneiro Granata[2], C. Albertini[1]
[1]ResMed, Clinical Sleep and Respiratory Care, São Paulo, Brazil, [2]Lumiar, Sleep, São Paulo, Brazil

Introduction: Continuous positive airway pressure (CPAP) is the stablished therapy for moderate to severe obstructive sleep apnea (OSA), however, low compliance and patient acceptance continue to be issues. Access to and affordability of CPAP therapy are barriers to patient treatment and maintenance in cash-pay markets. Healthcare providers seek cost-efficient solutions to enhance care in this area. We hypothesize that a CPAP subscription model could bridge this gap by offering more affordable access to treatment and improving compliance. Our objective is to demonstrate how a subscription model can positively influence patient behavior and compliance and make OSA treatment with PAP therapy more affordable and accessible.

Materials and Methods: This longitudinal study enrolled consecutive adult patients who underwent CPAP treatment between November 2022 and February 2023 and used CPAP with telemonitoring (AirView™) for at least 3 months. The patients were divided in two groups: Standard Care Group (SCG) and the subscription Model Group (SMG). The SCG followed the acquisition or rent model, receiving in person CPAP adaptation and subsequent telemonitoring. The SMG subscribed to a monthly plan, including CPAP AirSense™ S10, ResMed™ nasal or oronasal mask, accessories replacement, and Clinical Standard Care. Compliance was defined as CPAP usage for more than 4 hours, over 70% of the month, or continuously for more than 30 days in the first, second, or third month. Both groups were invited to use the engagement app (MyAir™) to monitor their sleep. The study accessed and compared CPAP compliance between the groups during the first three months, as well the adherence with and without the engagement app.

Results: A total of 818 participants were enrolled (701 in SCG and 117 in SMG). After 3 months, the SMG demonstrated higher overall compliance than the SIG in 80.34% (94/117) vs 73% (510/701), respectively. In the SMG, 91,5% (86/94) achieved compliance criteria in the first month compared to 79.5% (406/510) in the SCG, 7.5% (7/94) vs 16.5% (84/510) in the second month, and 1.06% (1/94) vs. 4% (20/510) in the third month. Regarding the engagement app, 70% (82/117) in the SMG and 35.8% (251/701) in the SCG activated the app. Both groups showed greater adherence with the app than without it: 82% (67/82) vs. 81% (203/251) (SMG vs. SCG).

Conclusions: In comparison to the one-time purchase approach, the subscription based-business model improved CPAP compliance during the 90-day adherence period by acting as an efficient positive reinforcement method. Additionally, most patients in the SMG achieved greater adaptation within the first month. This model added value to patients, enhancing their experience and fostering a strong, long-term relationship with the service provider. The engagement app (MyAir ᴹ) proved to be a wise choice for improving adherence in both groups, despite the lower interest in activating the app among the standard care group. Implementing these two strategies together can offer an attractive approach for long-term adherence.

Acute effect of continuous positive airway pressure (CPAP) on weight in patients with obstructive sleep apnea

G.F. Lima[1], S.H. Silva[1], M.D. Fernandes[1], J.G.A. Lima-Junior[2], L.F. Drager[2], G. Lorenzi-Filho[1], P.R. Genta[1]
[1]Faculdade de Medicina, Universidade de São Paulo/Instituto do Coração, Laboratório do Sono, Divisão de Pneumologia, São Paulo, Brazil, [2]Faculdade de Medicina, Universidade de São Paulo/Instituto do Coração, Unidade de Hipertensão, Divisão de Cardiologia, São Paulo, Brazil

Introduction: CPAP was thought to lead to weight loss among obstructive sleep apnea patients. Recent studies have shown that CPAP leads to a modest weight gain over periods ranging from 1 week to 6 months. However, the proposed mechanisms are conflicting, include reduction in basal metabolic rate and increase in caloric intake, leading to an increase in fat and lean body mass. Fluid accumulation is a well-known effect of positive pressure ventilation. We have recently shown that fluid accumulation occurs after one week of CPAP and is a plausible mechanism leading to weight gain during obstructive sleep apnea (OSA) treatment with CPAP. However, whether weight gain occurs more acutely during the first night of CPAP use is not known. We hypothesized that weight gain occurs during the first night of CPAP treatment.

Materials and methods: Thirty-eight severe OSA subjects underwent baseline polysomnography (PSG). During the following night, participants were randomized to CPAP or a repeat baseline study (Control). Body weight was assessed twice during each study night, before bedtime and at wake-up (after voiding). Overnight urinary volume and osmolality were determined in the morning following PSG. Morning weight difference, urinary volume, urinary osmolality, nocturia episodes were outcome variables. We used estimating equations to perform multiple comparisons between and within groups, morning weight adjusted for bedtime weight.

Results: Mean age (53±8 and 55±10 years), body-mass index (35.0 ± 6.8 and 34.9±5.8 kg/m²), apnea-hypopnea index (74.2±26.9 and 68.4±22.2 events/h) and the proportion of males (69 and 52%) were similar, Control and CPAP groups, respectively. Mean titrated CPAP was 8±2 cmH$_2$O. The morning weight difference in the control group was -0.30±0.46 and CPAP group 0.37±0.55 kg (P=<0.001), nocturia episodes in control group and CPAP group in visit 1 (1 [0-3] and 1 [0-3] P=>0.999) and visit 2 (1 [0-4] and 0[0-2] P=0.007), urinary volume in visit 1 (873±537 and 825±389 ml P=>0.999) and visit 2 (915±517 and 556±334 ml P=0.087) and urinary osmolality in visit 1 (575±221 and 629±183 mOsm/kg P=>0.999) and visit 2 (523±225 and 746±154 mOsm/kg P=0.005). Urinary volume during visit 2 was associated with morning weight difference (visit 1-visit 2) (R=0.476, P=0.002).

Conclusions: The acute weight gain during the first night of CPAP and concomitant reduction in nocturia episodes, urinary volume and increase in urinary osmolality suggest that fluid accumulation is the main mechanism involved.

Adherence time to CPAP and the polysomnography' parameters of the elderly patients

V.V. Pena[1], V.S. Lemos[2], M.P. da Cunha Menezes[3], P.M. Xavier[3], G.M. dos Santos[2], J.P. Ferreira Capanema[2], V.H. Fernandes Leão[2], M.A. Camilo[2], M.H. Siqueira Santos[2], J.V. Resende David[2], F.V. Narciso[4]
[1]Centro Universitario Mario Palmerio, Fisioterapia, Monte Carmelo, Brazil, [2]Centro Universitario IMEPAC-Araguari, Medicina, Araguari, Brazil, [3]Ambulatório do Sono da Prefeitura Municipal de Araguari and Centro Universitario IMEPAC-Araguari, Medicina, Araguari, Brazil, [4]Centro Universitario IMEPAC-Araguari and Centro Universitario Mario Palmerio, Fisioterapia, Araguari/Monte Carmelo, Brazil

Introduction: Differences in sleep quality among patients with the adherence time to CPAP have revealed poor quality of life and increased sleepiness. Therefore, the aim of this study was to verify the quality of life, sleepiness, and polysomnography' parameters of the patients using CPAP.
Materials and Methods: The ninety six patients (women: n=45; men: n=51) with age between 50 and 85 years (mean age: 61.1 ± 10.5 years) of the sleep outpatient clinic of the Araguari/MG city were evaluated with the follow parameters: subjective sleepiness (Epworth Sleepiness Scale-ESS), sleep functionality (Sleep Questionnaire 10-FOSQ-10), and the polysomnography' parameters (Oxygen Desaturation Index-ODI, Apnea Index-AI, Hypopnea index-HI, Apnea and Hypopnea Index-AHI, and sleep-disordered breathing-RERA). All of them used the CPAP, and they were stratified in two groups (group 1: >6 months and group 2: ≥15 days to ≤5 years and 11 months). Mann-Whitney (U) analysis was conducted to assess all the variables. The α-level for all analysis was set at 0.05.
Results: Our results showed the significative difference between the two groups (IA: U=144.0, p=0.05, and RERA: U=216.0, p=0.03). Therefore, AI and RERA were higher in the group 2.
Conclusions: Our data suggest that patients of the group 2 (patients with a short time of use of the CPAP: ≥15 days to ≤5 years and 11 months) have a higher AI and RERA compared with group 1. Patients with greater adherence time to CPAP (group 1) presented lower AI and RERA. On the other hand, patients with higher AI and RERA can decrease the cognition health, physical performance, and developing metabolic diseases.

Adherence to Continuous Positive Airway Pressure (CPAP) treatment in patients with obstructive sleep apnea (OSA) through telemonitoring: experience in a reference Hospital in Northeastern Brazil

M.E. Moreira Cardoso[1], M.E. Mendonça do Nascimento[1], L.J. Coelho de Possídio[2], D.C. Silva Clímaco[2], S.C. Gonçalves Martinez[1], T. Neves Santos Silva[2]
[1]Hospital da Restauração, Neurology, Recife, Brazil, [2]Hospital Otávio de Freitas, Sleep Medicine, Recife, Brazil

Introduction: CPAP is the gold standard for treating patients with moderate to severe OSA[1]. However, its efficacy depends on patients correctly adhering to therapy, which means wearing it for at least 4 hours per night, five days per week, and about 70% of the monthly nights[2,3]. The first 30 days of therapy may be the key for further better adherence[2,3].

The patients are referred to the reference Hospital Otávio de Freitas (HOF), where a sleep specialist evaluates them regarding the treatment of OSA with CPAP or other approaches. This program includes telemonitoring for evaluation and adjustment of CPAP parameters, and is supported by local state public health funding. This study evaluates adherence to CPAP therapy for patients with moderate and severe OSA by telemonitoring in a public health service.

Materials and methods: This retrospective cross-sectional study was conducted between February 1 and March 31, 2021. The database used was the AirView platform (ResMed Inc., San Diego, EUA), which stores all data concerning CPAP adherence. All patients in the database who used CPAP therapy for at least 90 days were included for analysis. Other parameters evaluated were residual apnea-hypopnea index (AHI), hourly use per night, mask leakage, and use of expiratory pressure relief (EPR). Patients under 18 years old, pregnant women, patients with incomplete clinical data, or those using CPAP for less than 90 days were excluded from the study.

After receiving the device, the patients were instructed on its use and monitoring by the multi-professional team (sleep specialist physician and respiratory physiotherapist). All necessary adjustments were made remotely within 15 days of prescription. If necessary, the patients were referred to a sleep specialist.

Results: The program included 421 patients, but 102 were excluded for incomplete data. Thus, the final sample was 319 patients, with 177 female and 142 male patients and a mean age of 46 years old. The sample was evaluated regarding the adherence rate in the first 30 days and the last 90 days of use. The adherence rate was 80% in the first group and 83% in the second group. The CPAP medium pressure delivered was 10cmH20 in both groups. Regarding mask leakage, the first group had a median of 24,6L/min, whereas the second group was 26L/min. The use of EPR was 65,83% in the first 30 days and 69,28% in the last 90 days. The residual AHI was slightly reduced in the last 90 days of assessment (median of 1.30/h against 1.4/h in the first 30 days).

Conclusions: Telemonitoring proved an effective strategy for assessing CPAP adherence with a multidisciplinary approach[5]. It allows early intervention for adjustments within 15 to 30 days of use, increasing the adherence rate to an optimal range as shown in this study[5]. According to the literature, adherence is considered a major challenge in treating patients with OSA[6]. This is an ongoing study with a current sample of 935 patients under statistical analyses for further publication.

Adherence to CPAP of patients with obstructive sleep apnea: the role of physiotherapist

J. Reis[1], J. Abreu[1], D. Emerick[1]
[1]University Center of Caratinga, Physiotherapy, Caratinga, Brazil

Introduction: Physical therapy follow-up for continuous positive airway pressure (CPAP) adjustments and monitoring and remote management of therapy are presented as strategies for good adherence to CPAP for the treatment of Obstructive Sleep Apnea (OSA). The objective was to compare the adherence of patients with OSA to CPAP therapy, submitted or not to remote physiotherapeutic follow-up.

Materials and methods: This is an observational, retrospective study, whose sample consisted of adult individuals, users of CPAP for treatment of moderate or severe OSA, assisted by remote monitoring from August 2017 to January 2020 without the physiotherapist looking and from February 2020 to July 2022, with the eyes of the physiotherapist. Participants were stratified into two groups: follow-up physiotherapeutic group (FPG) and without physiotherapeutic follow-up group (WPFG) and also among users of automatic CPAP and fixed pressure. It was considered adherence to CPAP the use of the equipment for more than 80% of the days, during the first 90 days of use and for four or more hours per night, in more than 80% of the days of use. The study was approved by the Research Ethics Committee of Caratinga Educational Foundation under opinion 5972471. Descriptive statistics and hypothesis tests ($p < 0.05$) within and between groups were used.

Results: The reports of 409 patients were evaluated, of which 189 were from the WPFG and 220 from the FPG. The WPFG that used automatic CPAP was composed of 121 individuals, 67.7% men, with a mean age of 55.3 years and 32.3% women, with a mean age of 65.7 years; while the WPFG that used fixed pressure CPAP was composed of 68 individuals, 52.9% men, mean age 50.1 years and 47.1% women, mean age 59.4years. The FPG that used automatic CPAP was composed of 121 subjects, 66.1% men, with a mean age of 56.6 years and 33.9% women, aged average of 62.6 years; while the FPG that used fixed pressure CPAP was composed of 99 individuals, 59.6% men, with a mean age of 54.6 years and 40.4%women, with a mean age of 62.9 years. There was no statistically significant difference in CPAP adherence between groups, but CPAP adherence was significantly more prevalent among male patients compared to female patients, with the exception of the FPG who used CPAP with fixed pressure, in which there was a higher prevalence (77.5%), statistically significant, of adherence by women compared to men.

Conclusion: With regard to remote monitoring, physiotherapeutic monitoring did not influence adherence to CPAP therapy for the treatment of AOS, as well as the mode used, whether automatic or fixed pressure. However, there seems to be a relationship between male gender and adherence to CPAP.

Adverse clinical associations of the comorbidity of insomnia and Obstructive sleep apnea

M. Yanagimori[1], M.D. Fernandes[1], P.M.M.S. Mariano[1], A.B. Monare[1], G. Farias[1], I. Rosanelli[1], B.M.S.P. Garcia[1], G. Freitas Grad[1], P.R. Genta[1]
[1]Universidade de São Paulo/Hospital das Clinicas HCFMUSP, São Paulo, Brazil

Introduction: •The comorbidity between insomnia and sleep apnea (COMISA) leads to worse clinical impact than either disorder alone. Predictors of the additive clinical impact of COMISA are not known. We hypothesized that quality of life is more compromised, and sleepiness is higher among COMISA than with either insomnia or obstructive sleep apnea (OSA) alone.

Materials and Methods: Subjects referred for OSA diagnosis underwent a type 3 sleep study and answered: Epworth sleepiness scale, Insomnia Severity Index (ISI), Pittsburgh sleep quality index (PSQI), WHOQOL-bref, Beck anxiety and depression inventory and medications in use. OSA was defined as apnea hypopnea index (AHI) > 15 events/h and insomnia as an ISI score > 15. Subjects were classified in 4 groups according to OSA and insomnia status: control (no OSA, nor insomnia); OSA only; Insomnia only and COMISA. Multiple linear regression was used to test independent predictors of: sleepiness, sleep quality, quality of life (physical and psychological).

Results: Anthropometric, polysomnographic and clinical characteristics of the studied groups are shown in the table below (Table 1). Sleepiness was significantly higher among COMISA as compared to the other 3 groups (Control, OSA-only and insomnia-only). Quality of sleep and quality of life were worse among COMISA than Control and OSA subjects. Multiple linear regression: sleepiness (dependent variable): ISI, AHI, no sedative use and belonging to COMISA or insomnia only groups compared to control group were independent predictors (Table 2); sleep quality (dependent variable): ISI and anxiety were independent predictors (Table 3) and quality of life – physical and psychological (dependent variable): ISI, depression and belonging to insomnia group compared to control group, were independent predictors (Tables 4 and 5).

Conclusions: COMISA is associated with worse clinical outcomes, including sleepiness, impaired quality of sleep and quality of life among subjects referred for polysomnography. Having COMISA was an independent predictor of sleepiness. Having insomnia and insomnia severity were independent predictors of sleepiness, sleep quality and quality of life.

Adverse effects and comfort assessment of nasal and oronasal masks in APAP therapy: a comparative study

L. Souto Barros[1], F. Batista Ferreira[2], M. Drummond[3], R. Natal[4]
[1]AAME, São Paulo, Brazil, [2]Casa Hunter, São Paulo, Brazil, [3]Universidade do Porto, Faculdade de Medicina, Porto, Portugal, [4]Universidade do Porto, Faculdade de Engenharia, Porto, Portugal

Introduction: Patient comfort is recognized as a crucial determinant of nocturnal ventilatory support adherence and efficacy. Often, patients complain that their reason for discontinuing treatment is the discomfort of the APAP mask. Objective: To identify and evaluate adverse effects (AE) with oronasal (Mirage Quattro™ and Quattro FX™, Resmed; Respireo Primo™, Air Liquide) and nasal (Mirage FX Female™, Mirage FX™, Resmed; FlexiFit 407™, Zest Plus™, Opus™, Fisher Paykel; Confort Blue™, Philips) masks APAP therapy in patients with OSA.

Methods: The study included 86 patients diagnosed with OSA at Hospital São João (Porto, Portugal) who met the criteria for APAP therapy. A questionnaire based on the adverse effects (dryness of the orofaringea, irritation ocular, nasal obstruction, nasal secretions, aerophagia and claustrophobia) reported in the literature and in a previous study was developed. Visual analog scales were used to determine patient comfort levels (1-10) with APAP mask. Patients filled in the referred questionnaire in 3 different moments after therapy initiation: Baseline (0,77±0,22 months) during the Group Education Session; Follow-up 1(1,85 ± 0,09 months) during follow-up session and Follow-up 2 (7,71 ± 0,80 months) using a telephone call.

Results: 33 of the 86 patients have switched masks because of discomfort or leaks. 57 patients completed the study. 50% of patients used oronasal interface, 45.3% nasal, and 4.7% nasal pillow at baseline. It was found no statistical difference between therapy adherence assessed by average hours of daily use and mask comfort levels. It was found statistical difference between Baseline comfort and Follow-up 1 comfort (6,4±2,1 *vs* 7,5±2,4;p=0,001*), but it was found no statistical difference between Follow-up 1and Follow-up 2 (7,5±2,4 *vs* 7,2±2,2;p=0,73). Comparing the type of interface with the mean comfort did not show a statistically significant difference. The percentage of AE complaints in the 3 moments respectively were: Dryness of the oropharynx (73.2%, 68.4%, 66.7%), ocular irritation (28%, 28.9%, 35.2%), obstruction nasal (40.22%, 42.1%, 16.7%), rhinorrhea (28%, 25%, 13%), aerophagia (24.4%, 40.8%, 35.2%), claustrophobia (22%, 14.5%,22.2%). There was no statistically significant difference when comparing the oronasal interface with the nasal interface with AEs.

Conclusion: Comfort increased significantly comparing M1 and M2, referring to the importance of patient education and follow-up by a specialized team during the first months; solving adaptation problems and making the necessary modifications. More study is needed to verify the action of time and learning with AEs according to the type of interface.

Adverse event reports for continuous positive airway pressure, hypoglossal nerve stimulation and oral appliance therapy devices: an fda maude database analysis

G. Vogel[1], L. Liptak[1], M. Murphy[1]
[1]ProSomnus Sleep Technologies, Pleasanton, United States

Introduction: This investigation analyzes adverse event reports (AERs) from the FDA MAUDE database for Continuous Positive Airway Pressure (CPAP), Hypoglossal Nerve Stimulation (HNS) and Oral Appliance Therapy (OAT) devices. The FDA defines adverse events as undesirable experiences associated with medical devices that should be reported when the outcome is death, life threatening, hospitalization, disability, required intervention, or serious medical events.

Materials and methods: The FDA MAUDE database is publicly available. For this investigation, the database was accessed on September 29, 2022. Publicly available industry reports were utilized to estimate prevalence of AERs.

Results:

Overview: From January 1, 2022 to September 2022, AERs for CPAP, HNS and OAT were 72,251, 11,867 and 30, respectively. From January 2017 to September 2022, the annual count of AERs for CPAP and HNS increased 245% and 252% respectively. The annual count of AERs for OATs decreased -1.3% over the same period.

Device Problems: For CPAP, "Degradation" comprised 96.6% of the AERs. For HNS, "Event Without Problem" and "Device Sensing" comprised 78.6% and 11.0% of AERs, respectively. For OAT "Event without Identification" and "Breakage" comprised 40.0% and 9.8% of AERs, respectively.

Patient Problems: For CPAP, seven patient problems comprise over 80% of reports: No Clinical Signs/Conditions, 57.3%; Dyspnea, 5.4%; Headache, 5.3%; Sore Throat, 4.3%; Respiratory Tract Infection, 4.1%; Cough, 3.5%; Unspecified Respiratory, 3.0%.

For HNS, nine patient problems comprise over 80% of reports: Unspecified Infection, 19%; Pain, 15.2%; No Clinical Conditions, 9.2%; Bacteria Infection, 8.7%; Perforation of Vessels, 7.1%; Erosion, 7.1%; Wound Dehiscence, 4.9%; Swelling/Edema, 4.8%; Hematoma, 4.4%.

For OAT, seven patient problems comprise over 80% of reports: Hypersensitivity/Allergic Reaction, 23.5%; Reaction, 19.0%; No Known Impact, 15.9%; Swelling, 8.7%; Pain, 6.2%; Discomfort, 4.5%; Erythema, 3.8%; Rash, 3.5%.

Conclusions: This analysis suggests that healthcare providers may wish to consider the significant differences in the frequencies and the severities of adverse events when prescribing treatment modalities for patients with OSA.

Dental side effects, a widely referenced reason for limiting the utilization of OAT devices, do not show up in the top 80% of the most frequently reported types of adverse events.

This investigation has limitations. The FDA database relies on reports from manufacturers. HNS is a Class III device whereas CPAP and OAT are Class II, which may result in different approaches to reporting.

Ageing and non-communicable disease in people living with HIV - sleep apnea as a neglected non-communicable disease

S. Akbarpour[1], M. Shafaati[2], S. Mohammad nejad[3], F. Hadavandsiri[4]
[1]Occupational Sleep Research Center, Baharloo Hospital, Tehran University of Medical Sciences, Tehran, Iran, Islamic Republic of, [2]Research Center for Antibiotic Stewardship and Antimicrobial Resistance, Infectious Diseases Department, Imam Khomeini Hospital Complex, Tehran University of Medical Science, Tehran, Iran, Islamic Republic of, [3]Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical, Tehran, Iran, Islamic Republic of, [4]Department of Epidemiology, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran, Islamic Republic of

Introduction: The present national study aimed to address aging and NCDs, namely diabetes, hypertension, heart disease, and obstructive sleep apnea co-morbidity and related factors in PLWH in Iran.

Methods: This national study was conducted on 1173 confirmed PLWHs with a mean age of 35.35 (199 Over 50 years old, 974 Under 50 years old) admitted from 15 different provinces in the country. Berlin Obstructive Sleep Apnea Questionnaire (BQ) were used for sleep apnea and NCD comorbidity (Heart disease, Lung disease, Hypertension, and diabetes) were collected by using the NCDs questionnaire. Participants who used NCD medication or had been diagnosed as NCD cases by a physician were categorized into the NCD group.

Results: From 1173 PLWH, 225 (19.18%) participants experienced at least one NCD (15.20% and 38.69% among under- and over-50-year-old patients, respectively). The prevalence of heart disease, hypertension, diabetes, and sleep apnea among all patients was 1.59%, 2.05%, 1.55%, and 10.26%, respectively. The similar prevalence for each NCD among those over 50 years was 10.11%, 15.71%, 9.01%, 25.44%, and 1.01%, 1.12%, 1.04%, and 9.23% among those under 50 years, respectively. The odds of being at risk of at least one NCD stood higher in patients over 50 years (OR= 2.93, 95% CI: 1.96–4.37), married (OR= 2.48, 95% CI: 1.41–4.35), divorced or widowed (OR= 2.78, 95% CI: 1.48–5.20), and obese (OR= 3.82, 95% CI: 2.46–5.91). Regarding patients over 50 years old, age and obesity were significant predictors. Also, being HIV-infected through sexual contact, being obese, having a diploma, and being older were associated with higher odds for at least one NCD comorbidity among those under 50 years old.

Conclusion: The higher prevalence of NCDs and sleep apnea in patients over and under 50 shows the importance of integrated care measures for NCDs and HIV in the country and needs to be paid more attention to by healthcare policymakers.

Keywords: Aging, Non-Communicable Disease, HIV, Comorbidity, obstructive sleep apnea, Iran.

A machine learning-based model to predict obstructive sleep apnea in pregnancy

J. Wang[1], F. Han[1]
[1]Peking University People's Hospital, Beijing, China

Introduction: Obstructive sleep apnea (OSA) is common in pregnancy and associated with an increasing risk of adverse maternal and fetal outcomes. OSA has been proposed as a potential intervention target for improving pregnancy outcome. However, lack of specific screening tools results in low screening and diagnosis rates of OSA in this population.

Materials and methods: A total of 289 pregnant women at high risk of OSA were recruited to complete validated questionnaires consisting of Berlin, STOP, STOP-Bang questionnaires and Epworth Sleepiness Scale. They also underwent basic physical examination including neck circumference and oropharyngeal examination. An overnight type III home sleep test was used to determine the OSA status for the subjects (apnea-hypopnea index≥5 events/h). 74 of them repeated this procedure at different trimesters, which generated 393 records totally in current study. 70% of records (n = 275) were randomly selected as training cohort and the remaining 30% (n = 118) were utilized as validation cohort. Logistic regression model was built based on the training cohort and validated by accuracy, area under the receiver-operating-characteristic curves (AUC), sensitivity, and specificity among validation cohort. Odds ratios and 95% confidence intervals (CIs) were calculated for predictor variables.

Results: The model for OSA risk prediction consisted of gestational age, body mass index (BMI), neck circumference, age, pre-pregnant BMI, history of snoring, hypertensive disorders of pregnancy (HDP), hyperglycemia in pregnancy (HIP), enlarged tongue, overjet and three questions selected from questionnaires. The accuracy, AUC, sensitivity and specificity in validation cohort are, 0.822, 0.910(95% CI, 0.854 - 0.963), 0.918 (95% CI, 0.808 - 0.968), and 0.754 (95% CI, 0.640 - 0.840) respectively. The prediction model performed satisfactory across three trimesters, especially in the second trimesters with accuracy of 0.813 and AUC of 0.895 (95% CI, 0.784 - 1.000).

Conclusions: This study provides an easy-to-use 12-item predictive tool with good predictive performance for clinical screening of OSA in pregnant women.

A mathematical model to estimate tissue level oxygenation during OSA events- beyond morphological descriptors and back to physiology

N. Qayyum[1], H. Wallace[2], A. Grosberg[3], R. Khayat[4]
[1]University of California-Irvine, Department Chemical and Biomolecular Engineering and Department of Biomedical Engineering, Irvine, United States, [2]University of California-Irvine, Deparmtent of Biomedical Engineering and Edwards Lifesciences Foundation Cardiovascular Innovation and Research Center, Irvine, United States, [3]University of California-Irvine, Biomedical Engineering, Center for Complex Biological Systems, NSF-Simons Center for Multiscale Cell Fate Research, Irvine, United States, [4]University of California-Irvine, Sleep Disorders Center, Newport Beach, United States

Introduction: The utility of the apnea hypopnea index (AHI) in assessing the severity of obstructive sleep apnea (OSA) has been questioned. Intermittent hypoxia is the critical pathophysiological abnormality in OSA, and severity of hypoxia exposure may correlate better with the consequences of OSA. We sought to create a mathematical model that uses clinical and polysomnographic parameters and can be deployed within the clinical sleep study to precisely measure the actual tissue- level hypoxemia and generate a quantitative assessment of OSA severity

Materials and methods: All oxygen transfer to the tissues in the systemic circulation was assumed to occur in the systemic capillaries, which were modeled as a single compartment. This was parameterized using an overall metabolic rate for tissue oxygen consumption. Therefore, the total oxygen concentration in the pulmonary arteries was taken to be equivalent to that in the systemic veins ($C_{pa,O2T} = C_{sv,O2T}$). Similarly, the total oxygen concentration in the pulmonary veins was taken to be equivalent to that in the systemic arteries ($C_{pv,O2T} = C_{sa,O2T}$). To determine the oxygen concentration in the pulmonary arteries, an unsteady-state mass balance was performed over a differential control volume moving through the systemic capillary compartment at the same velocity as the surrounding blood.

Ventilatory measurements: To convert the recorded nasal pressure to a nasal flow rate, a fitting parameter for each patient was defined by assuming that the average maximum nasal pressure during the identified normal breathing corresponds to the maximum simulated inspiratory flow for ideal tidal breathing. The generated nasal flow signals were then integrated over time to achieve time-dependent lung volumes, which were used to approximate the patient alveolar volumes as model inputs.

Results: We first used the model to estimate the tissue oxygenation during simulated scenarios of apnea/hypopnea sequences including non-scorable event sequences such as 3% desaturations, respiratory effort related arousals (RERA)s, and short apneas. Also, several scenarios of different sequences of the same AHI were modeled with variable hyperventilatory and event durations. trains of events, longer events, and those with shorter hyperventilation were associated with worse tissue oxygenation.

Second, to demonstrate the clinical utility of the model, recorded heart rate and approximated lung volume data

from the converted nasal pressure of two OSA patients were used as time-dependent inputs. The model output hemoglobin oxygen saturation in the systemic vessels, which can be compared to the recorded pulse oximeter data. In some regions the model predicted a higher arterial saturation than the recorded SpO2, while it was comparatively lower following a respiratory effort related arousal (RERA) event. In addition, the solution provided the dissolved oxygen concentration in the systemic vessels to better quantify the hypoxic burden on tissues

Conclusions: The results support previous claims of the AHI not being the most reliable predictor of OSA severity. In addition, the clinical application of our model was highlighted by using OSA patient data from multi-hour sleep studies, underscoring the model strengths of providing more sensitivity in comparison with pulse oximeter measurement and the utility of systemic venous oxygenation.

Analysis of adherence to the proposed treatment according to the apnea-hypopnea index from August 2021 to December 2022 in patients at the sleep clinic at a Military Hospital in Rio de Janeiro

M. Mosciaro-Glatt[1], M. Nasr[1], E. Pinho[1], S. Albagli[1], G. Aganetti[1], A. Rodrigues[1], H. Flora[1]
[1]Aeronautic central hospital, Otorhinolaryngology, Rio de Janeiro, Brazil

Introduction: Obstructive Sleep Apnea (OSA) is characterized by a sleep breathing disorder, with recurrent episodes of partial or total obstruction of the upper airways, prevalent in 9% to 24% of the adult population over 40 years old. The therapeutic approach should be multidisciplinary and individualized according to each patient, aiming at the best possible adherence, reducing obstructive events, improving life quality and reducing the systemic repercussions of the disease.

Materials and Methods: An observational, cross-sectional study carried out at the Hospital Central da Aeronáutica (HCA) between August 2021 and December 2022, in Rio de Janeiro, Brazil. A representative population sample was analyzed, consisting of 66 individuals over 18 years old, of both genders, who were followed up at the Sleep Medicine outpatient clinic in the Otorhinolaryngology sector of the HCA.

The variables analyzed for each individual were: AHI (apnea and hypopnea index), gender, age and proposed and performed treatment. Based on these variables associated with anamnesis, physical examination and complementary exams, an individualized treatment was proposed for each patient.

Results: The treatment was considered successful when the patient had an AHI reduction of 50% or more.

Of the ten patients with mild OSA, six (60%) underwent successful surgical treatment, one (10%) patient had adequate adaptation to Continuous Positive Airway Pressure (CPAP) and three (30%) did not adhere to the proposed treatment.

Of the nineteen patients with moderate OSA, nine (47.6%) underwent successful surgical treatment, six (31.5%) patients had adequate adaptation to CPAP, one (5.2%) patient underwent combined treatment of CPAP associated with nasal surgery, one (5.2%) patient used an intraoral appliance and two (10.5%) did not adhere to the proposed treatment.

Of the thirty-seven patients with severe OSA, five (13.5%) underwent successful surgical treatment, eighteen (48.6%) patients had adequate adaptation to CPAP, two (5.4%) patients underwent combined treatment of CPAP associated with a surgical procedure and twelve (32.5%) did not adhere to the proposed treatment.

Conclusions: In conclusion, the analysis of adherence to the proposed treatment based on the apnea-hypopnea index over 17 months revealed significant insights into the therapeutic approach of Obstructive Sleep Apnea (OSA). The diversity of therapeutic options adopted, including surgical treatment, CPAP, combined treatment and use of an intraoral appliance, demonstrated the importance of individualizing treatment for each patient. The results indicated that adherence to treatment varied considerably, with different success rates for each severity category of OSA. Notably, the prevalence of patients with severe OSA at the Hospital Central da Aeronáutica (HCA) underscores the continuing need for effective and personalized approaches to deal with this challenging clinical condition. This analysis offers a valuable perception to guide future efforts to improve adherence and treatment of OSA, aiming at improving the quality of life and the repercussions of the disease for patients treated at the HCA sleep clinic, in Rio de Janeiro.

Analysis of clinical outcomes related to COVID-19 infection in adults with obstructive sleep apnea using continuous positive airway pressure therapy: a retrospective cohort study

L. Mello[1,2,3], R. Duarte[4], J. Rodrigues Filho[5], C. Valete[1,2]
[1]Instituto Nacional de Infectologia Evandro Chagas, Fundação Oswaldo Cruz, Rio de Janeiro, Brazil, [2]Hospital Universitário Clementino Fraga Filho, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil, [3]Hospital Federal da Lagoa, Rio de Janeiro, Brazil, [4]Instituto de Doenças do Tórax - Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil, [5]Hospital Universitário Gaffrée e Guinle, Universidade Federal do Estado do Rio de Janeiro, Rio de Janeiro, Brazil

Introduction: Obstructive sleep apnea (OSA) is a chronic disease characterized by cyclical obstruction (partial or total) of the upper airway during sleep. Its pathophysiology is multifactorial and complex with the participation of anatomical and non-anatomical factors, and the direct systemic consequences are intermittent nocturnal hypoxemia and sleep fragmentation. Since the emergence of the infection caused by the new Coronavirus (SARS-CoV-2) in December 2019 in the Chinese province of Wuhan, the World Health Organization has determined the so-called COVID-19 disease. Possibly, the main risk factors associated with COVID-19 infection are obesity, hypertension, and diabetes mellitus, which are commonly seen in OSA patients. It was recommended that OSA be included as a risk factor for negative prognosis (admission to the Intensive Care Unit [ICU], use of mechanical ventilation, or death) of patients with COVID-19. The objective of this study was to verify whether, in obstructive sleep apnea (OSA) patients, adherence to continuous positive airway pressure (CPAP) therapy, clinical and/or polysomnographic data, could be considered as predictors of two clinical outcomes related to infection by COVID-19: the presence of symptoms and need of hospitalization. Secondarily, we also evaluated whether some clinical or polysomnographic factors could be considered predictors for the occurrence of symptoms due to COVID-19 infection and/or the need for hospitalization.

Materials and Methods: A retrospective cohort study was developed with OSA Brazilian adults using CPAP during the COVID-19 pandemic, which were categorized into two groups: adequate or inadequate CPAP adherence. The CPAP adherence was obtained through memory card reading or remote monitoring for the period of 3 months prior to the date of the COVID-19 infection. Use of CPAP ≥ 4 hours for ≥ 70% of the nights was considered satisfactory adherence. The two COVID-19 outcomes evaluated were the presence of symptoms and the need for hospitalization

Results: Overall, 57 adults (68.4% males) were divided into two groups: 22 non-adherent and 35 adherent patients to CPAP therapy. Logistic regression analysis showed that no parameter was considered as a predictor of the presence of symptomatic COVID-19 infection. The body mass index (BMI) emerged as an independent parameter of hospitalization: adjusted odds ratio: 1.270 (95% confidence interval: 1.001-1.615). Adherence to CPAP treatment was not a useful predictor in either of the two evaluated outcomes.

Conclusions: Our findings suggest that CPAP adherence does not influence the presence of two clinical outcomes associated with COVID-19 infection in OSA patients undergoing CPAP therapy. However, BMI was a significant predictor of the need for hospitalization due to COVID-19 infection.

Analysis of the characteristics of Catathrenia, a survey based on Internet

W. Yongfei[1], L. Mengjie[2], X. Liyue[3], G. Yinghui[2], W. Hui[1], X. Feng[1], H. Fang[3]
[1]Cangzhou People's Hospital, Pulmonary and Critical Care Medicine, Cangzhou, China, [2]Peking University International Hospital, Sleep Center, Beijing, China, [3]Peking University People's Hospital, Sleep Center, Beijing, China

Introduction: Catathrenia, also known as nocturnal groaning, is characterized by slow exhalation after deep inhalation, accompanied by monotonous vocalizations. The incidence of nocturnal groaning is low. Because of the monotonous and special groaning sound, the patient's bed partner or family members can often notice the special sound and self-diagnose catathrenia.

Objective: In this study, a large number of patients with nocturnal groaning were collected through the Chinese Internet platform. And the pathogenesis was studied.

Methods: An article containing video and audio recordings of patients nocturnal groaning was written on the Chinese Internet platform "Zhihu". Netizens' comments under the article were followed. Send research invitations to the suspicious patients by "private chat" , and assist them to complete the questionnaire of nocturnal groaning consultation remotely. Thus questionnaire survey was used to analyze the clinical characteristic of nocturnal groaning.

Results: The article was published on Zhihu in February 2020, and by June 2023 it had been read 0.9 million times, received 1,607 "endorsements", and received 942 comments and replies. A total of 540 patients suspected of groaning were invited to the consultation questionnaire, and 202 questionnaires were recovered, among which 176 people complained of nocturnal groaning and 6 complained that their friends or close relatives had groaned. Among the 176 patients with groaning, the male to female ratio was 1:2.91 (45:131), the BMI was 21.15±3.82kg/m2, the filling age was 23.55±5.04 years, and the onset age was 17.59±5.32 years. 14.8% (26) discovered the phenomenon by themselves, 33.5% (59) discovered by their family members, and 49.4% (87) discovered by their roommates. About what can make the condition worse. 20.5% (36) reported the groaning get worse when they got a nasal congestion, 14.8% (20) reported when they had a upper respiratory tract infection (URTI), 46.6% (82) reported when they were tired, 54.5% (96) reported when they had mental stress. 27.8% (49) reported the groaning get better when they felt relaxed. 22.2% (39) reported the condition decrease daytime energy, 71.0% (125) and 19.9% (35) reported the condition affecting relationships with roommates and causing anxiety/depression. 36.4% (64 people) reported they groaned every day, 14.8% (26) reported they groaned five to six times a week, and 10.2% (18) reported they groaned three to four times a week. Of the 131 women, only 3 reported the condition increased menstruation, while the rest reported no change during the menstrual cycle. 8.0% (14) reported that their father or mother also had condition.

Conclusions: Nocturnal groaning occurs at a low age, mostly in adolescents and mostly in females, with Normal weight or underweight. Most patients were unaware of the vocalization; Nasal congestion, URTI, fatigue and other aggravating the groaning phenomenon and mental relaxation can reduce the phenomenon; Groaning can lead the decreasing of daytime energy, affect the relationship with roommates, and lead to anxiety and depression. Some patients have a family history.

Analyzing the demographic profile of Obstructive Sleep Apnea in the United States from 2004 to 2020

T. Fleury Curado[1], M. Abdelwahab[1], A. Huang[1], F. Castro[1], A. El Abany[2], L. Diniz Costa[3], P. dos Santos Cé[4], N. Scott Howard[5], S. Marques[1], R. Capasso[1]
[1]Stanford University School of Medicine, Sleep Surgery Division, Department of Otolaryngology – Head and Neck Surgery, Palo Alto, United States, [2]Stanford University School of Medicine, Facial Plastics Division, Department of Otolaryngology – Head and Neck Surgery, Palo Alto, United States, [3]University of Sao Paulo, Facial Plastics Division, Department of Otolaryngology, Sao Paulo, Brazil, [4]Federal University of Santa Catarina, Department of Maxillofacial Surgery, Florianopolis, Brazil, [5]University Hospitals, Case Western Reserve University School of Medicine, Department of Otolaryngology – Head and Neck Surgery, Cleveland, United States

Introduction: Conservative estimates suggest that OSA affects 25-30% of adults in the United States, making it a common disorder. The prevalence is even higher among obese individuals, exceeding 50%. OSA is associated with increased cardiovascular morbidity and mortality. This study aims to analyze a comprehensive healthcare database to determine the volume, types, and trends of surgical procedures offered to treat OSA among various social groups at a national level.

Materials and Methods: The study utilized the Optum Clinformatics® Data Mart databases to examine longitudinal data from January 2004 to December 2020. The analysis included patients aged 18 to 89 years, both male and female, with a confirmed diagnosis of OSA. Patients were either treated with continuous positive airway pressure (CPAP) or underwent surgical interventions.

Results: A total of 1,250,273 individuals were diagnosed with OSA during the study period. The mean age at the time of OSA diagnosis was 62 years (SD=16), with a male predominance of 62.3% and 75% of patients being Caucasian. During the period from 2004 to 2020, the number of patients diagnosed with obstructive sleep apnea (OSA) increased, while the number of patients opting for surgical interventions decreased. In 2006, approximately 2.9% of individuals diagnosed with OSA underwent surgical procedures. However, this percentage gradually declined over the years, reaching a low of 0.6% in 2019.

The most common surgical procedure for treating OSA was Uvulopalatopharyngoplasty. The frequency of UPPP peaked in 2006 with 883 patients, but subsequently declined, resulting in a total of 100 surgical interventions in 2020. This procedure was more frequently performed on males than females (77.5% and 22.5%, respectively), and the majority of patients identified themselves as white (73.6%), followed by Hispanic and Black individuals (10.8% and 9.8%, respectively).

Facial skeletal procedures for OSA, including isolated maxillary or mandibular advancement, as well as the more common combined maxillomandibular advancement (MMA), accounted for a smaller fraction, with a total of 830 procedures or 5.1% of the reported cases. The gender distribution for these procedures was balanced (48.5% male and 42.6% female), and the number of annual procedures remained relatively steady at around 50, until dropping to 32 in 2020.

Another treatment option for OSA, the implantable hypoglossal nerve stimulator, was performed in 1.9% of patients, and its numbers have been increasing since 2016. Unlike other surgical procedures, the rate of patients opting for hypoglossal nerve stimulation increased over time. Compared to other surgical interventions, this procedure was more common among an older population, with a mean age of 62.0 years, and there was a male-to-female ratio of approximately 2 to 1 (67.1% male and 32.9% female). However, racial disparities were further pronounced in this treatment modality, with 81.2% of patients self-identifying as white, 8% as Hispanic, and 6.1% as Black.

Conclusions: This study provides valuable insights into the prevalence and characteristics of surgical procedures used for OSA treatment in a diverse national population. The findings highlight the importance of understanding surgical intervention patterns and trends to improve patient care and outcomes.

An evolving interest for obstructive sleep apnea surgical interventions

A. Ravivarapu[1], V. Firmalino[2]
[1]University of the Pacific, Arthur A. Dugoni School of Dentistry, San Francisco, United States,
[2]University of Texas Southwestern, Parkland Memorial Hospital, Oral and Maxillofacial Surgery, Dallas, United States

Obstructive sleep apnea (OSA) is a common global disease which can be treated surgically by Oral and Maxillofacial Surgeons. Many treatment options are available to be explored by physicians and patients. Continuous positive airway pressure(CPAP) and modifications have reigned as the most common treatment. However, when CPAP isn't compatible with an individual's needs, solutions can be achieved through various surgeries instead of or in conjunction with CPAP(1). Patients hold interests in researching possible surgical solutions using the internet. An analvsis of internet searches can help providers to understand varying interest levels in each surgical treatment type for OSA. The purpose of this study is to understand future demand for various OSA treatments by analyzing which surgical procedures are most commonly searched, if there has been a recent change in interest, and which geographic locations these searches are generated from.

Data was collected via Google Trends(GT) for the last 12 months, May 2021 to May 2022, to show current trends and from May 2020 to May 2021, in order to identify any significant changes in interest from then to 2022. GT analyzes countries in which certain terms are searched for and the relative search volumes(RSV) between regions, reported as a score out of 100. A score of 100 signifies peak interest in the topic. Common surgical treatments for OSA include septoplasty, uvulopalatoplasty(UPPP), advancement genioplasty, mandibular osteotomy, maxillomandibular advancement(MMA), and hyoid suspension(2). To see the current variance in popularity by search volume and geographic location, the following terms were analyzed through GT: "septoplasty", "vuloplatoplasty, "genioplasty, "mandibular osteotomy", "maxillomandibular advancement", "hyoid suspension". RSVs and origins of the term searches were compared against each other in order to determine relative global interest in surgical options for OSA. Two-tailed tests were used to determine any significant changes in interest for each of the terms from 2021-2022; p-values less than 0.05 were considered significant.

Of the terms analyzed, septoplasty(77.9 RSV; 41 countries) and maxillomandibular advancement(63.4 RSV; 14 countries) have the first and second highest mean RSVs, respectively, worldwide. Mandibular osteotomy(50.9 RSV; 3 countries), genioplasty(45.6 RSV; 19 countries), and uvulopalatoplasty(35.9 RSV; 7 countries) follow from highest to lowest mean RSV. Hyoid suspension(25.2 RSV; 1 country) is least searched for. Changes in interest(mean RSV) for search terms from 2020-2021 to current were analyzed. "Septoplasty" went from 42.1 to 77.9, and showed a statistically significant increase(P<0.00001). "Genioplasty" went from 33.2 to 45.6 and showed significant increase(P<0.00001). "Maxillomandibular advancement" went from 55.7 to 63.4 and showed significant increase(P=0.023997). "Uvulopalatoplasty" went from 46.3 to 35.9 and showed significant decrease(P=0.000122).

Google Trends shows significant worldwide interest in oral and maxillofacial surgeries used to treat OSA. Further investigation on the root of the public's interest, recent shift in interest, and spread of search origin should be done to understand varying interest. With further knowledge on the public's position on various surgeries, providers are enabled to better understand patient concerns, and better inform and guide patients towards suitable treatments.

Thank you Dr. Stanley Yung Liu, MD, DDS, FACS of Stanford Sleep Surgery for your guidance.

¡Anxiety, depression, and poor sleep quality! The hidden face of sleep apnea in older adults

L. Vargas-Ramirez[1], F. Valderrama[1], D. Rodríguez[1], K. Rojas[1], L. Rodriguez Corredor[1]
[1]Instituto Neumológico del Oriente, Bucaramanga, Colombia

Introduction: A high prevalence of anxiety and depression symptoms has been described in patients with obstructive sleep apnea (OSA), at around 35% according to recent systematic reviews. We are unaware of the behavior of these symptoms and their impact on sleep quality according to the severity of OSA in the older adult population, as well as the impact of interdisciplinary intervention in the adaptation process to positive airway pressure (PAP) therapy.

Materials and Methods: Cross-sectional study. Categorical variables are described as absolute and relative frequencies, and continuous ones as medians (IQR). Chi-squared and Mann-Whitney U test to assess differences according to the severity of OSA. Beck's Anxiety and Depression Inventory and Pittsburgh Sleep Quality Questionnaire. The study was approved by the ethics committee of the Eastern Pulmonology Institute.

Results: Data was collected from 110 patients with a median age of 72.5 years who attended an interdisciplinary program (pulmonology, psychology, physiotherapy) for adaptation and follow-up to positive airway pressure therapy over the course of one year. Of these patients, 60.91% had severe OSA, while the remaining percentage had moderate OSA.

In the severe OSA group, 44.7% were female, while in the moderate OSA group, 67.4% were female (p 0.02).

The median age of patients with severe OSA was 72.5 years (IQR 66-79), while in patients with moderate OSA, it was 70 years (IQR 64-79), p 0.35.

In the severe OSA group, the median BMI was 28.9 (IQR 26.2-31.7), with no significant differences compared to the moderate OSA group with a BMI of 26.9 (IQR 25.0-29.3) (p 0.17).

There were no significant differences between the two groups in sleep efficiency observed in the baseline polysomnogram, with 81.1% (IQR 66.8-87.5) in moderate OSA and 77.3% (IQR 64.8-88.3) in severe OSA (p 0.54).

Significant differences were observed in the oxygen desaturation index between the two groups: moderate OSA 17.9/h (IQR 13.4-24.2) compared to 37.5/h (27.0-52.9) in the severe OSA group (<0.01).

In the total patient population, 95% required management with CPAP, and 76.19% required pressures greater than 8 cmH2O.

There were no differences in reported sleep hours between patients with moderate and severe OSA. 82.7% of patients had some degree of anxiety or depression, with 46% of patients with moderate OSA and 53.85% of patients with severe OSA experiencing compromised sleep quality.

In the follow-up process, 95.79% of patients required at least three psychology consultations, while 66.67% required at least three consultations with pulmonology.

In 81% of patients with moderate OSA and 86% of those with severe OSA, an AHI < 10/h was achieved with the pressure set on the positive airway pressure device (CPAP or Bilevel).

The median device usage hours were 5.9 (IQR 5.05-6.59), and the median usage percentage was 89.50% (IQR 71.05-100)

Conclusions: The frequency of anxiety and depression, as measured by the Beck Depression Inventory, in older adult patients with moderate and severe OSA who initiated PAP therapy is higher than the average reported in the literature.

Applicability of the conceptual framework of the International Classification of Functioning, Disability and Health in the physical therapy evaluation of individuals with obstructive sleep apnea: an online survey

J. Nascimento dos Santos[1], J. Arcanjo Lino[2], C. Ferreira Leite[1]
[1]Federal University of Ceará, Master Program in Physiotherapy and Functioning, Fortaleza, Brazil,
[2]Federal University of Ceará, Fortaleza, Brazil

Introduction: Obstructive sleep apnea (OSA) is the most prevalent sleep-related breathing disorder worldwide. With a multifactorial pathophysiology, the repercussions of OSA cause impairments in functioning, limiting activities, and restricting participation. Therefore, evaluative conduct aligned with the context of functioning is necessary to understand the subjectivities and guide individualized treatments. In this study, we sought to identify physical therapy practices for clinical assessment of individuals with OSA using the International Classification of Functioning, Disability, and Health (ICF) as a reference.

Materials and methods: This is a survey study, electronic format, cross-sectional and exploratory. The sample selection occurred by the snowball strategy through electronic invitation or direct contact. Physical therapists with active registration; residence and practice in Brazil; clinical experience in the sleep area for ≥02 years and working with OSA in the last year were included. Those who did not answer the questionnaire in full or did not return the completed questionnaire within 30 days of receipt were excluded. The invitation was published digitally for dissemination, with the entire process managed in the Research Electronic Data Capture tool. The questionnaire comprised two domains. The first concern was physical therapy assessment practices correlating to the conceptual structure and codification of the ICF. A 5-point Likert scale of frequency and importance was used as a response standard. The second domain focused on sociodemographic and academic characteristics. Data analysis was based on descriptive statistics with a mean, standard deviation and frequencies. The study was approved by the research ethics committee of the Federal University of Ceará (64995622.1.0000.5054).

Results: The sample (N=60) comprised physical therapists with a mean age of 41.8 ± 8.6 years, mostly working in the state of São Paulo (40%). 91.7% worked in outpatient service, and 65% worked exclusively with sleep disorders in private practice. Sleep certified professionals represented 41.7% of the sample. Among the sleep functions, 98.3% evaluated sleep quality with a subjective question and daytime sleepiness with a specific instrument. The indication of the items asked to evaluate very often when grouped by domain had a coverage of 98.3% for function, structure (56.7%), activity (66.7%) and participation (65%). 85% believe to evaluate the patient's functioning, but in a subjective way, predominantly questions about performance in activities of daily living and/or daily situations. The domains of activity (73.3%), environmental factors (73.3%), function (71.7%), structure (66.7%) and participation (61.7%) were considered very relevant in the evaluation process.

Conclusions: Physical therapy evaluation of patients with OSA tends to investigate outcomes subjectively, however, in this assessment format, important functioning constructs may be left out. Function was the most frequent ICF component inserted in the anamnesis, with an emphasis on respiratory function variables coming from complementary exams.

Keywords: Obstructive sleep apnea. International Classification of Functioning, Disability and Health. Physical Therapy Modalities; Assessment; Biopsychosocial Model.

A preliminary study of TCM rhinopathy Sun's sequential therapy to improve acceptance of AutoCPAP treatment in patients with OSA combined with hypertension

H. Li[1], S. Sun[2], L. Yang[3], J. Qiao[3], Y. Sun[3]
[1]Guang'anmen Hospital South Campus, China Academy of Chinese Medical Sciences, Sleep Medicine Center, Beijing, China, [2]Guang'anmen Hospital, China 'Academy of Chinese Medical Sciences, Beijing, China, [3]Guang'anmen Hospital, China 'Academy of Chinese Medical Sciences, Otolaryngology Department, Beijing, China

Introduction: Obstructive sleep apnea (OSA) is a common sleep disorder that is multidisciplinary and associated with multiple diseases, and OSA has been identified as an independent factor in the development of masked hypertension. OSA is closely related to nasal and pharyngeal disorders, and modern medical treatment is currently focused on continuous positive airway pressure ventilation （AutoCPAP）, but its acceptance in China is not satisfactory.TCM rhinopathy Sun's sequential therapy （SST） is a traditional Chinese medical method that combines internal and external treatment. Our team has used SST in clinical practice to improve a variety of nasal and pharyngeal related problems. This study intends to investigate its potential to improve the acceptance of AutoCPAP in patients with OSA.

Materials and methods: Patients with snoring or hypertension who attended our hospital as outpatients were randomly selected. Sleep monitoring and blood pressure checks were performed on patients with possible OSA. Patients who were diagnosed and met the inclusion criteria were included in the study, and all enrolled patients were required to sign an informed consent form. Patients were treated with AutoCPAP for 2 days, followed by completion of a comfort questionnaire and reading of AutoCPAP data. SST treatment was started on day 3. After treatment, the comfort questionnaire was completed again and the AutoCPAP data were read.

Results: A total of 32 subjects were included in this study, and comparing the total patient acceptance questionnaire scores before and after SST treatment, there was an improvement of 15.6 ± 7.28 points after treatment compared to before treatment. Comparing the mean pressure reduction of patients with AutoCPAP before and after SST treatment was approximately $1 cmH_2O$.

Conclusions: SST treatment may improve overall patient acceptance of AutoCPAP treatment.For patients with mild OSA-related masked hypertension, clinical cure can be achieved; for patients with moderate to severe OSAHS requiring continuous positive airway pressure (CPAP) therapy, SST not only reduces the side effects of CPAP, but also enhances patient acceptance and compliance, resulting in effective control of the rhythm of their blood pressure values.

Discussion: OSA is closely related to the onset and evolution of hypertension, and the first-line treatment for OSA is non-invasive positive pressure, but its compliance is a major problem for clinical workers. Patient acceptance of the first treatment is directly related to later compliance. Previous studies have found that poor compliance with CPAP is caused by nasal ventilation dysfunction and high treatment pressure. This study was conducted by comparing before and after treatment. It was shown that SST could improve patients' nasal ventilation function and enhance treatment comfort and acceptance. We found a feasible treatment plan with TCM characteristics for clinical patients with OSA combined with hypertension, and provided help for such patients to better receive continuous positive pressure ventilation treatment and improve clinical symptoms.

Arousal threshold modifies the effects of CPAP therapy on neurocognition in men and women in the APPLES study

A. Zinchuk[1], A. Walker[1], C. Kushida[2], A. Wellman[3], H. Yaggi[1], <u>S. Sands</u>[3]
[1]Yale University, Department of Sleep Medicine, New Haven, United States, [2]Stanford University, Stanford, United States, [3]Brigham and Women's Hospital and Harvard Medical School, Department of Medicine and Department of Neurology, Division of Sleep and Circadian Disorders, Boston, United States

Introduction: Obstructive Sleep Apnea (OSA) is associated with neurocognitive dysfunction. Continuous positive airway pressure (CPAP) is the first-line therapy for OSA, however clinical trials evaluating the effects of CPAP on neurocognition are inconclusive. OSA endotypes, specifically arousal threshold (ArTH) impact the clinical presentations of OSA and may help identify individuals most likely to respond to CPAP therapy.

Objectives: To assess whether arousal threshold (ArTH) modifies the effect of CPAP therapy on neurocognition function.

Materials and methods: We performed a secondary analysis of a randomized, controlled trial, The Apnea Positive Pressure Long-term Efficacy Study. ArTH and other OSA endotypes (loop gain, pharyngeal collapsibility, and pharyngeal muscle compensation) were measured from polysomnography using established methods (Sands et al., SLEEP 2018). The co-primary outcomes were 3 metrics of key neurocognitive function domains at 6-months: 1) Pathfinder Number Test-Total Time ([PFNTOTL], attention and psychomotor function), 2) Buschke Selective Reminding Test-Sum Recall ([BSRT], learning and memory), and 3) Sustained Working Memory Test-Overall Mid-Day Score ([SWMT], executive and frontal-lobe function). Generalized linear modeling assessed whether the effect of CPAP was modified by ArTH (treatment-by-ArTH interaction).

Results: 1055 participants with OSA, [apnea-hypopnea index (AHI) ≥ 10 events/h] and measurable OSA endotypes were included (CPAP n = 543, Sham n = 521). The majority were male (65%) with older individuals in the CPAP vs. Sham arms (52.2 vs 50.8 years, p-value <0.05). All other baseline metrics: demographics, anthropometrics, intelligence quotient scores and polysomnographic parameters did not differ between groups. No effect modification was identified for attention and psychomotor function or learning and memory. For executive and frontal lobe function (SWMT) there was significant effect modification of CPAP treatment by ArTH (p=0.042). Specifically, the effect of CPAP on SWMT at 6-months in those with average ArTH was (0.05 (-0.04, 0.18) while it was nearly 2-fold higher for those with high ArTH (0.14 (0.02, 0.27). Findings persisted after adjustment for age, OSA severity and hypoxic burden.

Conclusions: Among patients with OSA, a high ArTH was associated with greater improvements in executive function following CPAP therapy. OSA endotypes may help identify those most likely to benefit from CPAP therapy in terms of executive and frontal lobe function.

Arousal versus chemoreflex contributions to ventilatory drive in obstructive sleep apnea

L.K. Gell[1], D. Vena[1], L. Messineo[1], T.-Y. Wang[1], A. Azarbarzin[1], P. Terril[2], C. Strassberger[3], D. Gilbertson[1], N. Calianese[1], S. Bertisch[1], R. Alex[1], G. Labarca[1], W.-H. Hu[1], D.P. White[1], A. Wellman[1], S.A. Sands[1]
[1]Brigham and Women's Hospital and Harvard Medical School, Division of Sleep and Circadian Disorders, Boston, United States, [2]The University of Queensland, School of Electrical Engineering and Computer Science, Brisbane, Australia, [3]University of Gothenburg, Center for Sleep and Vigilance Disorders, Institute of Medicine, Sahlgrenska Academy, Gothenburg, Sweden

Introduction: Obstructive sleep apnea (OSA) is characterized by a repeating pattern of pharyngeal obstruction followed by post-event recovery. Typically, the increased obstruction and loss of pharyngeal muscle activity at event onset occur with a decline in ventilatory drive, for reasons that are unclear but may be attributable to declining post-arousal carryover effects (residual arousal drive after 'alpha-theta' transition) or a post-hyperventilation loss of chemoreflex activity. Here, using direct measurement of ventilatory drive (calibrated diaphragm electromyography) and ventilation (mask/pneumotach), we examined arousal contributions to the time course of ventilatory drive, as distinct from chemoreflex contributions, in OSA events. We tested the hypotheses that event-termination is independently associated with an abrupt increase in arousal-related ventilatory drive, and that ventilatory drive falls at event onset due to ongoing loss of arousal stimulus.

Materials and methods: All available events within a series of recurrent events were included in primary analysis (N=5727 from 77 patients). Linear mixed-model analysis quantified the additional ventilatory drive observed (%increase above eupnea) in the presence versus absence of arousal ('arousal contribution'), adjusting for reduced ventilation on previous breaths and prior baseline drive ('chemoreflex contribution'). Separate associations were described for increased drive seen with the first, second, third, and further arousal breaths, with more intense arousals (EEG power analysis), and potential post-arousal carryover effects.

Results: In fully-adjusted analysis, we identified a strong association between ventilatory drive and arousal onset (first breath: $+79[77,82]\%_{eupnea}$, second: $+59[57,61]\%_{eupnea}$, third: $+35[32,38]\%_{eupnea}$) and smaller effects of any breath thereafter ($+21[18,24]\%_{eupnea}$). Increased arousal intensity was additionally associated with increased drive (first breath: $+24[22,37]\%_{eupnea}$ per SD increase, thereafter $+14[13,15]\%_{eupnea}$ per SD). A single-breath carryover effect after arousal termination was observed after shorter (1-2 breath) arousals (next non-arousal breath: $+11\%_{eupnea}$) but not longer arousals. Curiously, responses to event termination *without arousal* were also associated with increased drive (first breath: $+50[46,55]\%_{eupnea}$, second: $+60[54,66]\%_{eupnea}$). Subjects differed substantially in individual responses to arousal (first breath: 10th centile = $+39\%_{eupnea}$, 90th centile = $+140\%_{eupnea}$). In time-course analysis of post-event recovery periods, the declining total drive from first to third breaths (132-107% above eupnea) was attributed to a falling arousal contribution (62-27% above eupnea), counteracted by a rising chemoreflex contribution (64-75% above eupnea) that peaked on breath 3. Similar analysis of event-onset revealed no arousal contribution following event onset (11% above eupnea prior to event onset, $<1\%_{total}$ thereafter); falling drive was therefore attributed to chemoreflex contribution alone, which progressively fell (54-29% above eupnea) to a nadir at breath 3.

Conclusions: Respiratory event termination is characterized by a surge in arousal-related ventilatory drive that declines over the first 3 breaths to become absent by a subsequent event, i.e. arousal related drive is more transient than constant. Notably, our study did not support the hypothesis that the decline in ventilatory drive at event onset is associated with carryover post-arousal effects. Rather, evidence indicates that reduced chemoreflex drive provides the leading explanation for the progressive decline in ventilatory drive, and thus provides a key target for mitigating respiratory events in many patients with OSA.

A sex-stratified nationwide study on the prevalence and clinical phenotypes of obstructive sleep apnea in Iran

K. Sadeghniiat-Haghighi[1], S. Akbarpour[1], A. Behkar[2], R. Moradzadeh[3], Z.B. Alemohammad[1], N. Forouzan[2], A. Mouseli[4], H. Amirifard[5], A. Najafi (ISRTP)[2]
[1]Tehran University of Medical Sciences, Sleep Breathing Disorders Research Center and Occupational Sleep Research Center, Tehran, Iran, Islamic Republic of, [2]Tehran University of Medical Sciences, Occupational Sleep Research Center, Baharloo Hospital, Tehran, Iran, Islamic Republic of, [3]Arak University of Medical Sciences, Department of Epidemiology, School of Health, Arak, Iran, Islamic Republic of, [4]Hormozgan University of Medical Sciences, Social Determinants in Health 15 Promotion Research Center, Hormozgan Health Institute, Bandar Abbas, Iran, Islamic Republic of, [5]Tehran University of Medical Sciences, Iranian Center of Neurological Research, Neuroscience Institute, Tehran, Iran, Islamic Republic of

Introduction: Since ethnicity impacts the prevalence and phenotypes of obstructive sleep apnea (OSA), OSA precision medicine requires investigating prevalence, clinical and pathophysiological phenotypes in different regions. Limited evidence exists regarding the prevalence and clinical phenotypes of OSA in women and men separately in Iran. This study aimed to assess the prevalence of OSA and its clinical phenotypes in Iran by presenting a sex-stratified distribution of prevalence and contributing factors to OSA in Iran.

Materials and methods: A nationally representative cross-sectional survey was conducted from 2017 to 2020 in 7 provinces of Iran, using a multi-stage random cluster sampling method. We enrolled 3198 people with a mean age of 39.7 years. We used STOP-BANG, ISI, and IRLSSG questionnaires. Complex sample survey analyses were performed to extrapolate the results to the Iranian adult population. OSA was described as a STOP-BANG score of≥3. We defined 3 clinical phenotypes as "Probable sleepy," "insomnia," and "RLS" for those with OSA. We investigated the significant contributing factors for each clinical phenotype.

Results: The prevalence of OSA was 28.7% (95%CI: 26.8-30.6). Age (OR:1.9, p: 0.001), male sex (OR:3.8, p:0.001), BMI (OR:1.13, p:0.001), neck circumference (OR:1.3, p:0.001), RLS (OR:2.0, p:0.001), and insomnia (OR:2.3, p:0.001) were significant OSA predictors. The prevalence of the "Probable sleepy", "insomnia," and "RLS" phenotypes were 82.3%, 77.8%, and 36.5% in women, and 64.8%, 67.5%, and 17.9% in men, respectively. "Probable sleepy" and "insomnia" phenotypes overlapped the most. 27.5% of women and 10% of men reported all 3 phenotypes at the same time. In men, the "Probable sleepy " phenotype was associated with youth and unmarried status but not in women. The "insomnia" phenotype was associated with shorter sleep duration in women; CVD history, urban residency, and shorter sleep duration in men. "RLS" phenotype was associated with shorter sleep duration and CVD history in women and older age, lower educational level, CVD history, and hypertension in men.

Conclusions: Due to the high prevalence of OSA in Iran and its health consequences, economic and insurance resources for screening OSA seem crucial. Because of variations in OSA phenotypes, future sleep research should evaluate women and men in separate trial groups, adopt a phenotype-based strategy, and consider overlapping phenotypes.

A single overnight infusion of TAK-925, a selective orexin 2 receptor agonist, reduces obstructive sleep apnea severity

A. Osman[1], S. Mukherjee[1,2], K. Loffler[1], T. Altree[1], S. Proctor[1,2], R. Adams[1,2], P. Nguyen[1], C. O'Reilly[1], G. Naik[1], J. Fauska[1], B. Yao[3], B. Toson[1], A. Cai[3], D. Buhl[4], M. Naylor[3], T. Olsson[3], S. Meyer[3], L. Rosen[3], D. Eckert[1]
[1]Flinders University, Adelaide Institute for Sleep Health/FHMRI Sleep Health, Bedford Park, Australia, [2]Southern Adelaide Local Health Network, Respiratory and Sleep Services, Bedford Park, Australia, [3]Takeda Development Center Americas, Inc., Cambridge, United States, [4]Takeda Development Center Americas, Inc. *at the time of the study, Cambridge, United States

Introduction: Preclinical studies indicate that orexin stimulates pre-Botzinger complex neurons, leading to respiratory stimulation and activation of upper-airway motoneurons. However, the respiratory effects of orexin agonists in people with obstructive sleep apnea (OSA) are unknown. This study investigated safety and tolerability of a single overnight infusion of TAK-925 (danavorexton), a novel orexin 2 receptor (OX2R)-selective agonist, and its effects on sleep and upper-airway obstruction in people with OSA.

Materials and Methods: In this double-blind, randomized, placebo-controlled, 3-period cross-over trial (NCT05180890), participants received ~10-hour overnight infusions of danavorexton (total 5 or 17mg) or saline (placebo) and underwent overnight polysomnography (PSG) during three separate visits. Prior to sleep, 12-lead electrocardiogram, clinical laboratory testing, upper-airway physiology (reported separately), vital signs, and subjective sleepiness (Karolinska Sleepiness Scale, KSS) were assessed. The Leeds sleep evaluation questionnaire was performed the morning after each PSG. To investigate potential mechanisms for physiologic response to danavorexton, OSA endotypes were estimated using validated signal processing techniques from PSG recordings.

Results: Thirteen participants with OSA were randomized, of whom 12 (92.3%) completed the study; one participant was withdrawn (5mg regimen, visit one) due to transient blood pressure increases before the PSG. No serious adverse events were reported. Vital signs at the time of maximum blood concentration (~1h post-infusion start) were similar to pre-dose levels for both 5mg and 17mg doses. There were no significant differences in KSS scores at the doses administered. Least squares [LS] mean±standard error (SE) apnea/hypopnea Index (AHI) was 38±8 events/h with placebo; change in AHI versus placebo was non-significant with 5mg danavorexton (–3 [95% CI –8,2] events/h; p=0.21) but was significant with 17mg danavorexton (–9 [–14, 4] events/h, p<0.01). Danavorexton 17mg also decreased hypoxic burden (LS mean [95% CI]: –30 [–57,–3] %min/h), increased wake after sleep onset (WASO; 48 [19,78] min), and reduced percent of total sleep time in REM (–12 [–15,–8] %), all p<0.05 vs. placebo, and a tendency to greater subjective difficulty getting to sleep (Leeds questionnaire, p=0.05) without significant change in objective sleep onset latency on PSG. OSA endotyping indicated that 17mg danavorexton-related AHI reductions were driven by improved pharyngeal collapsibility (LS mean±SE $V_{passive}$ 94±10 vs. 80±10 %V_{eupnea}, p=0.01) and loop gain (LG$_1$; 0.54±0.04 vs. 0.65±0.05 dimensionless, p=0.02) despite an increased arousal threshold (137±18 vs. 160±18 %V_{eupnea}, p=0.03).

Conclusions: Overnight danavorexton infusion significantly decreased OSA severity in participants with OSA, with no serious adverse events. AHI reductions were driven by decreased airway collapsibility and respiratory control instability (loop gain). However, OX2R stimulation was associated with reduced REM sleep and wake-promoting effects, including increased WASO and reduced arousal threshold.

Association between anthropometric and polysomnographic parameters with respiratory arousal threshold in Obstructive Sleep Apnea

M. Rajagopalan[1], U. Maheshwari[1], K. Venkatnarayan[1], U. Devraj[1], C. Veluthat[1], P. Ramachandran[1]
[1]St. John's National Academy of Health Sciences, Bangalore, India

Introduction: Excessive daytime sleep (EDS) is one of the most important presenting symptoms in patients with Obstructive Sleep Apnea (OSA), and is associated with reduced quality of life and increased morbidity. Sleep fragmentation is an important contributing factor for EDS and is purported to be influenced by the inherent Arousal Threshold (AT) of the patient. In this study, we aimed to study the association between clinical and polysomnographic parameters and AT in patients with OSA.
Materials and Methods: Patients with OSA who underwent a Level I polysomnography were included in the study. Clinical features, anthropometric parameters and polysomnographic indices were recorded. AT was calculated using a clinical screening tool established by Edwards et al[1] based on three criteria – Apnea Hypopnea Index (AHI) <30/hr, Lowest saturation >82.5% and proportion of hypopneas >58.3%. Each criterion was awarded a score of 1 and a total score of $\geq$ 2 was considered as low AT.
Results: Among 70 patients included, 45 (64%) were males and 25 (36%) were females. Mean (SD) age was 50.9(13.1) years. Anthropometric measures showed a Mean (SD) BMI of 32.2(11) kg/m^2, neck circumference of 40.5(3.49) cm and a Waist Hip Ratio (WHR) of 1.35(0.53). Polysomnography showed a median (IQR) AHI of 43.55 (46.15). A low AT was seen in 21(31%) patients. Patients with a low AT had a higher mean Epworth Sleepiness score (10.5 vs 8.5). WHR was significantly lower in patients with low AT (1.15 vs 1.46; p =0.013). Among polysomnographic indices, patients with a low AT had a lower time below saturation of 90 in mins(T90) (30.46 mins vs 87.21; p <0.001) and mean duration of apnea (17.1secs vs 21.27secs; p= 0.004).
Conclusions: In this study, OSA patients with a low AT had more daytime sleepiness, a lower WHR, mean duration of apnea and T90. Lower AT is likely to be associated with higher sleep fragmentation which may contribute to the EDS. The latter may also lead to earlier termination of the event leading to shorter apneas and lesser desaturation. The role of AT as a determinant of specific OSA phenotypes needs to be evaluated in larger studies.

Reference :1. Edwards BA, Eckert DJ, McSharry DG, Sands SA, Desai A, Kehlmann G, Bakker JP, Genta PR, Owens RL, White DP, Wellman A, Malhotra A. Clinical predictors of the respiratory arousal threshold in patients with obstructive sleep apnea. Am J Respir Crit Care Med. 2014 Dec 1;190(11):1293-300. doi: 10.1164/rccm.201404-0718OC. PMID: 25321848; PMCID: PMC4315811.

Association between changes in cardiac function before and after ablation therapy for atrial fibrillation and concomitant sleep apnea

Y. Tomita[1], K. Ooaku[1], T. Kumagai[1], Y. Kimura[1], S. Kasagi[1]
[1]Toranomon Hospital, Sleep Center, Tokyo, Japan

Introduction: Obstructive sleep apnea associated with atrial fibrillation (AF) is known to be a risk factor for recurrence after AF ablation. On the other hand, since AF is a risk of central sleep apnea independent of heart failure, the sleep apnea pattern may change before and after ablation, but the details have not been clarified.

Materials and Methods: Patients who underwent AF ablation and polysomnography between November 2016 and May 2023 were included in the study. When evaluating the association between polysomnographic parameters and echocardiographic parameters, post-ablation echocardiography was used for post-ablation polysomnography, and pre-ablation echocardiography was used for pre-ablation polysomnography.

Results: Ninety-five subjects were included, 82 males and 13 females, with an average age of 62.7 years and an average BMI of 26.1 kg/m^2. Pre-ablation AF was paroxysmal in 58 and chronic in 37, with a mean left ventricular ejection fraction (LVEF) of 57.2% and a mean left atrial diameter (LAD) of 41.7 mm. We compared the two groups: 25 patients in the group that underwent polysomnography prior to ablation (polysomnography preceding group) and 70 patients in the group that underwent polysomnography after ablation (ablation preceding group). There were no significant differences in age, gender, or cardiac function before ablation. However, the mean sum of central and mixed respiratory events index (CMAHI) was significantly higher in the polysomnography preceding group (11.5/h and 5.0/h, respectively; p = 0.039). Comparing echocardiography before and after ablation showed an increase in LVEF (57.2%→59.9%, p=0.016) and a reduction in LAD (41.7mm→39.9mm, p=0.001). In a model to estimate CMAHI values, being older (β=0.32, p=0.037) and having a lower LVEF (β=-0.56, p<0.001) were associated, with no association found for gender, body mass index, LAD, or heart rhythm during polysomnography.

Conclusions: Central respiratory events are more likely to be observed on polysomnography before AF ablation than after, suggesting that this may reflect a change in rhythm and an improvement in LVEF of cardiac function due to ablation.

Association between event-related hypoxia burden, aging, BMI and changes in electroencephalographic cortical activity in obstructive sleep apnea patients

M. Hajipour[1], A.H. Allen[1], J.K. Raneri[2], A.E. Beaudin[2], R. Jen[1], S. Fels[1], A. Singh[1], P. Hanly[1], A. Azarbarzin[3], N. Ayas[1]
[1]University of British Columbia, Vancouver, Canada, [2]University of Calgary, Calgary, Canada, [3]Harvard, Boston, United States

Rationale: The key index of OSA severity is the apnea-hypopnea index (AHI) which attributes equal value to all respiratory events. However, there is substantial variability in the extent of desaturation associated with respiratory events, and this may affect the patient's physiologic response. We hypothesized that the degree of event-related desaturation would affect ensuing electroencephalographic responses.

Methods: Participants enrolled at the Vancouver and Calgary sites of the multi-center Canadian Sleep and Circadian Network (CSCN) were studied; The area under the oxygen desaturation curve was calculated for each apnea and hypopnea (event-related hypoxic burden: HB_{EV}). EEG power different frequency bands were calculated using Fast Fourier transformation 6s prior to the start of the event (baseline) and in the 6s after event termination. Change in power (power ratio) was defined as: log (power after termination/ power before the event using the C3-A2 lead). We examined associations between event-related hypoxic burden and frequency band power ratios using mixed-effect analyses.

Results: PSG recordings from 620 patients were included (median [IQR]: age 56 [45, 64] years, AHI 28 [15, 70] events/hour, and BMI 33 [28, 40] kg/m^2). There was substantial variability in HB_{EV} (1.61 [0.98, 2.73] %min). After all events, there were significant increases in power amplitude for all frequencies (positive power ratios). In mixed effect analysis, HBEV was associated with an increase in the power ratio of all frequency bands after controlling for confounders (p<0.0001 for all frequencies). The strength of association was greater in higher frequency bands. Moreover, the duration of events was consistently associated with changes in power band frequencies.

Conclusions: HB_{EV} was associated with increased change in power ratios of all frequency bands. Future investigations should determine whether indices that incorporate these event-related changes in cortical activity predict symptoms, cognitive function, and long-term health outcomes (e.g., cardiovascular disease) better than AHI.

Association between nasal airway minimal cross-sectional areas and obstructive sleep apnea

T. Peltomäki[1], J. Makkonen[2], O. Tertti[2], S. Markkanen[2], O. Valtonen[2], I. Kivekäs[2], J. Ormiskangas[3], M. Rautiainen[1]
[1]Tampere University, Faculty of Medicine and Health Technology, Tampere, Finland, [2]Tampere University Hospital, Department of Otorhinolaryngology and Oral Diseases, Tampere, Finland, [3]Tampere University, Faculty of Engineering and Natural Sciences, Tampere, Finland

Introduction: Most adult obstructive sleep apnea (OSA) patients have some impairment in the upper airway anatomy commonly located in the oropharyngeal area. Many OSA patients also suffer from nasal obstruction which can lead to nasal CPAP intolerance. Although studies on nasal pathology of OSA patients are scarce, these patients seem to have more septal deformity, conchae bullosa, or turbinate hypertrophy. As nasal resistance limits the air flow in the upper airway, a narrow area or pathology may cause obstruction and increased nasal resistance. However, the role of the nose in the pathogenesis of OSA remains unclear.

The aim of the present study was to study whether the size of the cross-sectional areas of the nasal airway is associated with OSA severity.

Materials and Methods: This register-based study consisted of 58 sequential patients (52% male, mean age 47 years) referred to oral appliance therapy at the Department of Otorhinolaryngology and Oral Diseases at Tampere University Hospital, Finland. The inclusion criteria were 18-70-year-old OSA patients diagnosed with polysomnography (PSG), had undergone maxillofacial and paranasal cone beam computed tomography (CBCT), and did not have paranasal sinus inflammatory pathology in an otorhinolaryngological examination. Basic patient characteristics (age, gender, height, weight, and body mass index) were gathered from electronic medical records.

Cross-sectional areas of the nasal cavity were measured in CBCT coronal sections separately on right and left sides using open-source software (3D Slicer, version 4). Following measuring points were used: the point of anterior nasal spine (ANS), 0.5 cm anteriorly to ANS; 0.5, 1, 2, 3, 4, and 5 cm posteriorly to ANS. The smallest single cross-sectional area, total and anterior mean areas were calculated. Total area represents the combined value of the smallest cross-sectional areas from both the left and right nasal cavities. The anterior mean represents the combined mean area of the four anterior measuring points from both the left and right nasal cavities. Statistical analyses were performed to find any correlation between the cross-sectional area measurements and AHI. Since AHI data did not show a normal distribution, correlations between variables were evaluated with Spearman's correlation test. P-value < 0.05 was considered statistically significant.

Results: Most of the patients were overweight (48%) or obese (38%). According to AH-index the severity of OSA was generally mild (50%) or moderate (38%). In 91% of all the nasal cavities, the smallest cross-sectional area was in the first 2 cm anteriorly. No correlation between AHI and the smallest, the total, or the sum of the anterior cross-sectional areas of the nasal airway was found.

Conclusions: Nasal pathology should be considered when examining patients with OSA. However, the small cross-sectional area of the anterior nasal cavity in patients without any major nasal inflammatory pathology does not seem to be associated with OSA severity.

Association between obstructive sleep apnea and pericoronary inflammation

M. Lu[1], Z. Wang[2], W. Yu[3]
[1]Beijing Tongren Hospital, Capital Medical University, Beijing, China, [2]Beijing Hospital of Traditional Chinese Medicine, Capital Medical University, Beijing, China, [3]Beijing Anzhen Hospital, Capital Medical University, Beijing, China

Introduction: Obstructive sleep apnea (OSA) is associated with increased coronary plaque burden, but the relationship between OSA and vascular inflammation is limited. Pericoronary fat attenuation index (FAI) on coronary computed tomography angiography has been shown to be a novel marker of coronary-specific inflammation with prognostic value for major cardiovascular events. Therefore, we aim to evaluate the association between OSA severity and pericoronary FAI.

Materials and Methods: Consecutive patients who underwent coronary computed tomography within 3 months of sleep studies between September 2015 and April 2019 were eligible. Pericoronary FAI was measured using a dedicated FAI analysis software (Dr. Wise® Coronary Artery CT Aided Diagnosis Software V200831). Multivariable linear regression analysis was used to investigate the association of OSA severity with pericoronary FAI.

Results: A total of 526 patients were included in this study. The mean age of all subjects was 54.7 ± 11.2 years, and 379 subjects (72.1%) were men. Among them, 307 (58.4%) patients had moderate-to-severe OSA. In the multivariable models, the AHI exhibited significant associations with right coronary artery FAI ($\beta = 0.088$, $P<0.001$) after accounting for established risk factors including age, gender, BMI, smoking status, the presence of hypertension, diabetes, hyperlipidemia, lipid-lowering medications, and lowest oxygen desaturation. However, no association was found between AHI and left anterior descending artery FAI or left circumflex artery FAI.

Conclusions: The severity of OSA was independently associated with right coronary artery FAI, suggesting increased pericoronary adipose tissue inflammation.

Association between sleep-disordered breathing and psychomotor vigilance performance in elementary school children

Q. Zhu[1], H. Wada[1], K. Onuki[1], Y. Ueda[1], M. Miyakawa[1], S. Sato[1], Y. Kameda[1], H. Nakano[2], T. Tanigawa[1]
[1]Juntendo University Graduate School of Medicine, Public Health, Tokyo, Japan, [2]National Hospital Organization Fukuoka National Hospital, Sleep Disorders Centrer, Fukuoka, Japan

Introduction: Sleep-disordered breathing (SDB) in children is associated with a higher risk of cognitive impairment. One of the major components of ordinary cognitive performance tasks is vigilant attention. However, the association between SDB and vigilant attention among school-age children remains unclear. The aim of the study is to elucidate their association.

Materials and Methods: The study sample consisted of 2,014 children (mean age 9.2 years, 50.7% boys) from the 1st to 6th grades across six elementary schools in Tokyo. Their parents completed a questionnaire-based survey, including questions about snoring frequency, while children were subjected to the Psychomotor Vigilance Test (PVT) to assess vigilant attention. PVT metrics included (1) Response speed (mean reciprocal reaction time, 1/s), (2) Median reaction time (ms), (3) Lapse 355 (reaction time ≥ 355 ms), and (4) Lapse 500 (reaction time ≥ 500 ms). Poor PVT performance was defined as the worst quartile of response speed, median reaction time, lapse 355, and lapse 500. Generalized linear models and multivariate logistic regression analysis were used to explore the association between SDB and impaired PVT performance variables.

Results: PVT performance was significantly better depending on grade among those in grades 1 to 5, whereas it reached a plateau in grade 6. A significant inverse association was observed between SDB and PVT performance, with higher snoring frequency associated with longer reaction time and more lapses. In Grade 1, multivariable-adjusted odds ratios of slower response speed, longer median reaction time, and more lapse 500 in children with habitual snoring (≥3 nights per week) were 2.56 (95% CI = 1.22–5.37; p = 0.02), 2.75 (95% CI = 1.32–5.75; p = 0.01), and 2.61 (95% CI = 1.25–5.47; p = 0.01), respectively.

Conclusions: Our findings demonstrated that SDB is associated with impaired vigilant attention in younger children. Additionally, vigilant attention rapidly improves throughout primary school age, and changes in vigilant attention seem to reflect cognitive, physiological, and anatomical development.

Association of Obstructive Sleep Apnea, insomnia and the combination (COMISA) with arterial stiffness: the ELSA-Brasil study

A. Pelepka[1], B. Parise[1], N. Lapi-Ferreira[1], L. Cunha[1], R. Santos[1], S. Giatti[1], A. Aielo[1], S. Souza[1], P. Lotufo[1], I. Bensenor[1], L. Drager[1]
[1]University of Sao Paulo, Sao Paulo, Brazil

Introduction: Obstructive sleep apnea (OSA) and insomnia are common sleep disorders and its combination, namely COMISA (Comorbid Insomnia and Sleep Apnea) may be associated with increased arterial stiffness and cardiovascular risk. We aimed to evaluate the associations between OSA, insomnia and COMISA with arterial stiffness.

Material and methods: Participants from the ELSA-Brasil performed sleep assessments with sleep assessments including OSA (defined by the apnea-hypopnea index $\geq$ 15 events per hour by a portable sleep monitor for 1 night, insomnia (defined by any complaint of difficulty initiating or maintaining sleep in parallel of reporting daytime fatigue in the last 30 days) and COMISA. We stratified our sample in 4 groups: 1) control (without OSA and insomnia); 2) OSA-only; 3) Insomnia-only (presence of insomnia without OSA); 4) COMISA. To assess arterial stiffness and on recommendations, we measured carotid-femoral pulse wave velocity (PWV) using standard techniques in a blinded fashion. A multivariate analysis was used to determinate whether OSA-only, insomnia or COMISA were independently associated with PVW after adjusting for age, sex, self-reported race, body mass index, physical activity, diabetes mellitus, hypertension and excessive drinking.

Results: We studied 1.725 participants (age 49±8 years; 42.3% men; PWV 7.3±1.2m/s; 26.6% had OSA-only, 13.7% had insomnia and 5.9% fulfilled the COMISA diagnosis). Compared to controls and insomnia groups, patients with OSA-only and COMISA were older, had higher values of adiposity parameters, more excessive daytime sleepiness, worse sleep efficiency and higher PWV levels. Multivariate analysis revealed that after adjustments, the OSA-only was independently associated with PWV (B: 0.24; 95% CI: 0.46, 4.26). We did not observe significant associations between PWV with insomnia-only or COMISA.

Conclusion: OSA, but not insomnia or COMISA, is independently associated with PWV in the ELSA-Brasil study.

Association of obstructive sleep apnea, insomnia and the combination (COMISA) with hypertension, diabetes and dyslipidemia: The ELSA-Brasil study

N. Lapi-Ferreira[1], B. Parise[1], R. Santos[1], S. Giatti[1], A. Aielo[1], A. Pelepka[1], L. Cunha[1], S. Souza[1], P. Lotufo[1], I. Bensenor[1], L. Drager[1]
[1]University of Sao Paulo, Sao Paulo, Brazil

Introduction: Obstructive sleep apnea (OSA) and insomnia are common sleep disorders and its combination, namely COMISA (Comorbid Insomnia and Sleep Apnea) may be associated with worse cardiometabolic outcomes. We aimed to evaluate the associations between OSA, insomnia and COMISA with hypertension (HTN), type 2 diabetes mellitus (DM2) and dyslipidemia (DLP).
Material and methods: Participants from the ELSA-Brasil underwent clinical and sleep assessments including OSA (defined by the apnea and hypopnea index ≥ 15 events per hour by a portable sleep monitor for 1 night), insomnia (defined by any complaint of difficulty initiating or maintaining sleep in parallel of reporting daytime fatigue in the last 30 days) and COMISA. We stratified our sample in 4 groups: 1) control (without OSA and insomnia); 2) OSA-only; 3) Insomnia (presence of insomnia without OSA); 4) COMISA. HTN, DM2 and DLP were diagnosis using standard definitions. A multivariate analysis was used to determinate whether OSA-only, insomnia or COMISA were independently associated with HTN, DM2 and DLP adjusting for age, sex, self-reported race, body mass index, physical activity, and excessive drinking.
Results: We studied 2,062 participants (age 49±8 years; 42.7% men; 26.2% HTN, 15.4 % DM2, 54.4% DLP). 26.9% had OSA-only, 13.5% had insomnia and 6.1% fulfilled the COMISA diagnosis. Comparing to controls and insomnia groups, patients with OSA-only and COMISA were older, had higher values of adiposity parameters, and higher frequency of HTN and DM2. Regarding DLP, patients with OSA-only had higher frequency of DLP than controls and patients with insomnia-only. Multivariate analysis revealed that after adjustments, the OSA-only was independent associated with HTN (OR:1.32; 95% CI: 1.01, 1.73). In contrast, we did not observe significant associations with DM2 and DLP. Although COMISA was associated with DM2 in the unadjusted model (OR 2.82; 95% CI:1.78, 4.46), this association was attenuated in the fully adjusted model (OR 1.60 (95% CI: 0.97, 2.65) COMISA was not associated with HTN and DLP.
Conclusion: OSA, but not insomnia or COMISA, is independently associated with HTN in the ELSA-Brasil study.

Association of severe sleep apnoea in primary aldosteronism

Y. Tanaka[1]
[1]Yodogawa Christian Hospital, General Medicine, Osaka, Japan

Introduction: It is well known that sleep apnoea and primary aldosteronism are related. However, it is unclear whether aldosterone excess contributes to the severity of sleep apnoea. Therefore, we investigated factors correlated with sleep apnoea in patients with primary aldosteronism: the endocrine system, including aldosterone levels, cardiac function, renal function, and blood pressure.

Materials and Methods: We performed a 3% oxygen saturation index (ODI) with a pulse oximeter in 50 patients (54% male, 49 ± 7.3 years old) diagnosed with primary aldosteronism scheduled for adrenal vein sampling in 2017-2020. 3% ODI results were classified as mild, moderate, or severe sleep apnoea. In addition, we compared aldosterone, renin activity, aldosterone/renin activity, left ventricular mass index, brain natriuretic peptide, estimated glomerular filtration rate and blood pressure at the initial visit in the severe group and other groups.

Results: The severe group did not have higher aldosterone levels than the mild (192.7 ± 114.7 vs 238.9 ± 128.8 pg/mL, p=0.640) and moderate (192.7 ± 114.7 vs 187.5 ± 85.5 pg/mL, p=0.995) groups, and the same results were obtained for renin activity and aldosterone/renin activity. In other parameters, the severe group had significantly higher blood pressure at the initial visit than the mild (175.3 ± 25.7 vs 144.8 ± 18.7 mmHg, p=0.003) and moderate (175.3 ± 25.7 vs 143.0 ± 18.5 mmHg, p=0.003) groups.

Conclusions: Our results showed that aldosterone excess did not contribute to the severity of sleep apnoea. However, severe sleep apnoea was significantly associated with elevated blood pressure.

Awakening hypercapnia: Non-invasive ventilation with PSV-ST and PSV auto-ST in patients with obesity hypoventilation syndrome (OHS) and Sleep Obstructive Apnoea (OSA)

O. Diana[1], F. Russo[2], F. Stanislao[3]
[1]Hospital Santa Maria della Pietà, Pnuemology, Casoria, Italy, [2]Hospital, Pneumolgy, Casoria, Italy, [3]Hospital Santa Maria della Pietà, Casoria, Italy

Introduction: Obesity hypoventilation syndrome (OHS) is a combination of obesity, daytime hypercapnia and sleep related disordered and may present with acute hypercapnic respiratory failure (AHRF). Non-invasive ventilation (NIV) is effective in patients, who have concomitant sleep disorder as severe obstructive sleep apnoea (OSA). We have evaluated the acute effect of NIV using either pressure support ventilation spontaneous temporized (PSV-ST) or pressure support ventilation spontaneous temporized auto-bilevel (PSV auto-ST) to awakening hypercapnia in naive OHS patients hospitalized for AHRF.

Materials and Methods: We have retrospectively studied 20 patients (BMI > 35 kg/m^2), affected da naive OHS with associated severe obstructive sleep apnea (AHI > 30/h) and without significant chronic obstructive pulmonary disease (COPD). The patients were evaluated at baseline and after the use of either PSV-ST (n= 9) or PSV auto-ST (n = 11). We have measured arterial blood gas analysis (IL GEM Premier 4000) at hospitalization (T0), at awakening of day two of hospitalization (minimum 12 hours of the NIV use) (T1) and before hospital dismission (T2). We accepted as control of nocturnal respiratory failure, values of SaO2 < 90 % for < 10 % and ODI < 10/h (oximeter Convidien Nellcor oximax N-65).

Results: The mean PaCO2 was 60 ± 9 mmHg (T0), 49 ± 6 mmHg (T1) and 46 ± 4 (T2) after PSV-ST, (always p<0.001). The mean PaCO2 was 62 ± 5 mmHg (T0), 50 ± 4 mmHg (T1) and 47 ± 5 (T2) after PSV-auto ST, (always p<0.001). The mean PH was 7.30 ± 0.23 mmHg (T0), 7.35 ± 0.15 mmHg (T1) and 7.38 ± 0.12 (T2) after PSV-ST, (always p<0.001). The mean PH was 7.31 ± 0.20 mmHg (T0), 7.34 ± 0.18 mmHg (T1) and 7.37 ± 0.14 (T2) after PSV-auto-ST, (always p<0.001).

Conclusions: Both PSV-ST and PSV auto-ST non invasive ventilation were effective in the improvement of awakening hypercapnia and in the management of the acute respiratory failure in patients OHS with severe OSA.

BAY2586116, a TASK potassium channel antagonist nasal spray, reduces OSA severity in Pcrit responders: a randomized trial

A. Osman[1], B. Toson[1], G. Naik[1], S. Mukherjee[1], M. Delbeck[2], T. Muller[2], G. Weimann[2], D. Eckert[1]
[1]Flinders University, Adelaide, Australia, [2]Bayer AG, Wuppertal, Germany

Introduction: Recent pig model and human physiological studies indicate that selective TASK 1/3 K^+ channel antagonism applied topically to the upper airway increases dilator muscle activity and pharyngeal collapsibility during anaesthesia in pigs and nasal breathing in humans during sleep. This study aimed to determine if BAY2586116, a novel, potent K+ channel antagonist, reduces obstructive sleep apnea (OSA) severity and the potential physiological predictors and underpinnings (NCT05527457).

Materials and Methods: 10 people (5 females), with OSA (AHI=45±26 events/h, BMI=35±6 kg/m^2, 59±7y (mean±SD)) who completed previous sleep physiology studies with BAY2586116 were invited to complete three clinical overnight sleep studies to measure OSA severity (i.e., AHI, ODI and other markers of hypoxemia). Immediately prior to lights out, in random order, participants received either placebo nasal spray (saline), BAY2586116 nasal spray (160µg), or BAY2586116 nasal spray (160µg) restricted to nasal breathing (chinstrap or mouth tape) as previous physiological studies were limited to nasal breathing. There was an ~1 week wash out between visits. Participants who previously had an improvement in upper airway collapsibility during sleep (Pcrit ≥2cmH$_2$O) with BAY2586116 nasal spray (NCT04236440- Osman et al, *Chest* 2023), were defined as physiological Pcrit responders *a priori*.

Results: There was no systematic change in AHI from placebo vs. 160µg BAY2586116 nasal spray either with unrestricted route of breathing or nasal only breathing compared to placebo (47±26 vs. 43±27 vs. 52±33 events/h, p>0.05). However, BAY2586116 (unrestricted route of breathing) reduced OSA severity in physiological Pcrit responders versus placebo (e.g., AHI=36±12 vs. 28±11 events/h, p=0.03, ODI= 28±12 vs. 18±10, p=0.02, ~1.5% increase in mean overnight oxygen saturation, p<0.01).

Conclusions: BAY2586116 nasal spray prior to sleep reduces OSA severity in people who demonstrate physiological improvement in airway collapsibility with BAY2586116 during sleep. These findings highlight the therapeutic potential for this novel pharmacotherapy target in selected people with OSA.

Behavioral improvement after treatment of pediatric sleep disordered breathing with upper airway surgery and palatal expansion in Hong Kong children

I.W. Lau[1], E. Cheung[1], T.W. Soo[2], G. Soo[3], S.S. Choy[4,5]
[1]Central Smile, Central, Hong Kong, SAR of China, [2]The Hong Kong University, Prince Philip Dental Hospital, Sai Ying Pun, Hong Kong, SAR of China, [3]The Chinese University of Hong Kong, Department of Otorhinolaryngology, Head and Neck Surgery, Shatin, Hong Kong, SAR of China, [4]The Chinese University of Hong Kong, Department of Psychology, Hong Kong, Hong Kong, SAR of China, [5]The University of Hong Kong, Department of Psychology, Pokfulam, Hong Kong, SAR of China

Introduction: Pediatric sleep-disordered breathing (SDB) is a prevalent condition with disturbances during sleep characterized by mouth breathing, snoring, nocturia, airway obstruction, restless sleep, bruxism, and sleep apnea. Upper airway surgery in children with SDB aims to improve breathing during sleep. Rapid maxillary expansion that increases palatal width, and decreases nasal resistance, has been shown to decrease SDB in children. This study examines the association between pediatric SDB behavioral symptoms with upper airway surgery and transpalatal arch development in children before and after ENT and dental treatment.

Materials and Methods: A retrospective review of children with SDB (n=105 patients; age range: 6-14years) was undertaken between August 2020–December 2022. Symptoms of SDB, airway and dental and transpalatal arch assessments were undertaken. Upper airway assessment was performed by an otolaryngologist. Dental examination was performed by a pediatric dentist. Outcome measures include parental reports of SDB symptoms, Connors ASQ Questionnaire, digital dental scans and orthopantomography. The Connors ASQ Questionnaire is a measure of behavior and emotional issue. The normative score is < 15; scores ≥ 15 indicate significant behavioral or emotional problems. The paired-sample t-test and Cohen's effect size was used to investigate the difference in the Connors ASQ scores before and after upper airway surgery and transpalatal arch expansion.

Results: 105 subjects were included in the study. Behavioral issues were noted in 83.8% (n=83) of the subjects. Transpalatal arch measurement of less than 37mm were noted in 77.1% (n=81). In subjects willing to undertake polysomnography, 33.3% (n=35) had significant SDB indices. 33 out of the 35 subjects consented to upper airway surgery (inferior turbinate reduction, n=32; adenoidectomy, n=28; tonsillectomy, n=28). 54.5%(n=18) of the subjects who underwent upper airway surgery, followed by transpalatal arch expansion. For the pre-treatment SDB group (n=33), 75.7% (n=25) had a significant Connors ASQ score (range=16-29, mean score =22.5). For the post-surgery group and the post-surgery with transpalatal arch expansion group (n=33), 63.6% (n = 21) reported improvement in the Connors ASQ scores (normal <15). The mean Pre-Connors ASQ score is 17.67±6.25. The mean Post-Connors ASQ score is 10.94±3.76. There is significant decrease in the Connor's ASQ Score of 6.73 ± 4.91 after upper airway surgery and transpalatal arch expansion (t(32)=7.88,P=0.000). Further analysis was performed on the subset of 25 subjects with significant Connors ASQ Score. The mean Pre-Connors ASQ score is 20.36 ± 3.34. The mean Post-Connors ASQ score is 11.56±3.34. There is a significant decrease in the ASQ score of 8.80±3.67, (t(24)=11.98,P=0.000). The effect size, as measured by Cohen's d, is d=3.67, indicating a large effect.

Conclusions: Pediatric SDB is associated with a high prevalence of emotional and social behavioral problems. We suggest that combined ENT and Pediatric Dental care be considered for SDB at-risk children. Further investigation is necessary to determine the optimal treatment suitable for children with SDB and the long term benefits of upper airway surgery and/or palatal expansion.

Cardiovascular dysfunction in individuals living with spinal cord injury who are susceptible to sympathetic denervation and sleep-related breathing disorders: "the perfect storm"

J. Furlan[1], E. Loh[2], M. Boulos[3]
[1]KITE Research Institute and Lyndhurst Centre, Toronto Rehabilitation Institute, University Health Network; and University of Toronto, Toronto, Canada, [2]Parkwood Institute Research, Lawson Health Research Institute; and Western University, London, Canada, [3]Sunnybrook Health Sciences Centre; and University of Toronto, Toronto, Canada

Introduction: Sleep-related breathing disorders (SRBDs) occur in up to 50% individuals with paraplegia and in up to 90% individuals with tetraplegia. SRBDs remain an under-recognized medical condition among individuals living with spinal cord injury (SCI). Catecholaminergic and sympathetic alterations related to SRBDs play a key role in the pathophysiology of cardiovascular disorders in non-disabled people. However, the effect of SRBD on cardiovascular function in individuals with SCI remains unclear. Individuals living with SCI commonly experience cardiovascular dysfunction, including low baseline blood pressure, orthostatic hypotension and episodes of autonomic dysreflexia (AD) and, hence, any impact of SRBD on cardiovascular function after SCI is important to characterize. This ongoing cross-sectional study is focused on the potential association between moderate-to-severe SRBDs and more severe cardiovascular dysfunction following SCI.

Patients and methods: This cross-sectional study included English-speaking adults with subacute or chronic (≥1 month after SCI onset), cervical or high-thoracic (T6 or more cranial), complete or incomplete SCI, who reported clinical warning symptoms and/or signs suggestive of SRBDs. The diagnosis of SRBD was established using a home-based/hospital unattended sleep screening test that quantifies the apnea-hypopnea index (AHI). Moderate-to-severe SRBD was defined as an AHI ≥ 15 events per hour. Episodes of AD were defined as a sudden increase in systolic blood pressure (BP) of at least 20 mmHg. For the purpose of this study, we did not count episodes of AD during sleep that were caused by triggers other than hypopnea or apnea.

Results: This study included 45 individuals (14 females and 31 males) with ages from 20 to 84 years (mean age of 57.0 years) who sustained a motor complete (n=22) or incomplete SCI at cervical (n=38), or high thoracic levels, who reported symptoms and signs suggestive of SRBD. Time from SCI onset varied from 1.5 months to 52 years (mean time of 49.4 months). Their mean apnea-hypopnea index (AHI) was 16.0 events per hour with an AHI range of 0.8 to 51.7 events per hour. The AHI was not associated with systolic BP (mean ± SEM: 122.0 ± 2.2 mmHg; p=0.903), diastolic BP (72.6 ± 3.0 mmHg; p=0.639), mean arterial pressure (90.1 ± 2.4 mmHg; p=0.714), and heart rate (70.6 ± 1.4 bpm; p=0.669) during sleep. However, the AHI was significantly and positively correlated with the number of silent episodes of AD (mean ± SEM: 3.6 ± 0.4; R^2=0.220, p=0.001) during sleep, after excluding other causes of AD.

Conclusions: The results of this cross-sectional study suggest, for the first time, that more severe SBRBs are associated with frequent silent episodes of AD during sleep among individuals living with a cervical or high-thoracic SCI. Future research is needed to assess the effects of continuous positive airway pressure (CPAP) therapy on cardiovascular dysfunction following SCI.

Catathrenia, a misterious and rare diagnosis - clinical case

P. Nogueira Costa[1], L. Gomes[1], D. Rodrigues[1], F. Teixeira[2], J. Moita[2]
[1]Centro Hospitalar e Universitário de Coimbra, Serviço de Pneumologia, Coimbra, Portugal, [2]Centro Hospitalar e Universitário de Coimbra, Centro de Medicina do Sono, Coimbra, Portugal

Introduction: Catathrenia is a rare diagnosis, most recently classified by the ICSD-3 (International Classification of Sleep Disorders-Third Edition) as a sleep-related respiratory condition. It is characterized by irregular groans, which occur during prolonged expiration in sleep and its pathogenesis remains inexplicable. The long-term prognosis encompassed by catathrenia is still unknown, but treatment with continuous positive airway pressure (CPAP) has been the approach with the most favourable results.

Clinical case: Male, 27 years old, serving in the military, without any pathological history or usual medication. Referred by his family doctor to the sleep pathology consultation due to daytime fatigue with years of evolution, episodes of apnea reported by his roommates and instances when he reported waking up with a sensation of dyspnea. Denied complaints of snoring, however, with a groan that was self-recorded by the patient. Epworth Sleep Scale of 14/24. A cardiorrespiratory sleep study with synchronous sound recording was requested, while there was not availability to perform a level 1 polysomnography (due to SARS-CoV-2 pandemic measures). The study showed an Apnea-Hypopnea Index of 13.9/h (26.9/h in supine position) with 80 central, 5 mixed and 4 obstructive apneas and 8 hypopneas. The Oxygen Desaturation Index was 2.3/h. Roncopathy was present in 19.9% of the study time. Analysis of the audio revealed expiratory groans compatible with catathrenia, and was assumed that the events described as central would, in reality, arise from the physiological process leading to catathrenia. The patient started treatment with auto-CPAP, later adjusted to CPAP and showed good adherence, with improvement of the daytime fatigue complaints and a pronounced reduction in the intensity of the sounds emitted.

Conclusions: The above-mentioned clinical case depicts a rare case of catathrenia and its favourable response to treatment with CPAP, with a major improvement in the patient's quality of life. Despite the scarce knowledge about the pathophysiology of this disease, we believe that this therapeutic option is a valid choice towards the management of this misterious sleep disorder.

Causal associations of sleep apnea with Alzheimer's disease and cardiovascular diseases: a bidirectional Mendelian randomization analysis

C. Cavaillès[1], S. Andrews[1], Y. Leng[1], K. Yaffe[1,2,3]
[1]University of California, San Francisco, Department of Psychiatry and Behavioral Sciences, San Francisco, United States, [2]University of California, San Francisco, Department of Neurology and Epidemiology, San Francisco, United States, [3]San Francisco Veterans Affairs Health Care System, San Francisco, United States

Introduction: Sleep apnea (SA) has been linked to an increased risk of dementia in numerous observational studies; yet whether this is driven by neurodegeneration or vascular mechanisms is not clear. Hence, this study aimed to examine the bidirectional causal relationships between SA, Alzheimer's disease (AD), stroke, and coronary artery disease (CAD) using Mendelian randomization (MR).

Materials and methods: Using summary statistics from four recent, large genome-wide association studies of SA and snoring (n=523,366), AD (n=64,437), stroke (n=1,308,460), and CAD (n=1,165,690), bidirectional two-sample MR analyses were conducted. Fixed-effects inverse variance weighted MR was carried out as the primary method. Diagnostics tests and sensitivity analyses were conducted to verify the robustness of the results.

Results: A significant causal effect of genetically predicted SA on the risk of stroke (odds ratio (OR_{IVW}) =1.13, 95% confidence interval (CI) =1.01-1.25) and CAD (OR_{IVW} =1.35, 95%CI =1.25-1.47) were observed. However, the association for stroke risk was attenuated after excluding single-nucleotide polymorphisms associated with body mass index (BMI) (OR_{IVW} = 1.08, 95%CI = 0.96-1.22). Genetically predicted SA was not causally associated with a higher risk of AD (OR_{IVW} =1.14, 95%CI =0.91-1.43). In the bidirectional analyses, as expected, evidence did not support causal relationships for genetically predicted AD, stroke, or CAD on the risk of SA.

Conclusions: This MR study suggests that SA increased the risk of stroke and CAD, and the association with stroke risk may be partially driven by BMI. Conversely, no causal effect of SA on AD risk was found. Future studies are warranted to confirm these findings, and to investigate cardiovascular pathways between sleep and dementia.

Central sleep apnea treated by a constant low dose CO_2 supplied by a novel device

Y. Luo[1], Y. Chen[2], S. Liang[2], L. Wu[2], A. Wellman[1], R.D. McEvoy[3], J. Steier[4], D.J. Eckert[3], M.I. Polkey[5]
[1]Harvard Medical School, Division of Sleep and Circadian Disorders, Brigham and Women's Hospital, Boston, United States, [2]Guangzhou Medical University, State Key Laboratory of Respiratory Disease, Guangzhou, China, [3]Flinders University, College of Medicine and Public Health, Adelaide Institute for Sleep Health, Adelaide, Australia, [4]Guy's and St. Thomas' NHS Foundation Trust, Lane Fox Respiratory Unit/Sleep Disorders Centre, London, United Kingdom, [5]Guy's and St. Thomas' NHS Foundation Trust, London, United Kingdom

Introduction: CO_2 inhalation has been previously reported as a treatment for central sleep apnea both when associated with heart failure or where the cause is unknown. Here we evaluated a novel CO_2 supply system using a novel open mask capable of comfortably delivering a constantly inspired fraction of CO_2 ($FiCO_2$) during sleep.

Materials and methods: We recruited eighteen patients with central sleep apnea (13 patients with cardiac disease, and 5 patients idiopathic) diagnosed by diaphragm EMG recordings made during full overnight polysomnography (Night 1). In each case, the optimal $FiCO_2$ was determined by an overnight manual titration with PSG (Night 2). Titration commenced at 1% CO_2 and increased by 0.2% until CSA disappeared. Patients were then treated on the third night (Night 3) with the lowest therapeutically effective concentration of CO_2 derived on night 2.

Results: Comparing night 1 and night 3, both AHI (31±14 vs. 6±3 events/h, $p<0.01$) and arousal index (22±8 vs. 15±8 events/h, $p<0.01$) were significantly improved during CO_2 treatment. Sleep efficiency improved from 71±18 to 80±11%, $p<0.05$, and sleep latency was shorter (23±18 vs. 10±10 min, $p<0.01$). Heart rate was not different between night 1 and night 3.

Conclusions: Our data confirm the feasibility of our CO_2 delivery system and indicate that individually titrated CO_2 supplementation with a novel device including a special open mask can reduce sleep-disordered breathing severity and improve sleep quality. Randomized controlled studies should now be undertaken to assess therapeutic benefit for patients with CSA.

Changes in QRS complex morphology in children and adolescents with obstructive sleep apnea

E. Gasimov[1], G. Benbir Senel[2], B. Yılmaz[2], D. Karadeniz[2], E.F. Öztunç[1]
[1]Istanbul University-Cerrahpasa, Cerrahpasa Faculty of Medicine, Department of Pediatrics, İstanbul, Turkey, [2]Istanbul University-Cerrahpasa, Cerrahpasa Faculty of Medicine, Department of Neurology, Sleep and Disorders Unit, İstanbul, Turkey

Introduction: Obstructive sleep apnea syndrome (OSAS) leads to many cardiovascular, neurologic, metabolic and neurocognitive consequences. The conduction deficits, deviations in electrical axis and changes in QRS morphology reflect the impairments in cardiac muscle activity and underlie the cardiovascular complications of OSAS. Here we aimed to determine the relationship between OSAS and the changes in the cardiac conduction system in children and adolescents.

Materials and methods: During the six-months duration of the study, all children having the diagnosis of OSAS in the Sleep and Disorders Unit following a full-night polysomnography (PSG) were consecutively evaluated. The ECGs were performed and analyzed in the Division of Pediatric Cardiology, Department of Pediatrics. The maximum spatial vector size (QRS_{max}), QRS electrical axis (EA), left and right ventricular hypertrophy, and the presence of fragmented QRS (fQRS) or prolonged R or S wave were examined in detail.

Results: A total of 17 boys with OSAS and 13 healthy boys participated in to the study. The mean QRS_{max} and the QRS_{max} on V5 derivative were significantly lower in the patient group in compared to those in the control group (p=0.011 and p=0.017, respectively). The EA was similar between two groups. The {SV1+RV6} equation was significantly lower in the patient group than those in the control group (p=0.047). The lower the {SV1+RV6} equation, the patients had more severe OSAS (p=0.049), and were younger (p=0.039). The percentage of the fQRS or notched R or S waves was also significantly higher in the patients with OSAS in compared to healthy controls (p=0.035).

Conclusions: This study demonstrated that the male children and adolescents with OSAS have a combination of QRS complex changes characterized by the low QRS voltages, and the increased frequency of the fragmented QRS. These findings reflect that the electrical and the structural remodeling of myocardium are considerably affected by OSAS in children and adolescents, leading to left ventricular hypertrophy, and intraventricular conduction problems.

Characteristics associated with OSA among young adults ages 18-40 years in the STAGES study

T. Gaffey[1], T. Santiago[2], S. Sullivan[3]
[1]Canada College, Redwood City, United States, [2]Johns Hopkins, Baltimore, United States, [3]Stanford University, Pediatrics and Psychiatry, Stanford, United States

Introduction: There are nearly one billion people worldwide living with obstructive sleep apnea. While presenting characteristics are generally well-described, disease prevalence increases with age, and many reports focus on the characteristics of the most prevalent age ranges, including middle aged and older adults. Moreover, common screeners for OSA also hinge partly on older age, such that younger adults with OSA might not be identified. Presenting characteristics among young adults are less well-understood. Using data from a prospective multi-center U.S. study, this investigation reports on presenting charateristics of adults aged 18-40 years with and without OSA as measured by polysomnography (PSG).

Materials and methods: The Stanford Technology Analytics and Genomics in Sleep (STAGES) study is a prospective cross-sectional multi-site study conducted from 2017 to 2020, involving 20 U.S. sites for six U.S. sleep centers, with PSG and Alliance Sleep Questionnaire (ASQ) data on 1,881 participants. Inclusion criteria were: ages 18-40 years old. Exclusion criteria were: age outside 18-40years and absence of Apnea Hypopnea Index (AHI) data. Candidate variables were identified based on potential association with the outcome of interest, as well as novel variables based on potential for mechanistic association. Statistical analyses were performed using Stata/ SE17.0 (College Station, TX). T-tests and Chi squared tests used to compare OSA and non OSA groups. Two-sided p-values <0.05 were considered statistically significant.

Results: There were 597 individuals (336 female, 56.3%) included for analysis, with mean (SD) age 31.1(5.9) years and BMI 31.7(8.8) kg/m2. Overall AHI for this group was 11.5 (16.1)/hour, with 277 (46.6%) having an AHI < 5/hour. Age, sex, Fatigue Severity Score(FSS), and hypertension were significantly associated with AHI, whereas BMI, Epworth Sleepiness Score(ESS), Nasal obstruction (NOSE Score), Insomnia Severity Index(ISI), Functional Outcomes of Sleep (FOSQ) and Depression, as well as other medical history variables, were not.

Comparing non-OSA and OSA groups (AHI<5 vs AHI >/= 5), hypertension (p=0.018), sex (p<0.001), and FSS (p=0.022) were significantly different in the OSA group. Additional features of family history of OSA, ESS score, and Insomnia Severity Index (ISI) were marginally but not statistically different (p=0.066; p=0.06; and p=0.0689, respectively), whereas Functional Outcomes of Sleep (FOSQ), nasal obstruction, moderate-to-severe depression, ESS> 10, allergies/ sinus, asthma, heartburn, loud snoring, apneas, snoring/ gasping, race were not significantly different between the OSA and non-OSA groups.

Conclusions: In the multicenter, prospective STAGES study, young adults aged 18-40 years with OSA share some charateristics reported for the general, older OSA population. Clinically, Fatigue Severity Score in particular may provide additional value in the workup of OSA. To best identify and treat OSA in young adults, more work is needed to understand how presentions of OSA may differ and predict disease.

Characterization of risk criteria for obstructive sleep apnea and its association with absenteeism among nursing staff: a cross-sectional study

K. Sadeghniiat-Haghighi[1], A. Najafi[2], S. Eftekhari[3], A. Behkar[2], S. Tarkhan[3]
[1]Tehran University of Medical Sciences, Sleep Breathing Disorders Research Center, Tehran, Iran, Islamic Republic of, [2]Tehran University of Medical Sciences, Occupational Sleep Research Center, Tehran, Iran, Islamic Republic of, [3]Tehran University of Medical Sciences, Center for Research on Occupational Diseases (CROD), Tehran, Iran, Islamic Republic of

Introduction: The association between risk factors of sleep disorders and nursing staff absenteeism is not well established. This study investigates the prevalence rate of obstructive sleep apnea (OSA), its main determinants among nurses, the role of OSA, and related risk factors in nurses' absenteeism.
Materials and methods: In this cross-sectional study, we used consecutive sampling to include 304 nurses working at Imam Hospital Complex, Tehran, Iran, between 2018 and 2020. We used the "STOP-BANG" questionnaire to assess the likelihood of OSA among nurses. We collected demographics, medical/pharmacological conditions, occupational characteristics, shift status, and work unit through face-to-face interviews. We used administrative affairs' information to determine unauthorized absences, vacations, and sick leaves to determine absenteeism. The ethics committee of the Tehran University of Medical Sciences approved the study protocol (IR.TUMS.MEDICINE.REC.1398.023). Analysis was conducted using SPSS version 23.0.
Results: The study involved 304 nurses, mostly females (81.3%). The average age was 35.00±8.38 years. 55% of participants were married, and 37.5% had children. On average, the nurses had 10.01±7.14 years of work experience and worked 82.01±43.88 hours of overtime per month. The average body mass index (BMI) was 24.81±3.91 kg/m2. The average duration of unauthorized absence, vacation leave, and sick leave were 0.35±0.88, 42.39±23.80, and 8.31±37.11 hours per month, respectively.
Twenty-seven of 304 participants were at high risk for OSA. Multivariable logistic regression showed that the main predictors of OSA among nurses were male gender (OR=11.701, P=0.006), neck circumference (OR=1.450, P=0.030), and elevated diastolic blood pressure (OR=1.143, P=0.025). Regarding work circumstances, there was no significant difference regarding job title, having shift work, shift status, and workplace between nurses with a high risk for OSA compared to nurses with a low risk for OSA. However, the mean overtime hours were longer for nurses with a high risk for OSA (112.76 vs. 79.01, P-value=0.001).
The mean hours for vacation absenteeism were significantly lower in the high-risk group (0.222 vs. 0.368, P-value=0.010), while, OSA was not associated with unauthorized and sick absenteeism. Shift work and night shifts were found to be significant predictors of total absenteeism among nurses (p=0.003 and p=0.038, respectively). Gender was not associated with absenteeism among nurses (p=0.191). Other indicators of OSA, such as neck circumference and diastolic blood pressure, did not show a significant association with absenteeism. However, a positive correlation was observed between vacation hours and advanced age (r=0.241, p<0.001) as well as BMI (r= 0.183, p=0.002).
Conclusions: OSA is prevalent in about 8.7% of our nursing staff, especially among men, overweight nurses, those with night-shifting conditions, and those suffering from diastolic hypertension. However, OSA may not be a significant indicator of absenteeism among nurses.
*The full study associated with this abstract has been accepted for publication in an upcoming issue of the "Nursing" journal (ISSN: 0360-4039).

Characterization of sleep apnea physiology and cerebral small vessel disease pathology

R. Sommer[1], L. Yu[2], J.A. Schneider[2], A. Buchman[2], D.A. Bennett[2], A. Lim[1]
[1]Sunnybrook Health Sciences Centre, Toronto, Canada, [2]Rush University, Chicago, United States

Introduction: Sleep apnea has been proposed as a modifiable risk factor for cerebral small vessel disease (CSVD). Most studies use the apnea-hypopnea index (AHI) as a measure of sleep apnea severity; however, recent work has shown that sleep apnea is physiologically heterogeneous, and AHI fails to capture this complexity. Additionally, few studies have looked at sleep apnea and post-mortem measures of CSVD. We hypothesize that distinct physiological characteristics of sleep apnea are differentially associated with CSVD histopathology.

Methods: We studied 64 participants (23% male, mean age at death = 90.0 years) from the Rush Memory and Aging Project. Sleep apnea physiology was quantified using a home sleep apnea test (WatchPAT, Itamar Medical). We used the average of all available WatchPAT recordings for each participant (median = 1 recording, IQR = 1-2 recordings) recorded at a median of 1.6 years [IQR = 0.6-2.6 years] before death. We characterized sleep apnea physiology using 16 variables and reduced them into 4 factors for primary analysis. We used the factor scores in ordinal and binary logistic regression (age, sex, and edcation adjusted) to relate them to 4 measures of cerebrovascular pathology assessed at autopsy: severity of cerebral arteriolosclerosis in the basal ganglia, severity of atherosclerosis in the Circle of Willis, burden of chronic microscopic infarcts, and severity of cerebral amyloid angiopathy (CAA).

Results: Factor analysis yielded 4 factors capturing distinct aspects of sleep apnea physiology: number of events, hypoxia, duration of events, and sleep fragmentation. Relating these to CSVD pathology, only the factor that represents the frequency of events, namely AHI, ODI, and hypoxic burden, was significantly associated with microinfarct burden [OR = 1.62; 95% CI = 1.02-2.78; p = 0.04] and arteriolosclerosis burden [OR = 1.62; 95% CI = 1.05-2.65; p = 0.03]. Hypoxia was inversely associated with microinfarct burden [OR = 4.09, 95% CI = 1.39-17.18; p = 0.03]. The association between the duration and sleep fragmentation factors and CSVD pathology was not significant.

Conclusion: The heterogeneity of sleep apnea physiology can be captured by 4 distinct factors. The frequency of respiratory events and hypoxia ante-mortem is associated with the presence of chronic microinfarcts and arteriolosclerosis in deceased older adults.

Chronic diseases and lifestyle habits as factors associated with sleep-disordered breathing in the robust older adult ≥ 65 years

L.S. Moraes Júnior[1], C.M. Guimarães[1], C.V.N. Aguiar[1], D.S. Sobral[1], C.M.C.C. Dias[1], M.G. Meira e Cruz[2,3,4], C. Salles[1,5,6]
[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]European Sleep Center, Lisbon, Portugal, [3]University of Lisbon, Sleep Unit, Cardiovascular Center, Faculty of Medicine in Lisbon, Lisbon, Portugal, [4]College São Leopoldo Mandic, Campinas, Brazil, [5]Jorge Amado University Center, Salvador, Brazil, [6]Federal University of Bahia, University Hospital Professor Edgar Santos, Salvador, Brazil

Introduction: Obstructive sleep apnea (OSA), the most common sleep-disordered breathing (SDB), has a higher prevalence among older adults compared to other population samples, occurring in 45% to 62% of older adults. OSA is associated with pathological processes that contribute to aging, as observed in its most common symptoms (changes in memory and cognition) and physiological consequences, with changes in metabolic and inflammatory markers intrinsic to this process. Meanwhile, hypertension and diabetes configure a characteristic associated with the emergence of OSA in this age group. Lifestyle habits with proven impact on health -such as smoking and alcohol intake- are also possible risk factors associated with OSA in older adults. The objective of this study is to evaluate the association between chronic diseases and lifestyle habits with sleep-disordered breathing in the older adult.
Materials and Methods: This study is part of a more extensive study entitled "Sleep disorders and metabolomic profile related to the occurrence of falls in older adults community-dwelling: a prospective longitudinal study". This is a prospective cross-sectional study. The inclusion criteria used were: robust older adult people of both sexes, aged 65 years or older, living in Salvador, Bahia, Brazil, approved by the Clinical Functional Vulnerability Index (CFVI-20). The exclusion criteria were: institutionalized older adult with neurological or osteoarticular disorders that affect balance and inability to understand instructions. The research data were collected at the Bahiana School of Medicine and Public Health at the Brotas campus. The instruments used were: a sociodemographic questionnaire; vital and anthropometric data; Berlin Questionnaire. The collected data was analyzed utilizing Pearson's chi-square method.
Results: After data collection, 77 older adult individuals were analyzed. The mean age of the sample was 71.0±5.0 years, among which 68.8% were female, and 76.6% self-reported as black or brown. Regarding chronic diseases, 79.2%(n=61) were diagnosed with comorbidities, among which 75.4% had systemic arterial hypertension (SAH) and 21.3% had diabetes. Furthermore, 62.3% of the older adult interviewed did not drink alcohol, and 98.7% did not smoke. It was observed that 50.6%(n=39) of the studied population had SDB, of which 48.7% had a high risk for OSA. Moreover, there was an association between SAH and SDB (p=0.000) and high risk for OSA (p=0.002), whereas the relationship between diabetes and SDB (p=0.418) and high risk for OSA (p=0.860) showed no association. Alcohol intake and high risk for OSA (p=0.028) showed a statistically significant association. However, there was no association between smoking and SDB (p=0.320).
Conclusions: The present study observed that SAH and alcohol intake were associated with SDB in older adult people aged ≥ 65 years, which also tend to aggravate the structural and functional decline inherent to the older adult population. Therefore, understanding the factors that are influencing SDB in older adults aged ≥65 years is essential to adopt preventive measures.

Chronobiological patterns of onset of acute myocardial infarction in patients with sleep apnea

O. Ludka[1,2], T. Kara[3]
[1]Masaryk University, Faculty of Medicine, Brno, Czech Republic, [2]University Hospital Brno, Department of Internal Medicine, Geriatrics and Practical Medicine, Brno, Czech Republic, [3]Mayo Clinic and Foundation, Division of Cardiovascular Diseases, Department of Internal Medicine, Rochester, United States

Introduction: Myocardial infarction (MI) occurs more often in the morning due to the simultaneous unfavorable timing of several physiological events. However, little is known about the possible influence of this circadian pattern by sleep apnea (SA). SA is characterized by acute nocturnal hemodynamic and neurohormonal abnormalities that may increase the risk of MI during the night. Therefore, we investigated the day-night variation of MI onset depending on the occurrence of sleep apnea.

Materials and methods: We prospectively studied 782 consecutive patients admitted to the hospital with the diagnosis of acute MI. The study was conducted in institutions, where primary percutaneous coronary intervention (PCI) is the standard of care in the treatment of acute MI. All subjects underwent sleep evaluations using a portable diagnostic device after at least 48 hours post-admission, provided they were in stable condition.

Results: Almost all patients (98%) underwent urgent coronary angiography and 91% primary PCI. We analyzed the data from 607 patients who had good quality sleep study records (175 patients had technically inadequate sleep studies due to less than 4 h recording time or excessive artifacts). Using a threshold of AHI $\geq$ 5 events/h, SA was present in 65.7% of patients after acute MI. Mild SA was present in 32.6%, moderate in 20.4% and severe in 12.7%. The day-night variation in the onset of MI in all groups of SA patients was similar to that observed in non-SA patients. From 6 AM to noon, the frequency of MI was higher in both SA and non-SA patients, as compared to the interval from midnight to 6 AM (all $p<0.05$).

Conclusions: Peak time of MI onset in SA patients was between 6 AM and noon, similar to that in the general population. Whether the time of symptoms onset together with SA could potentially influence the prognosis of acute MI patients remains to be determined.

Clinical and economic assessment of a comprehensive program to improve adherence of continuous positive airway pressure treatment in obstructive sleep apnea patients in Spain: a randomized controlled trial with a health economic model

S. Alami[1], D. Rudilla[1], H. Pasche[1], D. C. Zammit[2], R. Catala[3], P. Landete Rodríguez[4], P. Lázaro y de Mercado[5]
[1]Air Liquide Santé International, Bagneux, France, [2]Air Liquide Santé International, Basel, Switzerland, [3]Sant Joan" University Hospital, Universitat Rovira i Virgili, Sleep Disorders Unit, Respiratory Department, Reus, Spain, [4]Hospital Universitario de La Princesa, Servicio de Neumología, Madrid, Spain, [5]Independent Health Services Researcher, Madrid, Spain

Introduction: Continuous positive airway pressure (CPAP) therapy is the first-line treatment for obstructive sleep apnea (OSA). Lack of adherence is the main challenge to CPAP effectiveness. PIMA is a proactive programme delivered by a home care provider to improve CPAP adherence and patients' quality of life based on patient stratification and personalized care plans.

Materials and Methods: A multicenter randomized controlled trial of PIMA vs standard follow-up was conducted in Spain to evaluate the impact on adherence and quality of life. Additionally, a health economic model was developed to estimate the clinical events, healthcare resource utilization and associated costs with CPAP therapy with standard follow-up, versus CPAP therapy that implements PIMA, according to adherence improvement. An incremental impact was estimated over a 1-year time horizon after the onset of CPAP therapy as the difference with and without PIMA. The model was used to simulate different scenarios among the eligible patients population.

Results: A total of 213 patients were randomized. Adherence was higher in the PIMA group compared to the control group at 90 days with a difference of 1.74 hours/day (95%CI: 1.18-2.30; p<0.0001) and at 180 days, with a difference of 2.31 (95%CI: 1.72-2.91; p<0.001). At one year, the percentage of compliers (≥ 4 hours of daily use) in the PIMA and control groups were 80% and 66.3% respectively. The largest impact of the PIMA intervention on the improvement of adherence to CPAP therapy was observed in the group of subjects with adherence less than 2 hours/day, more so than any higher adherence time category. This outcome was consistent across all time points. The secondary endpoints on quality of life, emotional state, activities, social relationships, perceived competence and motivation showed significant differences in favor of the PIMA group. Considering the estimated 775,850 patients currently treated with CPAP in Spain, over the 12-month period of CPAP therapy, the model predicted 32 260 cardiovascular events avoided, 8,662 road traffic accidents avoided and 1,274 occupational accidents avoided. This led to annual savings of €186,734,338 in direct costs (150,003 specialized care visits, 53,008 emergency visits, 30,811 hospital admissions, 5,476 ICU admissions and 16,594 hospitalization days), €13,043,828 in direct non-medical costs, and €292,831,954 in indirect cost (2,071,364 work days missed). Considering only the current patients managed under the PIMA program in Spain (n = 5000), the cost offsets attributed to PIMA amounted to €1,287,479 in direct costs and €3,174,648 in total (direct + indirect) costs. These findings correspond to net cost savings of €257 and €635 per patient per year in direct and total costs respectively.

Conclusions: Widespread use of interventions to increase CPAP adherence such as PIMA, could represent a significant immediate health benefit to patients and substantial cost savings for the Healthcare System and society.

Clinical and instrumental characteristics of patients with a combination of obstructive sleep apnea and paroxysmal atrial fibrillation in different tactics of treatment of arrhythmia

N. Obukhova[1], M. Agaltsov[1], O. Drapkina[1]
[1]Federal State Budgetary Institution National Medical Research Center for Therapy and Preventive Medicine of the Ministry of Healthcare of the Russian Federation, Moscow, Russian Federation

Introduction: Atrial fibrillation (AF) is the most common cardiac arrhythmia in clinical practice. One of the risk factors for AF is obstructive sleep apnea (OSA). We compare the severity of cardiovascular pathology, intracardiac hemodynamic parameters, drug load in patients with a combination of paroxysmal AF and OSA, depending on the tactics of arrhythmia treatment.

Materials and methods: The study included 362 patients with paroxysmal AF. The median age was 62 years [54-67], 170 people were men (46.9%). The patients were divided into 2 groups. Group 1 (n=115) — patients with AF undergoing drug therapy for arrhythmia, group 2 (n=247) — patients with AF after catheter ablation of arrhythmia. All patients underwent sleep polygraphy and transthoracic echocardiography.

Results: Patients who underwent catheter ablation were statistically significantly younger than those who received drug therapy (60 [53-65] and 67 [58.5-70] years, respectively, p<0.001). According to the severity of sleep breathing disorders in the structure of the drug treatment group, patients with moderate and severe OSA prevailed (31.8% and 38.2%, respectively), in the group of patients after catheter ablation patients without breathing disorders during sleep were more common (42.5%).

In the group of drug therapy for arrhythmia, patients with arterial hypertension (p=0.002), coronary heart disease (p<0.001), type 2 diabetes mellitus (p<0.001), and obesity (p<0.001) were more common. Also in this group, there was a greater drug load, patients received 2 drugs more (p<0.001). A direct (according to the Chaddock scale), statistically significant (rs=0.35; p<0.001) correlation was found between OSA severity and body mass index (BMI). With an increase in BMI by 1 kg/m2 an increase in the apnea-hypopnea index (AHI) by 0.64 episodes/hour should be expected.

The area under the ROC-curve corresponding to the relationship between the prognosis of severe OSA and BMI was 0.652±0.036 with a 95% CI: 0.582-0.723. The resulting model was statistically significant (p<0.001). With a BMI equal to or greater than 31 kg/m2, patients with paroxysmal AF were predicted to be at high risk of developing severe OSA. According to the results of echocardiography, a direct correlation was found between the severity of apnea and the anterior-posterior size of the left atrium (r=0.28; p<0.001).

Conclusions: A high comorbidity and a greater drug load were found in the group of drug therapy for AF. The BMI threshold at which a high risk of developing clinically significant OSA was predicted corresponded to the presence of grade 1 obesity. The results demonstrated an association between an increase in the anteroposterior size of the left atrium and the severity of OSA.

Clinical and physiological predictors of response to hypoglossal nerve stimulation for sleep apnea

K. Campbell[1], R. Thomas[1], E. Heckman[1], C. Brook[2], J. Chang[1], A. Ahn[1]
[1]Beth Israel Deaconess Medical Center, Department of Sleep Medicine, Boston, United States, [2]Beth Israel Deaconess Medical Center, Department of Otolaryngology, Boston, United States

Introduction: Moderate to severe sleep apnea (AHI > 15/h) elevates risk for cardiovascular, metabolic, and cerebrovascular complications. If unable to tolerate positive airway pressure therapy, hypoglossal nerve stimulator (HNS) has emerged as an alternative. When activated, HNS stimulates genioglossus protrusion to maintain airway patency. The primary aim of this ongoing study is to identify clinical and physiological characteristics that may predict response to HNS. A secondary aim is to use adjuncts such as acetazolamide (targeting high loop gain) to provide endotype-targeted precision apnea care.

Materials and Methods: Fourteen adult patients implanted with HNS evaluated with overnight attended in-lab polysomnography (PSG) were monitored s/p device activation. Inclusion criteria: Age 18+, AHI 4% range from 15-65/h with less than 25% central apneas, BMI <35 kg/m2, absence of concentric collapse on DISE, and inability to tolerate CPAP. Three were implanted outside our center and presented with inadequate or failed response to the device. High loop gain was established by morphological criteria and mathematical respiratory self-similarity assessment. Stimulation amplitude, electrode configuration, frequency and pulse width were adjusted to optimize participant comfort and response to therapy. Comorbid sleep disorders including RLS and insomnia were treated once identified. Baseline and therapy PSG analyzed using paired t-test.

Results: 70.59% of participants responded to therapy (responder defined as residual AHI on therapy <20/h and AHI reduction of 50%). Baseline AHI and RDI of participants is strongly correlated with response to therapy (AHI3%: baseline mean (M)=45.81, SE 5.27; therapy M=29.98, SE 5.33; t(16)=2.34, p < .03), (AHI4%: baseline M=35.66, SE 4.53; therapy M=18.48, SE 5.89; t(12)=2.34, p < .02), (RDI: baseline M=56.63, SE 7.45; therapy M=27.25, SE 4.90; t(12)=2.34, p < .0002). PSG s/p implantation showed average AHI 4% reduction of 48.17%. TST, sleep efficiency, and sleep stages were unchanged from pre-implantation. Epworth Sleepiness Scale decreased from an average of 10 to 5/24 (SD 5.1, p: 0.001). Compliance with use was high, 94%. Non-responder commonalities: Unstable ventilatory control /high loop gain (HLG), periodic breathing, and baseline ESS ≥ 10. PSG on therapy demonstrates potential amplification of arousal with periodic breathing/HLG sleep apnea as HNS stimulation continues during recovery breaths. Comorbid sleep disorders: Insomnia (52.94%), PLMS/RLS (41.18%), somnambulism (7.1%). 52.94% recommended for acetazolamide to stabilize breathing; 1 discontinued after adverse drug effects.

Conclusions: HNS is generally well tolerated with high compliance. Residual apnea is common regardless of scoring criteria, and in general a 50% reduction of events can be expected. Improvement in sleep quality is far more difficult to achieve than improvements in respiratory abnormality and subjective sleepiness. Transition to a unipolar configuration, using adjunctive therapy with acetazolamide or oxygen to stabilize breathing, sedatives to improve sleep consolidation, and optimizing care and management of any comorbid insomnia or RLS may improve therapeutic response, allowing more comfortable progression in amplitude. Awake endoscopy may help to evaluate efficacy of alternate electrode configurations. Pre-implant endotyping should be considered especially in those with non-rapid eye movements sleep dominant apnea. Acknowledgement: The Institute for Personalize Sleep Health, Beth Israel Deaconess Medical Center, Boston, Massachusetts, USA

Clinical characteristic and sleep structure among Asian patients with Obstructive Sleep Apnea (OSA) and Co-morbid Insomnia and OSA (COMISA): a cross-sectional study

V.H. Tran[1], H.-C. Lee[2]
[1]Taipei Medical University, International Ph.D. Program in Medicine, Taipei, Taiwan, [2]Taipei Medical University, Department of Psychiatry & Sleep Center, Taipei Medical University Hospital, Taipei, Taiwan

Introduction: The simultaneous presence of obstructive sleep apnea (OSA) and insomnia poses difficulties in both diagnoses and management. Previous studies showed different clinical characteristics and sleep structures between isolated OSA and comorbid insomnia and OSA (COMISA). However, there is scant information on the Asian population. This study aimed to identify distinct characteristics that potentially could enhance the clinical management of COMISA.
Materials and methods: This prospective, cross-sectional study recruited all consecutively referred patients completing overnight polysomnography (PSG), clinical assessment, and self-report questionnaire in a single sleep center from July 2022 to Oct 2022. OSA was diagnosed as Apnea-Hypopnea Index (AHI) ≥ 5 events/hour. Besides, COMISA was determined when patients with OSA reported dissatisfaction with sleep quality that was associated with difficulty falling asleep, interrupted sleep, or early morning awakening at least 3 days a week for more than one month. Clinical characteristics, self-report sleep quality and mood, and sleep structures were compared between OSA and COMISA patient groups.
Results: There were 170 patients having AHI ≥ 5 events/hour in the whole sample. Among patients with OSA, 68 (40%) of them met the criteria of COMISA. There were no significant differences in any sleep parameters from PSG including total sleep time, sleep onset latency, sleep efficiency, the distribution of N1, N2, N3, and REM sleep stages, and AHI. There were significant differences in self-report sleep quality and mood measures by the Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7).
Conclusions: Our study results indicate that insomnia is also commonly seen among Asian patients with OSA. In contrast with previous research in Western countries, there were no significant differences between the sleep structures of Asian patients with COMISA and those with isolated OSA. COMISA patients were more anxious and depressed. Appropriate clinical management strategies should be considered according to this preliminary finding.

Clinical subtypes of patients with obstructive sleep apnea: East vs West

H. Yi[1,2], C. Zhang[1], X. Dong[1], J. Guo[3], L. Xu[1], F. Han[1]
[1]Peking University People's Hospital, Department of Respiratory Sleep Medicine, Beijing, China, [2]Peking University, School of Nursing, Beijing, China, [3]Chinese People's Liberation Army Air Force Characteristic Medical Center, Department of Sleep Medicine, Beijing, China

Introduction: Previous studies have shown that OSA is a heterogeneous disease with multiple clinical subtypes. However, the results were pertinent to the specific study cohorts evaluated and focus more on moderate to severe patients with OSA. The aim of our research was to further understand individual differences of clinical subtypes between Asian and Caucasian with OSA patients in all severity groups.

Materials and methods: Two Asian cohorts were collected: one from Peking University peoples' hospital and the other from other Asian sites of SAGIC (Sleep Apnea Global Interdisciplinary Consortium). West patients were recruited from 8 western sites in the SAGIC. A latent class analysis was performed using data on 18 self-reported sleep symptoms variables and comorbidities. We also compared each clusters with prevelance of comorbidities and PSG variables to see if there were pathophysiological mechanisms behind.

Results: 2708 patients were collected in our analysis, five cluster solution (labeled "disturbed sleep","minimal symptoms","excessive sleepiness with upper airway symptoms","upper airway symptoms dominant" and "sleepiness dominant") were optimal in both cohorts from Peking University peoples' hospital and the other Asian sites. The classification of symptom-based subtypes in Asian was consistent with Caucasian and same as research before in moderate to severe OSA identified in SAGIC. We also replicated the classic three clusters ("disturbed sleep","minimal symptoms","excessive sleepiness") identified in ISAC corhorts within the subset of the SAGIC sample from Asian with moderate to severe OSA. Additionally, in patients with mild OSA, the optimal number of clinical classifications was four (labeled "disturbed sleep","minimal symptoms","excessive sleepiness with upper airway symptoms" and "moderate sleepiness dominant"), but the characteristics of subtypes was a little different in two population. Patients in west had higher incidence of insomnia symptoms than Asians, who had higher severity of daytime sleepiness. Although, the prevalence of cardiovascular comorbidities was not significantly higher in excessive sleepiness clusters, PSG physiology variables always showed extremely high burden of hypoxia.

Conclusions: The clinical symptom subtypes were stable in East and West with moderate to severe OSA. Our results also expanded previously identified clinical clusters in mild patients with OSA. Phenotypes analysis provided more opportunities on understanding the underlying physiological mechanisms of OSA pathogenesis.

Clustering analysis of oximetry parameters in mild Obstructive Sleep Apnea patients

P. Amorim[1,2,3], D. Ferreira-Santos[2,3], M. Drummond[1,4], P. Pereira Rodrigues[2,3]
[1]São João University Hospital, Sleep and NIV Unit, Porto, Portugal, [2]Faculty of Medicine, University of Porto, Department of Community Medicine, Information and Decision Sciences, Porto, Portugal, [3]Center for Health Technology and Services Research, Porto, Portugal, [4]Faculty of Medicine of University of Porto, Porto, Portugal

Introduction: In patients with mild obstructive sleep apnea (mOSA), the clinical guideline suggests that the therapeutic decision should be based on the symptoms and the comorbidities. However, patients with a similar apnea-hypopnea index (AHI) may present respiratory events with different severity and with distinct hypoxic burden.
Recently, novel oximeters parameters for evaluating sleep breathing disorders were proposed, showing that they can help characterize the hypoxic burden and physiological stress experienced by a patient.
Thus, our objective was to perform a cluster analysis to study different oximetric parameters in mOSA patients with AHI between 10 and 15 per hour.
Materials and Methods: Conventional parameters - mean and minimum oxygen saturation, oxygen desaturation index (ODI), time <90% of SpO2 (t90) - and other novel metrics - desaturation duration (DesDur), desaturation severity (DesSev), average desaturation area (aDesArea) and average desaturation duration (aDesDur) - were studied in adult patients with mOSA who underwent a sleep study at the Sleep Laboratory of São João University Hospital (Porto, Portugal).
Oximetry signal was extracted from each polysomnography and analyzed with ABOSA software. Based on these oximetry data, a cluster analysis (*kmeans*) was performed using the R software.
Results: A total of 57 patients with mOSA were included. The average age was fifty-eight, 53% men, with a BMI of 29.6 kg/m2.
Based on the oximetry data, two clusters were built. Cluster 1 (n=25) included patients with worse DesSev (0.39 vs 0.30, $p < 0.001$), aDesArea (107 vs 67, $p < 0.001$) and aDesDur (34 vs 26, $p < 0.001$) values, while Cluster 2 (n=32) showed higher ODI values (13 vs 16, $p = 0.006$). Mean and minimum SpO2, t90 and DesDur did not show statistically significant differences. Age was higher in Cluster 1 ($p = 0.01$), while BMI was higher in Cluster 2 ($p = 0.02$). Gender and AHI values were similar across clusters.
Conclusions: Even with a similar AHI, some patients have worse DesSev, aDesArea and aDesDur, which has already been shown to be associated with future worsening of sleep apnea and linked to adverse cardiovascular events and mortality. We defined two clusters of mOSA patients that could not be identified by conventional oximetry. New oximetry parameters seem to be useful in the approach and follow-up of patients with mOSA.

Comorbidity between Obstructive Sleep Apnea, insomnia and primary headaches. A review of the literature

L.M. Fernández[1], M.J. Gaete[1], N. Velásquez[1,2], V. Iturriaga[1,2], T. Bornhardt[1,2]
[1]Universidad de la Frontera, Temporomandibular Disorders and Orofacial Pain Program, Temuco, Chile, [2]Sleep and Pain Research Group, Temuco, Chile

Introduction: Sleep disorders (SD), such as obstructive sleep apnea (OSA) and insomnia, as well as primary headaches (PH), have a high prevalence in the adult population, reducing the quality of life of people. A possible comorbidity between these entities is described. Insomnia can be a risk factor for both the appearance and frequency of PH, similarly, it has been described that half of the patients who present migraine PH suffer from insomnia. Other authors describe that autonomic trigeminal PHs (TACs), particularly cluster headaches (CHs), may present a higher risk of OSA. Therefore, the objective of this study is to describe, according to the current scientific literature, the relationship between OSA, insomnia and PH, considering its comorbidity.

Materials and Methods: A literature review was conducted through a systematic search of the Medline, Scopus and Dentistry and Oral Sciences Source database between July-August 2023. MESH terms were used and the search was limited to the last 10 years, in English and Spanish. The inclusion criteria were primary studies and literature reviews addressing the relationship between OSA or insomnia and PH, studies in the pediatric population were excluded.

Results: 246 articles were obtained, duplicate articles (n=78) and articles that did not meet the selection criteria (n=153) were eliminated, and 15 articles were finally selected for review. *OSA, insomnia and migraine:* sleep disruptions secondary to OSA and insomnia, can trigger migraine attacks, prospective studies establish bidirectional associations between insomnia and an increased risk of migraine. *OSA, insomnia and tension-type headache (TTH):* There is a significant association between OSA and TTH, although the mechanisms are still unclear, it is proposed that the regulation of sleep/wake cycles in patients with OSA improves the management of TTH. On the other hand, insomnia and TTH could have a bidirectional comorbidity by sharing mechanisms related to serotonin and melatonin dysregulation and hypothalamic dysfunctions. 75% of patients with TTH indicate that a triggering factor is inadequate sleep. *OSA, insomnia and TAC:* the association between OSA and TAC is controversial, however, it is described that oxygen desaturations in OSA increases the frequency of CH crises. In turn, insomnia is prevalent in patients with CH, which could be explained by the alteration in melatonin production in insomnia and which may influence CH crises.

Conclusions: Due to the comorbidity described between these entities, it is essential in the clinical evaluation to assess the presence of PH in a patient with SD, especially OSA and/or insomnia. The pathophysiological mechanisms that relate them are not yet clear, but a bidirectional relationship between these entities is suggested, other studies with adequate methodological designs are required to determine if this association actually exists.

Co-morbid sleep apnea and chronic insomnia (COMISA), positive airway pressure (PAP) adherence and feasibility of EEG neurofeedback training in COMISA patients- Data from the Akershus Sleep Apnea Clinical Cohort

H. Hrubos-Strøm[1], C.T. Øverby[1]
[1]Akershus University Hospital, Otorhinolaryngology, Lørenskog, Norway

Introduction: Comorbid insomnia and obstructive sleep apnea (COMISA) is a clinical challenge. We aimed i) to diagnose COMISA in a clinical cohort, ii) to study the association between COMISA and positive airway pressure (PAP) adherence and iii) to study feasibility of and adherence to treatment with electroencephalography (EEG) neurofeedback in a subsample of the cohort diagnosed with COMISA.

Materials and Methods: Consecutive patients referred to the otorhinolaryngology department at Akershus University Hospital with suspected OSA were invited to participate between 2015 and 2016. Participants underwent in-hospital sleep studies and treatment was initiated during the discharge consultation. Among 275 participants, 165 were diagnosed with OSA. Six years later, OSA patients underwent a modified Duke interview, answered questions regarding treatment adherence and excessive sleepiness. Patients diagnosed with COMISA were invited to participate in a sub study involving EEG neurofeedback. Polysomnography was performed before and after treatment. Objective sleep efficiency and time to fall asleep were calculated. Feasibility was assessed by user logs and comments.

Results: At follow-up we reached 135 (62 %) of the OSA patients. Twenty-nine (21 %) were diagnosed with COMISA. Seventy-one (68%) of 106 initial PAP users reported treatment adherence. No overall difference was seen between patients with and without COMISA. However, 4 (19%) of COMISA patients were partial users compared to only 5 (6%) without. Eleven patients (52%) with COMISA were treated with EEG neurofeedback. Among those, 6 (55%) were adherent to 6 weeks of treatment. 5 of these participants reduced their time to fall asleep and all six had improved sleep efficiency in the follow-up polysomnography. Adherent users found the equipment useful.

Conclusions: Prevalence of COMISA and overall PAP adherence were comparable to other studies. COMISA patients were found to be more partially adherent to PAP treatment than patients without COMISA. Finally, participants in a sub-study that were adherent to treatment with EEG neurofeedback reported the treatment to be feasible. Adherent users reduced their sleep onset latency and increased sleep quality when assessed by polysomnography.

Comparing novel electrophysiological biomarkers and circulating cardiac biomarkers in predicting cardiovascular mortality and all-cause mortality in the Akershus Sleep Apnea (ASAP) epidemiological cohort

H. Hrubos-Strøm[1], T.C. Øverby[1], F. Sigurdardottir[2], X. Feng[3], S. Nikkonen[4], H. Korkalainen[4], T. Leppanen[4], J. Töyräs[5], E.S. Arnardottir[6]
[1]Akershus University Hospital, Otorhinolaryngology, Lørenskog, Norway, [2]Akershus University Hospital, Internal Medicine, Lørenskog, Norway, [3]University of Oslo, Clinical Medicine, Lørenskog, Norway, [4]University of Eastern Finland, Kuopio, Finland, [5]Kuopio University Hospital, Kuopio, Finland, [6]Reykjavik University, Reykjavik, Iceland

Introduction: There is an ongoing debate regarding biomarkers predicting major cardiovascular events (MACEs) and mortality in patients with obstructive sleep apnea (OSA). The apnoea-hypopnea index (AHI) has several limitations and may be supplemented by novel electrophysiological biomarkers (EPBs) such as noxturnal oxygen desaturation parameters and circulating cardiac biomarkers (CCBs). In this longitudinal study, we aimed to predict MACE and all-cause mortality by traditional and novel EPBs and CCBs cardiac troponins I (cTnI) and T (cTnT).

Materials and Methods: Polysomnography and CCB analyses (cTnI and cTnT) were conducted on 459 participants in the Akershus Sleep Apnea (ASAP) epidemiological cohort. The baseline evaluation was conducted between baseline (2006-2008) and outcome evaluation in 2021 (mean follow-up 14 years). EPBs evaluated were the AHI, the oxygen desaturation index (ODI), the desaturation duration (DesDur), and the desaturation severity (DesSev). Desaturation metrics were calculated with the ABOSA software. We used Cox regression for survival analysis and collected endpoints from the national patient register.

Results: Between baseline and endpoint evaluation, 77 and 35 participants reached the endpoints of MACE and all-cause mortality, respectively. In the adjusted Cox regression model, cTnI and cTnT were significantly associated with MACE with hazard ratios of 1.84 [95% Confidence interval, 1.43, 2.37] and 1.57 [1.09, 2.25], respectively. The hazard ratios of of cTnI and cTnT to all-cause mortality were 1.98 [1.36, 2.89] and 1.73 [1.04, 2.89], respectively. EPBs were only associated with outcomes in bivariate analyses.

Conclusions: CCBs, but not EPBs were independently associated with MACE and all-cause mortality in the ASAP epidemiological cohort 14 year follow up study.

Comparison of clinical effectiveness and patients' preference for two non-invasive treatment options for patients diagnosed with moderate to severe obstructive sleep apnea: the FLOSAT study

M. Dieltjens[1], S. Charkhandeh[1], K. Van den Bossche[2], S. Engelen[2], D. Van Loo[2], J. Verbraecken[2], M. Braem[2], O. Vanderveken[2]
[1]University of Antwerp, Antwerp, Belgium, [2]Antwerp University Hospital, Antwerp, Belgium

Introduction: Continuous positive airway pressure (CPAP) is generally recommended as a first-line treatment option for patients with moderate to severe obstructive sleep apnea (OSA), while mandibular advancement device (MAD) therapy is frequently seen as second-line when CPAP is discontinued. The aim of this clinical trial is to evaluate the overall effectiveness of MAD therapy as first-line treatment option in patients with moderate to severe OSA, to compare the overall clinical effectiveness of MAD with that of CPAP therapy in the same patients in a cross-over setting, while asking for the patients' preference at the end of the study.

Materials and Methods: Patients diagnosed with moderate to severe OSA fulfilling the inclusion criteria (body mass index (BMI)<35 kg/m², 15 events/hour≤obstructive apnea/hypopnea index (oAHI)<65 events/hour of sleep, central AHI<30% of total AHI, no history of CPAP or MAD) were contacted to start MAD therapy for three months (ProSomnus EVO Sleep and Snore Device, ProSomnus Sleep Technologies) as a first-line treatment option with measurement of objective adherence using an embedded active thermomicrosensor (Theramon, MC Technology GmbH), followed by polysomnographic evaluation. Subsequently, after a two-week wash-out period, all participants underwent CPAP treatment for three months, followed by a polysomnography and read-out of the objective adherence. At the end of the study, patients' preferences (MAD, CPAP or no preference) was recorded. Data are presented as median (quartile 1, quartile 3) if not normally distributed and as mean±standard deviation if normally distributed. Thereafter, mean disease alleviation (MDA) was calculated as the product of efficacy and compliance in an intention-to-treat analysis.

Results: To date, 136 patients have been included in this ongoing clinical trial. Ninety of these patients (86% male, age: 50±11 years, BMI: 28.5±3.0 kg/m², AHI: 23.1 (17.2; 30.5) events/hour) completed all study visits up till now, including the questioning on patient's preference. Two patients (2%) failed to comply with MAD therapy compared to 20 patients (22%) failed to comply with CPAP therapy. Overall, AHI decreased significantly from 23.1 (17.2; 30.5) events/hour to 7.4 (4.9; 11.5) events/hour with MAD (p<0.05) and to 3.2 (1.4; 5.0) events/hour with CPAP (p<0.05). The average use was 6.7 (5.0; 7.3) hours/night for MAD therapy which was significantly higher than the 5.3 (1.5; 6.7) hours/night for CPAP therapy (p<0.05). Regarding patients' preference: 52% of patients had a preference for MAD, where 40% of participants preferred CPAP and 8% expressed no preference.

Conclusions: In this ongoing clinical trial, MAD therapy as a first-line treatment option showed a good efficacy in reducing AHI, combined with high patient adherence. This in turn resulted in at least equal overall effectiveness for MAD therapy vs CPAP. Finally, there was a higher preference rate for MAD compared to CPAP.

Comparison of lateral cephalometric parameters between subjects with and without OSA: An interim analysis

P. Sivaramakrishnan[1], L.K. Saini[2], A. Chugh[3], R. Gupta[4]
[1]All India Institute of Medical Sciences, Pulmonary Medicine, Rishikesh, India, [2]All India Institute of Medical Sciences, Pulmonary Medicine and Division of Sleep Medicine, Rishikesh, India, [3]All India Institute of Medical Sciences, Dentistry, Rishikesh, India, [4]All India Institute of Medical Sciences, Psychiatry and Division of Sleep Medicine, Rishikesh, India

Introduction:

- Level 1 polysomnography (PSG) is the gold standard test for diagnosis of OSA, but has some limitations like lack of availability, long waiting times, and the inability to identify the accurate site of obstruction.
- Lateral cephalogram is a widely used modality for 2D analysis to quantify craniofacial skeletal abnormalities and analyze Oro-pharyngeal space.
- This simple, inexpensive investigation provides reliable information on craniofacial patterns, with much less radiation than MDCT.
- The present study was planned to evaluate the cephalometric parameters among patient with OSA and non-OSA in India, as presently the related data is scarce.

Materials and methods:

- We aimed to study a total of 126 patients (84 patients with OSA, and 42 patients without OSA). The study has been approved by the institutional ethical committee.
- After routine history and physical examination, patients presenting with sleep-related symptoms to Sleep Clinic, AIIMS Rishikesh have undergone level 1 PSG and lateral cephalometry. The marking of cephalometric parameters were done manually and measurements were taken using "autoceph" software. Parameters noted were soft palate length (SPL), Nasopharyngeal airway space (NAS), Superior and Middle posterior airway spaces (SPAS & MPAS), and distances between hyoid to Posterior nasal spine(H-PNS), C3 vertebral body(H-C3) and posterior pharyngeal wall (HAS), mid-facial length (ML), cephalometric angles (SNA, SNB, ANB) and gonial angles (GA).
- Following PSG reporting, patients were divided into 2 groups, one with Apnea-hypopnea index (AHI) > 5, and one with AHI < 5, and the data was analyzed.
- In this interim analysis, we have analyzed a total of 40 patients.

Results:

- Among 40 analyzed patients, thirty had an AHI of > 5 (OSA group) and 10 patients had an AHI of <5 (Non-OSA group).
- The mean age of the study population was 46 years (OSA 48 years and non-OSA 38 years). A total of 13 females (32.5%) and 27 males.
- In OSA group, 6 (20%) , 9 (30%) and 15 (50%) patients were of mild, moderate and severe OSA respectively.
- The average BMI among OSA and non-OSA patients were 31.56 and 26.8 kg/m2 respectively.
- Among the anthropometric parameters, there was a significant statistical difference between weight (P 0.001, t-test statistic 3.473, 95% CI 8.4-32.2), and Body mass index in correlation with OSA patients (P 0.011, t-test statistic 2.667, 95% CI (1.58-11.65)).
- Among the cephalometric parameters, SPL, MPAS, H-PNS showed statistical significance.
- Patients with larger SPL (P 0.01, t-test statistic 2.708, 95% CI (1.07-7.50), larger H-PNS (P 0.037, t-test 2.170, 95% CI 0.401 to 11.849) or lesser MPAS (P 0.038, t-test -2.153, 95%CI -3.69 to -0.11) having the predisposition to suffer from OSA.
- The rest of the cephalometric parameters did not show any statistical significance.

Conclusions: In this interim analysis of our study, soft palate length (SPL), middle posterior airway space (MPAS), and hyoid to posterior nasal spine distance (H-PNS) showed a significant correlation with the presence of OSA.

Comparison of REM-related obstructive sleep apnea with NREM-related obstructive sleep apnea in terms of possible disease complications and demographic indicators

P. Adimi[1], F. Mohammadi[2], Z. Rashvandi[1], N. Raad[1], B. Khoundabi[3]
[1]Shahid Beheshti University, Tehran, Iran, Islamic Republic of, [2]Shahid Beheshti University, Sleep Clinic, Tehran, Iran, Islamic Republic of, [3]Science and Technology university, Tehran, Iran, Islamic Republic of

Introduction: Obstructive sleep apnea (OSA) is a relatively common disease associated with high blood pressure, cardiovascular disease, cerebrovascular disease, obesity, glucose intolerance, and impotence. Patients who develop apnea only in REM sleep, despite a low AHI index, may have more complications from this disease.

Less arousal during REM sleep is a natural mechanism to restore and strengthen sleep-seeking power. Therefore, due to the frequent interruption of REM sleep in patients of this group, a higher EDS is expected. As we know, the more sleepy people are, the more cardiovascular complications they have. Therefore, it is recommended to start treatment with a lower AHI earlier.

Materials and methods: This case-control study was conducted on 489 patients with OSA referred to the sleep clinic. Patients were divided into two groups according to the AHI REM/AHI NREM ratio. The case group (REM) was patients with AHI REM/AHI NREM ratio ≥ 2, and the control group (NREM) was patients with AHI REM/AHI NREM ratio ≤2. Demographic factors and underlying diseases and Epworth Sleepiness Scale (ESS) were compared between the two groups.

Results: The proportion of people with blood pressure in the NREM group was significantly higher than REM group ($P=0.030$). There was no significant difference in the proportion of people with diabetes in both NREM and REM groups. The average number of awakenings in sleep was also higher in the NREM group than in the REM group and this difference was significant ($P=0.044$). The difference in mean ESS and percentage of O2 saturation less than 90 in two groups was not significant. Of course, in the case of ESS, due to the non-significance of its mean in the studied groups, it seems that the dispersion of ESS tends towards numbers less than 10 in the REM related group, if we pay attention to the median and mode. The average desaturation index in the NREM group was significantly higher than the control group ($P<0.001$). The ratio of choking in REM group was significantly higher than NREM group ($p=0.045$). Also, the proportion of patients with sweating and bruxism was higher in the REM group than NREM group, and this difference is significant at the 10% level. The mean of AHI in REM group (38.7/h) and NREM group (34.7/h) was not statistically different.

Conclusions: The usual parameters in the PSG report cannot distinguish REM-related OSA from NREM-related; Pure REM-OSA and pure NREM-OSA phenotype does not exist and in addition, many factors are effective in reducing REM sleep time and shortening sleep cycles.

Comparison of the rate of delayed bleeding in children with intracapsular tonsillectomy and extracapsular tonsillectomy by coblation

J. Zhong[1]
[1]Shenzhen Hospital, Southern Medical University, Shenzhen, China

Objective/Introduction: Postoperative bleeding is a common complication of tonsil surgery in children. Our focus is on reducing postoperative bleeding. There are many influencing factors for postoperative bleeding. To understand the impact of different tonsillectomy and wound treatment on the postoperative bleeding.

Methods: A retrospective analysis of 3183 patients in our hospital who were underwent tonsillectomy from August 2017 to Feb 2023. These patients were divided into three groups; group A was extracapsular coblation tonsillectomy without suturing the anterior and posterior arches, group B was extracapsular coblation tonsillectomy with suturing of the anterior and posterior arches, and group C was intracapsular coblation tonsillectomy. Postoperative bleeding rate and bleeding degree were recorded and analyzed statistically.

Results: Of the three groups of children, 1556 were in group A with a postoperative bleeding rate of 3.28%, 1005 were in group B with a postoperative bleeding rate of 2.79% , and 622 in group C with a postoperative bleeding rate of 0.48%. Primary postoperative bleeding rate of the three groups was compared, pairwise comparison, $P>0.05$, the delayed postoperative bleeding rate was compared between group A and Group B, $P>0.05$, No statistically significant difference. Compared between group C and Group A, compared between group C and Group B, $P<0.05$, there was statistically significant difference.

Conclusion: There was no significant difference in the rate of postoperative bleeding in children who underwent extracapsular coblation tonsillectomy with suturing the anterior and posterior arches and extracapsular coblation tonsillectomy without suturing the anterior and posterior arches intracapsular coblation tonsillectomy. Intracapsular tonsillectomy had the lowest postoperative bleeding rate in clinical application.

Keywords: Children, Extracapsular tonsillectomy, Intracapsular tonsillectomy, Coblation, Wound treatment, Delayed bleeding

Considerations for drug induced sleep endoscopy in cerebral palsy: a clinical case

C. Vasquez[1], J. Torres[2]
[1]National Institute of Children' Health, Otorhinolaringology, Lima, Peru, [2]National Institute of Children's Health, Pulmonologist, Lima, Peru

Introduction: Patients with childhood Cerebral Palsy (CP) have a high incidence of physiological problems that predispose them to present sleep - disordered breathing (SDB) and often be refractory to treatment. In these cases the Drug Induced Sleep Endoscopy (DISE) carried out neatly becomes an valuable tool.

Case description: A 12-year-old male patient with history of CP, structural epilepsy and aspiration pneumonia in whom intense nocturnal snoring and episodes of respiratory cessation lasting seconds were observed. A Cardiorespiratory Polygraphy was performed since there was not Polysomnography (PSG) type I at the Institution, which concluded severe obstructive sleep apnea (OSA) without hypoxemia, with an AHI of 11.4 in a predominantly right lateral position, with a minimum O2 saturation of 84% lasting only 2 minutes, the average was 93%. The heart rate average was100 bpm. The patient also showed a high percentage of snoring time (60%). Consultation with Otorhinolaryngology evidenced moderate hypertrophic lower turbinates, Mallampati IV, and normotrophic palate tonsils. A DISE was performed, showing multilevel obstruction with a rating scale according to template of 10/18 in dorsal and right lateral decubitus, with slightly positive mandibular traction. Finally, a high-flow cannula was titrated with PSG, snoring disappearing, apneas and lower saturation improving, until a CPAP can be obtained.

Discussion: CP in children is one of the most common neurodevelopmental disabilities and is defined as a group of movement and posture disorders that cause limitations in activity and that can be attributed to non-progressive disturbances that occur during fetal or brain development child.
Patients with childhood CP have a high incidence of physiological problems such as gastroesophageal reflux disease (80% to 90% of patients with severe CP present it), musculoskeletal problems, epilepsy, visual impairment, respiratory problems, drooling and uncoordinated swallowing. These symptoms and others predispose patients with CP to present sleep disorders. It is important to emphasize that hospitalized patients with CP have a higher incidence of sleep problems than those who are not .
Among the sleep problems they experience are difficulty initiating and maintaining sleep, sleep-wake transitions, bruxism, excessive sleepiness, daytime sleepiness, nightmares, and sleep talking. Of these, SDB is one of the most frequently worrying because family members or caregivers report generally intense snoring and pauses during breathing.
Within the SDB , OSA or hypopnea is one of the most frequent disorders in these types of patients, surpassed only by chronic insomnia.
The gold test for the diagnosis of SDB is PSG, to which DISE is added to give us more information.

Conclusions: PSG is recommended prior to DISE to confirm the presence and severity of OSA. The sedation level during sleep endoscopy should be adjusted based on audible snoring, an obstructive breathing pattern, while ensuring that the patient remains asleep during the sleep endoscopy procedure. Lateral positioning and mandibular maneuvers can be used during pediatric sleep endoscopy to collect additional information. CP patients have several factors that predispose them to sleep problems, not just SDB, which need to be addressed with a multidisciplinary approach.

Corrective procedures of the tongue base using Shaver and plasma-PK techniques in the treatment of snoring and sleep apnea - own experience

M. Michalik[1], A. Dmowska-Koroblewska[1], A. Gerwel[1]
[1]MML Medical Center, Warsaw, Poland

Introduction: A special group of patients with sleep apnea and snoring are people with a large mass of tongue, which is an obstacle to proper sleep breathing. In this group of patients, after radiological and endoscopic examination of the lower throat during a pharmacological sleep, a technique involving the reduction of muscle tissue with a Shaver was used, simultaneously with plasma generator PK.
Materials and methods: We wanted to show the advantages of the Shaver/PK technique compared to other techniques used to reduce of the tongue root.
The study material included 36 men with confirmed obstructive sleep apnea, aged 32 to 57 years. Surgery was performed by introducing a 4 mm diameter Shaver in the midline, the muscle mass of the tongue was reduced using plasma coagulation at the same time.
Results: There was a subjective improvement. In the questionnaire survey, all the patients experienced improvement.The radiographic examination of the tongue and lower throat areas performed 90 days after surgery revealed a reduction in its mass and an increase in the distance from the posterior wall to the root of the tongue in the study group. In the polysomnographic study, improvement of respiratory parameters was observed in 90% of patients. In one patient a complication in the form of haemorrhage from the arterial vein was observed. Embolisation was used.
Conclusions: The technique of using Shaver/PK in the reduction of the tongue root may be complementary to the method of fibrinolysis/RF/harmonic/laser and can extend the scope of otolaryngology, especially where other treatments have not yielded the expected results. In addition, it is worth noting that the expected therapeutic effect and convalescence of patients after surgery is much faster.

Correlation between palatal inter-molar distance on CT scan and sleep endoscopy findings for 30 Indian adult patients with snoring: an exploratory study

K. Pandyan[1], S.K. Sistla[2]
[1]Subbaiah Institute of Medical Sciences, Department of ENT, Shivamogga, India, [2]AIG Hospitals, Department of Otolaryngology, Hyderabad, India

Introduction:
Obstructive sleep apnea (OSA), the most common sleep-related breathing disorder (SRBD), is defined as repeated episodes of partial or complete closure of the upper pharyngeal airway resulting in disrupted breathing during sleep.
Mouth breathing can create unequal distribution of forces between the cheeks, lips and tongue which alters the growth of the craniofacial complex which lead to dentoskeletal changes. In our study was aimed at comparing the correlation between the palatal inter-molar distance (PID) with the level of obstruction seen on drug induced sleep endoscopy (DISE)

Materials and Methods:
In our pilot study, a total of 30 adult patients (age range: 18-55 years) with snoring complaints were enrolled in the study. All participants underwent a level 3 sleep study, followed by a CT scan and sleep endoscopy examination. PID was obtained from the CT imaging software by measuring the distance between the palatal first molars. DISE findings were categorized as per the VOTE classification for the severity and level of obstruction. Statistical analysis, including correlation coefficient (Pearson's R) and chi-squared test, was conducted to evaluate the relationship between PID and DISE findings.

Results:
The mean value for PID among was 32.05 ± 2.3 mm. DISE findings indicated that 26 individuals (86.6%) presented with complete collapse at velopharynx, 7 individuals (23.3%) had a complete collapse at oropharynx and 11 individual (36.6%) had a complete collapse at the tongue base, epiglottis collapse was seen in 2 individuals (6.6%). Multilevel collapse was seen in 66.6 % of the patients and lingual tonsil hypertrophy was seen in 43.23% of patients.
A significant positive correlation was found between PID and SE findings ($R = 0.579$, $p < 0.001$), suggesting that lower PID values were associated with obstruction and at the tongue base level during SE findings. Specifically, patients with low PID values were more likely to have severe obstruction on SE findings ($p < 0.001$).

Conclusions:
Our pilot study demonstrated a significant correlation between PID measured on CT scan and SE findings in Indian adult patients with history of snoring. Lower PID values were associated with increased severity of collapse on sleep endoscopic findings, indicating a higher likelihood of upper airway obstruction during sleep. The measurement of PID on CT scan could serve as a valuable adjunctive tool to predict the level of anatomical obstruction and guide treatment decisions in patients with snoring.

Correlation between the severity of obstructive sleep apnea, hypertension and serum lipid and glycemic: a case control study

A. Bastos Lira[1], C.F. de Sousa Rodrigues[1], A.B. Lira[1]
[1]Universidade Federal de Alagoas, Medicina do Sono, Maceió, Brazil

Introduction: Obstructive sleep Apnea (OSA) is the most common form of sleep-related breathing disorder, and It is a chronic disease characterized by recurrent episodes of partial or total obstruction of the upper airway during sleep (obstructive respiratory events), and is considered an important cause of morbidity and mortality. Hypoxia stimulates the arterial chemoreceptors (carotid receptors) which increase the activity of the sympathetic nervous system. Besides that the cycles of hypoxia and reoxygenation may alter oxidative balance and induce an increase of free radicals, are important factors for pathological consequences of OSA. The purpose of this study was to evaluate the correlation between the severity of OSA and the levels of blood pressure (BP), lipids and glucose, as intermittent hypoxia increases BP, changes the oxidative balance, and can induce the formation of free radicals and atherogenesis.

Materials and methods: 32 patients (20 male, aged 23–83 years, and 12 female, aged between 41 and 76 years), after acceptance of the Terms of Consent approved by the ethics committee of the Federal University of the Alagoas State, were evaluated about BP during wakefulness and sleep, total cholesterol and lipids, LDL (low-density lipoprotein), HDL (high-density lipoprotein), triglycerides, glucose and polysomnography. They were divided into four groups according to the respiratory events per hour of sleep (RDI)): control group (RDI < 5), Group I (RDI 5-15), Group II (RDI 15-30), Group III (RDI > 30). There was no financial support as well as conflicts of interest.

Results: There was no increase in BP in groups' cases, the verification of systolic ($p = 0.429$) and diastolic ($p = 0.475$) BP in 24 h, systolic ($p = 0.277$) and diastolic ($p = 0.143$) BP during wakefulness, and systolic ($p = 0.394$) and diastolic ($p = 0.703$) BP during sleep in the control group. When implementing the Spearman correlation test (Cc), a correlation directly proportional to the severity of the disease was not observed. Regarding the level of serum total cholesterol ($p = 0.092$), LDL ($p = 0.242$), HDL ($p = 0.517$), triglycerides ($p = 0.947$), total lipids ($p = 0.602$) and glucose (0.355), there was no statistically significant difference between groups ($p > 0.05$ for all parameters).

Conclusion: There is no correlation between the severity of OSA and elevated blood pressure in 24 h, during wakefulness and sleep, as well as elevated the serum levels of total cholesterol, LDL, HDL, triglycerides, and fasting glucose. However, the duration of OSA may be an important fator in the onset or worsening of hypertension and metabolic disorders.

Correlation of sleep spindle structures and apnea/hypopnea index in adult survivors of childhood Hodgkin lymphoma

A. Sanchez-Corzo[1], Z. Loschinskey[1], M. Navarrete[2], C. Saini[3], K.K. Ness[4], M.M. Hudson[5], K. Krull[2], B. Mandrell[6], R. Sitaram[1]
[1]St. Jude Children's Research Hospital, Diagnostic Imaging Department, Multimodal Functional Brain Imaging and Neurorehabilitation Hub, Memphis, United States, [2]St. Jude Children's Research Hospital, Psychology Department, Memphis, United States, [3]Pontificia Universidad Católica de Chile, Instituto de Ingeniería Biológica y Médica, Macul, Santiago, Chile, [4]St. Jude Children's Research Hospital, Epidemiology & Cancer Control Department, Memphis, United States, [5]St. Jude Children's Research Hospital, Oncology Department, Memphis, United States, [6]St. Jude Children's Reseach Hospital, Nursing-Research Department, Memphis, United States

Introduction: The significance of healthy, restorative sleep extends far beyond mere rest, playing a crucial role in cognitive development and maintenance, physical well-being, and behavioral skills (Merz & Tomfohr-Madsen, 2018). Impaired sleep quality is commonly reported by childhood cancer survivors (Mulrooney et al., 2008) with more than half reporting a sleep disturbance (Kaleyias et al., 2012; Zhou & Recklitis, 2014). Sleep disturbances are associated with impaired neurocognitive and behavioral functioning, impacting the childhood cancer survivor's health-related quality of life (Gibson et al., 2005; Hockenberry-Eaton & Hinds, 2000). Understanding the neural electrophysiology of sleep may provide valuable insights into the intricate link between sleep disturbances and cognitive function. Sleep spindles are brief bursts of brain activity typically occurring at a frequency range of 11-16 Hz occurring primarily during stage 2 NREM. The emergence of mature spindles during developmental years is a predictor of improved intellectual ability (Bestmann A. et al., 2019; Geiger A. et al., 2012) and memory performance (Hahn M. et al., 2019). Here, we examined the correlation between overnight polysomnography (PSG) sleep variables of apnea/hypopnea, heart rate, and oxygen saturation and electroencephalograph (EEG) measurement of sleep spindle structures among adult survivors of childhood Hodgkin lymphoma (HL).

Materials and methods: Overnight PSG data were obtained from 54 adult survivors of childhood HL, mean age of 41 years (± 9.6), 59% female. The PSG was scored according to the American Academy of Sleep Medicine scoring criteria. The EEG electrode (FpZ) data was preprocessed, and sleep spindles were detected using the Yet Another Spindle Algorithm framework in Python. Statistical analysis was conducted in R to correlate spindle frequency, relative power, density, and duration with Apnea Hypopnea Index (AHI), Apnea Overall Index (AOI), Hypopnea Overall Index (HOI), pulse rate (PR), respiratory disturbances, and blood oxygen saturation (SpO2).

Results: Correlation was found between mean spindle relative power and AOI (R=0.327, P=0.017), mean spindle duration and HOI (R=-0.318, P=0.02), and mean spindle duration standard deviation (SD) and HOI (R=-0.331, P=0.016). Slow spindle (9-12.5 Hz) analysis identified correlations between mean spindle power and AOI (R=0.366, P=0.007) and mean spindle duration and HOI (R=-0.340, P=0.013). Additionally, the mean spindle duration correlated to the pulse rate SD (R=0.361, P=0.008), as did fast spindles (12.5-15Hz) (R=0.441, P=0.001). The mean spindle relative power significantly correlated with the SpO2 SD (R=0.351, P=0.01). While the SpO2 Max significantly correlated with the spindle relative power SD (R=0.440, P=<0.001) and the spindle duration (SD) (R=0.321, P=0.019). No correlations were found with spindle frequency or spindle amplitude.

Conclusions: Spindle duration and variability were correlated with apnea/hypopnea, SPO2, SPO2 variability, and heart rate variability. These results are consistent with recent studies reporting correlation between a higher AHI and shorter sleep spindle duration (Mohammadi et al., 2021). Short spindle duration has been associated with poorer memory performance (Schabus et al., 2008). Sleep spindle duration may contribute to the cognitive impairment that is commonly reported in childhood cancer survivors with sleep disturbances

*AS-C and ZL contributed equally to this work

CPAP partially rescues early gestational age at delivery associated with OSA of any severity

K. Antony[1,2], J. Nick[3], K. Plessner[3], L. Rice[3], N. Jacobson[3], A. Wiedmer[3], S. Tandon[2], A. Stanic-Kostic[2], M. Bazalakova[4]
[1]University of Auckland, Auckland, New Zealand, [2]University of Wisconsin Madison, Obstetrics and Gynecology, Madison, United States, [3]University of Wisconsin Madison, College of Arts and Sciences, Madison, United States, [4]University of Wisconsin Madison, Neurology, Madison, United States

Introduction: Obstructive sleep apnea (OSA) is now consistently implicated in perinatal maternal and neonatal morbidity and mortality, including pre-term birth (PTB). We have established a Sleep Pregnancy Clinic as a collaborative clinical effort at the University of Wisconsin-Madison. As part of this specialized intervention, we maintain a database of pregnant women who screen positive for OSA, undergo objective testing and/or initiate auto-continuous positive airway pressure (Auto-CPAP) treatment during pregnancy. Here, we present real-world data that any diagnosis of OSA, even "mild," is associated with higher rates of PTB and earlier gestational age (GA) at delivery. Tantalizingly, Auto-CPAP treatment in our cohort partially rescued early GA at delivery.

Materials and methods: This is a retrospective analysis of data from 184 completed pregnancies. Gravidae who screened as high risk for OSA using the 4-variable Facco questionnaire were referred for OSA testing, primarily with the Respironics Alice PDx® home sleep apnea test (HSAT). We only included cases where OSA screening and HSAT testing occurred during pregnancy. We used AASM-recommended 3% desaturation criteria to define hypopneas and a respiratory effort index (REI) of 3%. HSATs scored by REI4% only and polysomnography testing were excluded for appropriate grouping of "OSA severity."

No OSA, "mild" OSA and "moderate to severe" OSA were defined as REI3% < 5/hr, REI3% 5-14.99/hr, and REI3% => 15/hr respectively. For patients who initiated CPAP treatment during pregnancy, an "Auto-CPAP compliant" group was defined as gravidae who used Auto-CPAP > 4 hrs/night, >70% of days. Non-auto-CPAP compliant gravidae were included in the "mild" or "moderate to severe" OSA groups.

Perinatal outcomes were collected from the electronic medical record once pregnancies were completed. In this analysis, we compared the incidence of PTB (defined as GA at delivery < 37 weeks) and GA at delivery in gravidae without OSA, with "mild" OSA, with "moderate to severe" OSA and gravidae with any OSA severity who were "CPAP compliant." Data were compared using Pearson's chi-square and ANOVA as appropriate, and analyses performed using STATA 16.0 (StataCorp, 2017, College Station, TX).

Results: The mean GA at delivery decreased from 38.32 weeks for no OSA (n=46), to 37.83 weeks for "mild OSA" (n=71), and 36.82 weeks for "moderate to severe" (n=36) OSA, but increased to 37.57 weeks in the "Auto-CPAP compliant" group (n=31) (F 2.91, p=0.036). While not statistically significant, there was a similar trend of increasing rates of PTB (9%, 14% and 27%) in the no/"mild"/"moderate-to-severe" OSA groups respectively, compared to 22% in the compliant group.

Conclusions: Any severity of OSA, even "mild," was associated with lower GA at delivery and higher incidence of PTB in our real-world cohort of gravidae screened, tested and/or treated for OSA during pregnancy. Importantly, auto-CPAP compliance was associated with partial rescue or increased GA at delivery, suggesting OSA treatment as a novel intervention for a worsening perinatal morbidity.

CPAP titration using real time transthoracic echocardiography in a patient with hypoplastic left ventricle and Fontan physiology

T. Johnson[1], J. Mora[1]
[1]Hospital of the University of Pennsylvania, Sleep Medicine, Philadelphia, United States

Introduction: There are three stages of palliative surgeries generally applied to patients born with hypoplastic left heart syndrome (HLHS). Those are the Norwood within a few days of birth, the Glenn at four to six months of age, and the Fontan, which is generally performed at two to five years ago age. Due to advances in surgical and medical management of heart failure, patients with Fontan physiology are now living well into adulthood. Thus, many more of these patients are now at risk for obstructive sleep apnea (OSA) or other forms of sleep disordered breathing (SDB). However, their unique physiology and preload dependent circulation create the potential for reduced cardiac output during treatment with positive airway pressure (PAP). Various strategies have been suggested to initiate PAP in patients with Fontan physiology. These include a formal hemodynamic assessment with right heart catheterization while applying different levels of PAP (Watson et al, 2009), or, more simply, an indirect hemodynamic assessment using transthoracic echocardiography (TTE) with different PAP levels (Nanayakkara et al, 2020). Here, we propose a slight alteration to the TTE protocol proposed by Nanayakkara et al, and describe the implementation of this protocol in a 33 year old female with Fontan physiology.

Materials and methods: A baseline TTE was performed prior to initiation of PAP therapy, with special attention to the parasternal long axis view (PLAX); the cross-sectional area (CSA) of the left ventricular outflow tract (LVOT) was measured, as well as the apical five chamber view (A5CV), and the velocity time integral (VTI) was calculated using pulse wave Doppler. Assuming that the LVOT is cylindrical in shape, stroke volume can be calculated as the product of CSA and VTI. This calculation was performed at PAP 0 cm H2O, then increased to 6 cm H2O, and subsequently increased by 2 cm H2O every three minutes until the predefined endpoint of >20% reduction in SV from baseline was reached. A ResMed N30 mask and home ResMed CPAP were used for the titration.

Results: Our patient's baseline SV was 35 mL, with the following SVs observed at each level of CPAP.
CPAP 6 cm H2O = 32 mL
CPAP 8 cm H2O = 31 mL
CPAP 10 cm H2O = 30 mL
CPAP 12 cm H2O = 33 mL
CPAP 14 cm H2O = 30 mLCPAP 16 cm H2O = 27 mL (77% of baseline SV, study terminated)
Based on these findings, we conclude a safe range of CPAP levels for our patient is 6-15 cm H2O.

Conclusions: Based on our findings, we suggest that using a TTE-guided protocol for initiation of PAP therapy in patients with preload dependent circulation is safer than empiric auto CPAP.

Description of a CPAP supply program for public health system patients in a northeast Brazilian hospital

M. Nascimento[1], M.E. Cardoso[1], S.C. Martinez[1], D.C. Clímaco[2], V. Vasconcelos[1], T.N. Silva[2], L. Possídio[2]
[1]Hospital da Restauração, Neurologia, Recife, Brazil, [2]Hospital Otávio de Freitas, Medicina do Sono, Recife, Brazil

Introduction: Obstructive Sleep Apnea (OSA) is a sleep disorder that can appear in many ways[1]. Due to its high prevalence, OSA is currently considered a public health problem, contributing to increased morbidity and mortality. Continuous Positive Airway Pressure (CPAP) therapy is an effective treatment for adults with OSA. However, offering this type of treatment is still a challenge. This study describes the CPAP distribution system performed in the Hospital Otávio de Freitas (HOF) in Pernambuco, Brazil. The equipment is distributed through the OSA patient therapy program, part of the "DOMICILIARY HYPOVENTILATION SYNDROME AND OXIGENOTHERAPY PROGRAM."

Materials and methods: It is a descriptive study of the CPAP delivery system used in the therapy program for patients with OSA at HOF, a hospital in northeastern Brazil. The data was collected from the public contract between the hospital and the company that supplies the CPAP equipment and from medical records.

Results: Located in Pernambuco, the HOF Pulmonology Service is a public health referral center that assists patients with Sleep Disorders. The sleep specialists and physiotherapy professionals work together as a multidisciplinary team. It also serves as a center for health education, with its medical residency service, and is a practice field for medical students and other medical residents. The "DOMICILIARY HYPOVENTILATION AND OXYGEN THERAPY SYNDROME PROGRAM" is a program funded by the local state public health and subsidized by the Health Secretariat of the State of Pernambuco. It provides care at the HOF and aims to offer regular CPAP and oxygen therapy devices to patients suffering from severe OSA. The program determines the need, inclusion criteria, and distribution of positive pressure devices for home use. Currently, the program has 935 CPAP, 205 VPAP, and 29 BIPAP devices in use, and approximately 20 new patients are added each month for treatment of OSA, with ten patients requiring life support ventilators. The hospital acquires the equipment through a bidding process, and the selected company is paid with resources from the public health system of the State of Pernambuco to provide the equipment and maintenance services. The equipment offered has Internet connectivity, as established in the contract. The hospital uses the RedMed AirView platform and activates the telemonitoring system if necessary. In addition, the program verifies if there is a need for maintenance or adjustment of the device.

Conclusions: The CPAP delivery system aims to facilitate care for patients with OSA. At the HOF, the CPAP delivery system is included in a well-established program that has been in place for approximately ten years. During this entire period, more than 1,000 patients have benefited from it, achieving significantly improved compliance rates. This success can be largely attributed to the financial facilitation that allows the acquisition of the equipment, considering the contrast between its high cost and the low purchasing power of the population served. In addition, we can attribute the good functioning of the program to a multidisciplinary system of individualized follow-up.

DHECA: A decision-making score to identify the need of CPAP treatment beyond the AHI

D. Schonfeld[1], S. Arias[2], D. Perez-Chada[3], O. Mediano[4], S. Romero Peralta[4], E. Dibur[5], F. Barbe Illa[6], D. Gozal[7]
[1]Centro Diagnostico San Jorge, Pulmonary Medicine, Puerto Madryn, Argentina, [2]Instituto Nacional de Enfermedades Respiratorias "Dr. Emilio Coni", ANLIS e Instituto de Salud Dr. "Carlos Malbrán", Epidemiology, Santa Fe, Argentina, [3]Austral, Pulmonary Medicine, Pilar, Argentina, [4]Guadalajara, Pulmonary Medicine, Guadalajara, Spain, [5]Hospital Aleman, Pulmonary Medicine, Buenos Aires, Argentina, [6]Hospital Universitari Arnau de Vilanova y Santa Maria, Lleida, CIBERES, Pulmonary Medicine, Lleida, Spain, [7]Marshall University, Joan C Edwards School of Medicine, Huntington, United States

Introduction: Obstructive sleep apnea (OSA) is a highly prevalent pathology for which the most effective treatment consists in the use of CPAP. CPAP indications primarily rely on the apnea/hypopnea index and are not consistent across different consensus guidelines. A series of co-morbidities associated with OSA that are potentially improved or resolved with the use of CPAP were identified and validated through a Delphi method. The aim of this study was to generate a decision-guiding score that should allow for delineating the need for CPAP treatment for each particular patient.

Materials and Methods: Thirty-three subject matter experts (SME) from different countries reviewed the literature and proposed an iterative series of options that resulted in four rounds of consultations among the SME. The first round selected the items in which the effectiveness of the use of CPAP was deemed as demonstrated evidence (2/3 agreement necessary). In subsequent rounds, the attributable individual score given to each of the items retained was explored and finalized.

Results: The final score, whose acronym is DHECA, takes into account: respiratory Disturbance in the sleep study, Hypoxemia (based on the T90), daytime sleepiness by Epworth scale, presence of Comorbidities (hypertension, ischemic heart disease, stroke, heart failure) and history of road or work-related Accidents.

A value of 2, 5, and 10 points was established for mild, moderate, and severe AHI; 5 points for a T90 greater than 10%; 8 points for an Epworth score >10; 8 points for the presence of non-dipper or resistant hypertension; 5 points for a history of ischemic heart disease, heart failure, or stroke; 8 points for a history of work or road accident.

When the total score reaches ≥10 or more points, CPAP should be prescribed.

Conclusions: A Delphi-based consensus aiming to define a simple score on when to prescribe CPAP was developed. It is based on the AHI and adds easily obtainable clinical data embedded in the medical record.

We propose that its implementation should facilitate treatment decision-making among OSA patients.
DHECA Study Group: Alan Schwartz, Alberto Alonso, Ana R. Diez, Ana Musetti, Candela Caballero Eraso, Carlos Egea, Carlos Franceschini, Carmen Carmona Bernal, Carmen Monasterio, Cesar Liendo, Claudio Rabec, Dalva Poyares, Daniela Vicentini, Eusebi Chiner, Francisco Javier Puertas Cuestas, Geraldo Lorenzi Filho, Gonzalo Labarca, Irene Cano Pumarega, José L. Carrillo, José P. Arcos, Juan Carrillo, Luis Larrategui, Maria Angeles Sanchez Quiroga, Marcela Smurra, Ma Fernanda Troncoso Acevedo, Maria J. Masdeu Margalef, Merce Mayos Perez, Miguel A. Martinez Garcia, Mikel Azpiazu, Neus Salord Oleo, Omar E. Burschtin, Patricio Escalante, Pedro Landete.

Diagnosis and treatment of later onset congenital central hypoventilation syndrome in children

S. Qiu[1], D. Liu[1], X. Luo[1]
[1]Shenzhen Hospital, Southern Medical University, Department of Pediatric Otolaryngology, Shenzhen, China

Introduction: To explore the diagnosis and treatment of patients with late onset congenital central hypoventilation syndrome (LO-CCHS).

Materials and methods: The clinical data of 2 patients with LO-CCHS admitted in our department in 2020 were retrospectively analyzed, the experience was summarized and the relevant literature was reviewed.

Results: Two patients with LO-CCHS were diagnosed. Patient 1, male, 3 years and 9 months old, and the patient had no obvious inducement to cough and cyanosis at 1 year and 6 months old. The lowest oxygen saturation was only 40%. The initial diagnosis was severe pneumonia. Later, the gene test showed that the class I pathogenic mutation of PHOX2B gene, a It is consistent with the diagnosis of congenital central hypoventilation syndrome (CCHS). The children were given oxygen inhalation and non-invasive ventilation after admission. However, CO_2 retention cannot be corrected, so endotracheal intubation is used to assist respiration, attempt several times to extubate in 1 month were failed, so tracheotomy was performed.When sleeping, the patient use a two-level ventilator to connect with the endotracheal tube to assist breathing, and when awake, do not need a non-invasive ventilator. One year and six months later, endoscopic examination found that the granulation hyperplasia in the trachea blocked 90% of the trachea, hypothermia plasma tracheal granulation resection was performed under general anesthesia.After discharge, the patient was followed up for 2 years. The patient was assisted by breathing with a two-level ventilator connected with a tracheal cannula during sleep, and when awake, do not need a non-invasive ventilator. During the day, the activity was normal, the blood gas analysis index was normal, the heart color Doppler ultrasound was normal, and all growth and development indicators were normal.

Patient 2, female, 2 years and 7 months old, at the age of 11 months, the child developed severe hypoxemia and hypercapnia due to upper respiratory tract infection, and the minimum blood oxygen was only 46%. Emergency intubation was needed for rescue, Cardiac color Doppler ultrasound showed pulmonary hypertension and right ventricular insufficiency after admission.It was initially diagnosed as congenital heart disease with pneumonia, and then the gene test showed the class I pathogenic mutation of PHOX2B gene, and CCHS was diagnosed. After treatment, the pneumonia of the child was cured, and the pulmonary hypertension disappeared. After the tracheal intubation was removed, the child slept with a two-level non-invasive respirator through the nasal mask. Follow-up for 2 years showed that the child's daytime activity was normal, the pronunciation was normal, the blood gas analysis index was normal, and the growth and development index was generally normal.

Conclusions: The treatment goal of CCHS patients is to ensure adequate ventilation during wakefulness and sleep. During treatment, can choose tracheotomy or non-invasive ventilation according to patients condition. Choosing the most appropriate treatment plan for different patients will help improve the quality of life of patients with LO-CCHS.

Different outcomes related to OSA diagnosed by AHI or RDI: does gender matter?

L. Palombini[1], L. Godoy[1], D. Poyares[1], M. Andersen[1], G. Pires[1], S. Tufik[1]
[1]Universidade Federal de São Paulo, Psicobiologia, São Paulo, Brazil

Introduction: Sleep disordered breathing (SDB) is defined based on clinical complaints and polysomnography events. Obstructive sleep apnea (OSA) was initially diagnosed based on the apnea hypopnea index (AHI), but the ICSD-3 has defined the respiratory disturbance index (RDI) as the actual diagnostic criteria. This study aimed to evaluate and compare clinical outcomes related to daytime function in OSA patients defined by AHI and RDI in women and men.
Materials and Methods: This study was derived from the São Paulo Epidemiological Sleep Study (EPISONO), in its 3rd edition (2007) and follow-up edition (2015). A total of 557 individuals had polysomnographies evaluated according to the 2012 American Academy of Sleep Medicine Scoring Manual in both editions. The scores of the Epworth Sleepiness Scale (ESS), Chalder Fatigue Scale (CFS), Pittsburgh Sleep Quality Index (PSQI), Beck Anxiety and Depression Inventories (BAI and BDI) and Insomnia Severity Index (ISI) were compared between individuals who sustained the same AHI level in both editions (either AHI<15 or AHI≥15). We did the same comparison between individuals who had either RDI<15 or RDI≥15. We compared the results obtained in women and men.
Results: The grouping by AHI included 348 participants with AHI<15 events/hour (222 women and 126 men) and 107 with AHI≥15 events/hour (46 women and 61 men); while the grouping by RDI was composed by 335 with RDI<15 events/hour (215 women and 120 men) and 118 with RDI≥15 events/hour (49 women and 69 men). Considering the AHI women´s grouping, a statistically significant increase in the BAI scores in the AHI≥15 group was observed after 8 years (p=0.001). Regarding the RDI women´s grouping, persistence of RDI≥15 was associated with fatigue (CFS) and increased anxiety severity (BAI) during follow-up (p=0.03 in both). On the other hand, regarding OSA diagnosis in men, there was no significant difference in clinical outcomes when we compared AHI and RDI groups after 8 years. A statistically significant increase in BAI and BDI scores in AHI≥15 group (p<0,01 and p=0.02, respectively) and in RDI≥15 group (p<0.01 and p=0.01, respectively) were observed in men. There was no statistically significant difference in the scores of the other questionnaires applied when comparing AHI and RDI groups in both genders.
Conclusions: Clinical outcomes differ according to OSA diagnostic criteria and gender. While in women worse anxiety and fatigue scores were observed when OSA was diagnosed according to RDI, in men, there was no difference when OSA was diagnosed according to AHI or RDI. These findings reinforce the current idea that OSA has different clinical presentation in men and women and that fatigue is a clinical complaint that should be evaluated in SDB patients.

Do nocturnal asthma attacks influence sleep parameters and inflammatory markers? A cross-sectional population-based study

M.R. Souza[1], D.S. Rosa[2], T.A. Alvarenga[1], P.K. Morelhão[1], S. Tufik[1,3], M.L. Andersen[1,3]
[1]Sleep Institute, São Paulo, Brazil, [2]Universidade Federal de São Paulo, Departamento de Microbiologia, Imunologia e Parasitologia, São Paulo, Brazil, [3]Universidade Federal de São Paulo, Departamento de Psicobiologia, São Paulo, Brazil

Introduction: Nocturnal symptoms and worsening lung function at night are common in patients with asthma. It has been reported that up to 74% of asthmatics wake up at night at least once a week due to wheezing, chest tightness or coughing. These symptoms can contribute to sleep disruption. Nocturnal asthma has also been linked to increased airway inflammation. However, little is known about the effects of nocturnal asthma attacks on sleep quality and inflammatory markers. Thus, this study aimed to evaluate sleep parameters and inflammatory markers of volunteers with nocturnal asthma symptoms in a cross-sectional population-based study.

Material and Methods: We used data from the EPISONO project with collections carried out in 2007 and 2018. The individuals completed the UNIFESP Sleep Questionnaire and a validated respiratory questionnaire, underwent overnight polysomnography and had blood collected for analysis of inflammatory parameters. Differences between groups were analyzed using the two-tailed unpaired t-test and the Mann-Whitney U test where appropriate.

Results: Overall 72 participants were involved in our study (mean age 41.7±14.7; 66.7% women and 33.3% men) with subsequent classification into two groups according to the frequency of asthma attacks at night: nocturnal symptoms of intermittent asthma (n=38) and persistent asthma (mild, moderate and severe; n=34). Volunteers with nocturnal symptoms of persistent asthma had higher body mass index, larger neck circumference, higher apnea-hypopnea index (AHI) and lower mean arterial oxygen saturation than those with nocturnal symptoms of intermittent asthma. No significant differences were observed in inflammatory parameters (white blood cells, C-reactive protein, erythrocyte sedimentation rate, neutrophil-lymphocyte and platelet-lymphocyte ratio) between groups.

Conclusions: The preliminary results demonstrate that participants with nocturnal symptoms of persistent asthma are more obese and have a higher AHI than those with symptoms of intermittent asthma, confirming the association between the severity of asthma and obstructive sleep apnea. The frequency of nocturnal asthma symptoms, however, did not affect immunological parameters.

Do traditional risk factors for obstructive sleep apnea vary by race among U.S. veterans?

S.L. Hsieh[1], W.K. Wohlgemuth[2], D.M. Wallace[2]
[1]University of Miami Leonard M. Miller School of Medicine, Miami, United States, [2]Miami VA Medical Center, Sleep Medicine, Miami, United States

Introduction: Traditional risk factors of obstructive sleep apnea (OSA) are used to risk stratify patients for polysomnography (PSG). However, these "classic" metrics/ symptoms may perform less well among women and minoritize people with varied OSA presentations and cephalometric risk factors. Due to the high level of diversity within the U.S. armed forces, we aim to better understand whether traditional risk factors (including sex) predicted OSA severity differentially in Black versus White veterans.

Materials and methods: This cross-sectional analysis consisted of U.S. veterans determined to be at elevated risk for OSA who were evaluated at the Miami VA sleep clinic over a 12-month period. Participants completed type III home PSG and questionnaires querying sociodemographics (i.e., self-reported sex, race) and subjective sleepiness. PSG details (total sleep time, apnea-hypopnea index [AHI], oxygen nadir), medications, and medical diagnoses were collected from the electronic medical record. Hypertension was determined per physician-diagnosis or anti-hypertensive prescription. First, Black and White comparisons between sociodemographics, medical comorbidities, and PSG data were performed per Student's t-test or Chi-square test, as appropriate. Then, race-stratified linear regression models predicting the AHI were constructed. Each model contained five traditional OSA risk factors: sex, age, BMI, Epworth sleepiness scale, and hypertension diagnosis. The analyses were performed with MPlus and maximum likelihood estimation assuming missing at random was used.

Results: The cohort consisted of 605 Black and White veterans (85% male; 39% Black) with mean age of 52 ± 15 years and mean BMI of 31 ± 6 m^2/kg. Eighty-one percent of veterans tested fulfilled a diagnosis of OSA (AHI$\geq$ 5 obstructive events/hr of sleep) and the mean AHI on home PSG was 20 ± 19 events/hr of sleep. Fifty-five percent of the cohort was subjectively sleepy (ESS > 10). Relative to White veterans, Black veterans had a significantly greater proportion of females (24% vs 10%, p <0.001) and hypertension diagnosis (52% vs 44%, p=0.047). There were no racial differences in mean BMI, Epworth sleepiness scale, AHI, oxygen nadir or PSG total sleep time. For Black veterans, male sex, greater BMI, and hypertension were each significantly associated with the AHI, but not age or subjective sleepiness. In contrast, for White veterans, greater age and BMI were associated with the AHI, but not sex, hypertension, or sleepiness. After adjusting for covariates, sex predicted AHI among the Black veterans. Surprisingly, sex is not associated with AHI among the White veterans (p=0.174).

Conclusions: OSA risk factors varied by race. Male sex was associated with the AHI for Black, but not White veterans. Age did not predict the AHI for Black veterans consistent with the reported younger presentation of OSA among Black populations. Daytime sleepiness may be a particularly poor determinant of AHI across both racial groups.

Drug-induced sleep endoscopy (DISE) and natural sleep endoscopy (NSE)

Y. Saito[1,2], S. Chiba[3,2]
[1]Ota General Hospital, Otorhinolaryngology, Kawasaki, Japan, [2]Jikei University School of Medicine, Otorhinolaryngology, Tokyo, Japan, [3]Ota Memorial Sleep Center, Otorhinolaryngology, Kawasaki, Japan

Continuous positive airway pressure (CPAP) therapy is effective in patients with obstructive sleep apnea syndrome (OSAS). However, there have been reports of treatment discontinuation and poor adherence. As alternatives to CPAP intolerance, oral appliances (OA) and hypoglossal nerve stimulation (HNS) therapy are considered viable options. To determine eligibility for HNS therapy, drug-induced sleep endoscopy (DISE) is necessary to confirm the location of obstruction. While European position papers have somewhat established the effectiveness of DISE, it is important to note that the examination is conducted under sedation (e.g., propofol), potentially deviating from the natural sleep conditions. Furthermore, DISE only allows for the observation of a limited number of respiratory cycles. Considering that airway dynamics can vary depending on the sleep stage, DISE alone may not adequately evaluate the complete concentric collapse pattern (CCCp) of the soft palate throughout the entire sleep period.
Therefore, our hospital conducted natural sleep endoscopy during polysomnography (PSG) to evaluate the airway under unmedicated, natural sleep conditions. Seventeen cases underwent natural sleep endoscopy during PSG, and in three of these cases, DISE was conducted separately. A comparison between the findings of both examinations was also performed.
In this study, we aim to discuss the locations and levels of collapse during sleep stages observed through natural sleep endoscopy. Additionally, for cases where both natural sleep endoscopy and DISE were conducted, we compare the findings from each sleep stage and discuss any differences.
By utilizing natural sleep endoscopy during PSG, which allows for evaluation under natural sleep conditions without the administration of sedatives, we can potentially overcome the limitations of DISE. This approach provides a comprehensive assessment of the airway, taking into account the variations in airway dynamics across different sleep stages. By examining the findings from both natural sleep endoscopy and DISE, we can gain further insights into the effectiveness and potential differences between the two evaluation methods.
In conclusion, natural sleep endoscopy conducted during PSG offers a valuable alternative to DISE for evaluating the complete concentric collapse pattern of the soft palate. It provides a more comprehensive understanding of the airway dynamics during different sleep stages and may contribute to improved treatment planning for OSAS patients.

Drug therapies for obstructive sleep apnea: a systematic review and meta-analysis

M.L. Nobre[1,2], P. Farias de Oliveira[3], F. Ferreira Wanderley[3], A.C. Alves Sarmento[1], N. Serquiz[1], J. Diniz Junior[2], A.K. Gonçalves[4,1]
[1]Federal University of Rio Grande do Norte, Postgraduate Program student in Health Science, Natal, Brazil, [2]Federal University of Rio Grande do Norte, Surgery Department, Natal, Brazil, [3]Federal University of Rio Grande do Norte, Natal, Brazil, [4]Federal University of Rio Grande do Norte, Department of Obstetrics and Gynecology, Natal, Brazil

Introduction: Obstructive sleep apnea (OSA) is characterized by repetitive upper airway closure during sleep, resulting in hypoxemia and sleep fragmentation. OSA is associated with cardiometabolic risk and impaired quality of life, affecting approximately one billion people worldwide. Gold standard treatment, positive airway pressure therapy, has low compliance rates. Recent advancements in studies regarding OSA endotypes have shed light on potential pharmacological targets. This study aimed to summarize the current evidence regarding drug therapies for OSA.

Materials and methods: PubMed, Embase, Web of Science, SciELO, LILACS, Scopus, Cochrane Register of Controlled Trials, and ClinicalTrials.gov were searched with no restriction to date or language. Two authors independently selected randomized controlled trials that compared the apnea-hypopnea index (AHI) in pharmacotherapies for OSA, by screening the title, abstract, and full text. Data was extracted, and meta-analysis was conducted when appropriate with Review Manager 5.4. The risk of bias was evaluated by the Cochrane Risk of Bias Tool (RoB 2). The Grading of Recommendation Assessment, Development, and Evaluation assessed the strength of the evidence. This review conforms to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis, and the protocol is registered in PROSPERO (CRD42022362639).

Results: 4930 articles were obtained, 68 met inclusion criteria, and 29 studies (11 drugs) were combined in a meta-analysis. The combination of atomoxetine plus oxybutynin vs placebo in AHI (5 studies) mean difference (MD): -7.71 (-10.59, -4.83) [Fixed, 95% CI, I2= 50%, overall effect: Z = 5.25, p<0.001]. Reboxetine plus oxybutynin vs placebo in AHI (3 studies) MD: − 10.78 (-24.27, 2.71) [Random, 95% CI, I^2= 68%, overall effect: Z = 1.57, p= 0.12]. Trazodone vs placebo in AHI (2 studies) MD: -12.75 (-21.30, -4.19) [Fixed, 95% CI, I2= 0%, overall effect: Z = 2.92, p=0.003]. Eszopiclone vs placebo in AHI (3 studies) MD: − 2.24 (-6.14, 1.67) [Fixed, 95% CI, I^2= 0%, overall effect: Z= 1.12, p=0.26]. Sodium oxybate vs placebo in AHI (2 studies) MD: -5.50 (-9.28, -1.73) [Fixed, 95% CI, I2= 32%, overall effect: Z = 2.86, p=0.004]. Zolpidem vs placebo in AHI (2 studies) MD: -0.21 (-4.39, 3.96) [Fixed, 95% CI, I2= 0%, overall effect Z= 0.10, p=0.92]. Zopiclone vs placebo in AHI (3 studies) MD: − 0.98 (-9.71, 7.76) [Fixed, 95% CI, I^2= 0%, overall effect: Z= 0.22, p=0.83]. Nasal decongestant vs placebo in AHI (2 studies) MD: -7.97 (-18.71, 2.77) [Fixed, 95% CI, I2= 0%, overall effect Z= 1.45, p=0.15]. Nasal steroid vs placebo in AHI (3 studies) MD: -1.74 (-7.79, 4.30) [Fixed, 95% CI, I^2= 0%, overall effect: Z= 0.56, p=0.98]. Donepezil vs placebo in AHI (3studies) MD: -8.56 (-15.78, -1.33) [Fixed, 95% CI, I2= 21%, overall effect: Z= 2.32, p=0.02].

Conclusion: While numerous drugs have been investigated, only a few have shown promising results, like the combination of noradrenergic and antimuscarinic drugs. Identifying endotypes that respond to each pharmacological mechanism may be the key to future drug therapies for OSA. Moreover, studies with longer follow-up periods assessing the safety and sustained effects of these treatments are needed.

Early life predictors of obstructive sleep apnoea in young adults: Insights from a longitudinal community cohort (Raine Study)

M. Ohn[1,2,3], N. McArdle[4,5], R.N. Khan[6], B. S. von Ungern-Sternberg[7,3,2], P. Eastwood[8], J. Walsh[4,9], A. Wilson[1,2,10], K. Maddison[4,9]
[1]Perth Children's Hospital, Department of Respiratory and Sleep Medicine, Perth, Australia, [2]The University of Western Australia, Medical School, Perth, Australia, [3]Telethon Kids Institute, Perioperative Medicine Team, Perth, Australia, [4]The University of Western Australia, Centre for Sleep Science, School of Human Sciences, Perth, Australia, [5]Sir Charles Gairdner Hospital, Department of Pulmonary Physiology & Sleep Medicine, Perth, Australia, [6]The University of Western Australia, Department of Mathematics and Statistics, Perth, Australia, [7]Perth Children's Hospital, Department of Anaesthesia and Pain Medicine, Perth, Australia, [8]Flinders University, College of Medicine & Public Health, Adelaide, Australia, [9]Sir Charles Gairdner Hospital, Department of Pulmonary Physiology & Sleep Medicine, West Australian Sleep Disorders Research Institute, Perth, Australia, [10]Telethon Kids Institute, Wal-yan Respiratory Research Centre, Perth, Australia

Introduction: Obstructive sleep apnea (OSA) is a common sleep-related breathing disorder that affects individuals of all ages, including young adults. The impact of OSA on individuals and society is significant, with associated adverse health outcomes and a socioeconomic burden. OSA research focuses on childhood and older adulthood, with little known about the young adult group. Like many other common diseases, OSA may be programmed early in life. This study identifies early-life factors predisposing young adults to OSA in the multigenerational Raine study cohort. The Raine study is one of the most comprehensive birth cohorts globally and ideally suited to determine, for the first time, early life predictors of OSA in young adulthood.

Materials and Methods: This retrospective study included 923 young adults and their mothers from the Western Australian Raine Study Cohort. OSA at 23 years was determined from in-laboratory polysomnography. Logistic regression was used to identify maternal and neonatal factors associated with OSA in young adulthood.

Results: *Maternal predictors associated with young adult OSA* Gestational diabetes mellitus was the strongest predictor of developing OSA in young adulthood, with a high odds ratio (OR 9.54, 95%CI 1.7, 58.5, *P*=0.011). Preterm delivery was also strongly associated, with over three times the odds of developing OSA at the age of 22 years (OR 3.18, 95%CI 1.1, 10.5, *P*=0.043), while preeclampsia, premature rupture of membrane, Chinese ancestry, maternal age ≥ 35 years, and high BMI (≥25 kg/m^2) during pregnancy had 2 to 3 times higher odds of OSA in young adulthood. Pregnancy-induced hypertension also increased the risk of OSA (OR 1.89, 95%CI 1.1, 3.2, *P*=0.019).

Neonatal predictors associated with young adult OSA Neonatal predictors associated with young adult OSA showed that male babies had double the odds (OR 2.10, 95%CI 1.5, 3.0, *P*<0.0001) of developing OSA at age 22 compared to female babies. The presence of meconium-stained liquor during delivery increased the odds of OSA by 60% (OR 1.60, 95%CI 1.0, 2.5, *P*=0.044). Neonates admitted to special care nurseries had 1.51 times higher odds of developing OSA in young adulthood (95%CI 1.0, 2.2, *P*=0.040). Interestingly, babies with longer birth body lengths had reduced odds of OSA by 7% for each additional centimetre (OR 0.93, 95%CI 0.87, 0.99, *P*=0.033).

Conclusions: This study identifies a wide range of early life predictors for OSA in young adults, which relate predominantly to poor maternal metabolic health, high-risk pregnancy and stressful perinatal events. The study is consistent with previous works on the critical role of the intrauterine environments on an offspring's health outcomes into adulthood. These findings have significant clinical and public health implications and highlight the need for preventive strategies to improve perinatal health. Early identification and management of at-risk individuals will reduce the likelihood of young adults developing OSA.

Effectiveness of Hypoglossal Nerve Stimulation changes with body mass index and supine sleep

R. Patel[1], H. Wang[1], M. Lindburg[2], R. Jackson[2], R. Malhotra[1], B. Lucey[1], E. Landsness[1]
[1]Washington University - St. Louis Missouri, Neurology, Saint Louis, United States, [2]Washington University - St. Louis Missouri, Otolaryngology, Saint Louis, United States

Introduction: The primary objective of this study was to assess the effectiveness of hypoglossal nerve stimulation (HGNS) as an alternative therapy for obstructive sleep apnea (OSA) patients at an academic medical center. The study also investigated the influence of body mass index (BMI) and supine sleep position on the efficacy of HGNS.

Materials and Methods: We conducted a retrospective cohort study of 109 adult patients who had been implanted with a hypoglossal nerve stimulator at the Washington University Medical Center in St. Louis, Missouri. After exclusions, 76 patients were included in the final analyses. We compared pre- and post-implantation apnea hypopnea index (AHI) values to evaluate the efficacy of HGNS. Additional measures included BMI and supine AHI.

Results: Of the 76 patients included in the final analyses, 59 (77.6%) achieved at least a 50% a reduction from their pre-implantation AHI values and had post-implantation AHI values lower than 15 events/hour after HGNS. We identified a significant decrease in median AHI across the cohort after HGNS, with median AHI values shown to decrease by 82.1%, from 29.3 events/hour to 5.3 events/hour. We also identified a significant association between patient BMI and response to HGNS, with higher BMI values associated with smaller changes in AHI. Analysis of a subgroup of 44 patients who underwent HGNS in a supine sleeping position found that HGNS holds less efficacy for improving AHI during supine sleep, with median AHI values shown to decrease by 52.9%, from 46.3 events/hour to 21.8 events/hour.

Conclusions: This retrospective study provides compelling evidence supporting the use of HGNS for the treatment of OSA. However, it is important for sleep medicine providers to inform patients that higher BMI and supine sleeping position may decrease the efficacy of this therapeutic approach. Future research will be crucial to understanding these factors and will enable the optimization of treatment strategies and patient counseling in the context of HGNS therapy.

Effectiveness of hypoglossal nerve stimulation to treat obstructive sleep apnea: systemic review and meta-analysis

S. Hwang[1]
[1]The Catholic University of Korea, Department of Otolaryngology-Head and Neck Surgery, Bucheon-si, Korea, Republic of

Introduction: Multi-level airway collapse during sleep is a common cause of obstructive sleep apnea. Recently, a hypoglossal nerve stimulation was introduced to activate the genioglossus muscle and treat obstructive sleep apnea. The goal of this study was to perform a systematic review with meta-analysis to determine the efficacy of the hypoglossal nerve stimulation (HGS) treatment for treating obstructive sleep apnea until postoperatively 1 year.

Materials and methods: Five databases (PubMed, SCOPUS, Embase, Web of Science, and the Cochrane database) were independently reviewed by two researchers, starting at the earliest timepoint recorded in the database to February 2023. Studies that measured the parameters, including apnea-hypopnea index (AHI), the oxygen desaturation index (ODI), and so on, in polysomnography and scored sleep apnea related to quality of life (Epworth Sleepiness Scale [ESS] and Functional Outcomes of Sleep Questionnaire [FOSQ]) postoperatively before and after HGS.

Results: 45 studies (8546 patients) met the inclusion criteria. About forty seven percent of patients achieved a post-treatment AHI <5, 72% an AHI <10, and 82% an AHI <15, respectively. The rate of clinically success rate based on Sher criteria (a drop in postoperative AHI by 50% and to a value less than 20) following the treatment was reported with 79%.

Mean AHI (mean difference: 22.8762 [20.6805; 25.0719]; I^2 = 95.7%, $p < 0.0001$), lowest O2 saturation (MD:-7.6914 [-10.4528; -4.9300], I^2 = 96.6%, $p < 0.0001$), ODI (MD:15.6051 [14.8324; 16.3778], I^2 = 49.0%, $p < 0.0001$), time with oxygen saturation<90% (T90) (MD:2.8204 [1.4856; 4.1552], I^2 = 34.0%, $p < 0.0001$) changed significantly until 12 months postoperatively compared to pretreatment values. In addition, quality measurements, like ESS (MD: 4.6001 [4.4241; 4.7760], I^2 = 50.0%, $p < 0.0001$) and FOSQ (MD:-3.2205 [-3.4508; -2.9902], I^2 = 27.3%, $p < 0.0001$) improved significantly postoperatively. In the subgroup analysis according to follow up timing, the efficacy of HGS could last until 12 months postoperatively but the AHI related favorable outcomes significantly lessened as the time went after HGS.

Conclusions: HGS could reduce QOL scores and PSG outcomes compared to preoperative status. More randomized clinical trials must be conducted to further verify the maintenance of effectiveness of HGS.

Effect of education's timing on short-term adherence to continuous postive airway pressure treatment in children

L. Yang[1], M. Zhi[1]
[1]Shenzhen Hospital of Southern Medical University, Shenzhen, China

Introduction: More and more children are increasingly being prescribed continuous positive airway pressure(CPAP) for treatment of obstructive sleep apnea syndrome(OSAS), yet adherence is poor. The education of CPAP is help to improve the adherence,but timing is the key. The purpose of this study was to examine the effect of different education's timing on short-term adherence to CPAP treatment in children.

Materials and methods: 120 children with OSAHS who were treated with CPAP in our department from 2018 to 2022 were retrospectively analyzed. First, according to the different timing of CPAP's education, the children were divided into two groups: group I (n = 57)(educating before hospitalization) and group II (n= 63) (educating during hospitalization,).The children in group II were divided into good adherence group (n = 26) and poor adherence group (n = 37) according to the standard that the OAHI decreased by more than 50% after 2 months. The related parameters of adherence were compared, including mean total minutes of usage across all days, minutes of usage in the first day, minutes of usage in the second day.

Results: Mean total minutes of usage across all days of group I was more than group II's (p=0.046). In the trend chart, the minutes of usage in the first and second day of group I were more than the good and poor adherence group's.

Conclusions: This study indicated that sufficient education of CPAP before hospitalization could improve the short-term adherence. We need pay attention to the first two days of CPAP treatment.

Effect of high flow nasal cannula and continuous positive airway pressure on the sleep apnea-specific hypoxic burden and pulse rate response in children with Obstructive Sleep Apnea

C.T. Au[1,2], N. Yuen[2], C. Massicotte[3], K.C.C. Chan[2], A.M. Li[2], I. Narang[1,3]
[1]Translational Medicine, Research Institute, The Hospital for Sick Children, Toronto, Canada, [2]The Chinese University of Hong Kong, Paediatrics, Hong Kong, Hong Kong, SAR of China, [3]Division of Respiratory Medicine, The Hospital for Sick Children, Toronto, Canada

Introduction: Elevated sleep apnea-specific hypoxic burden (SASHB) and pulse rate response (ΔHR) are both associated with an increased risk of cardiovascular morbidity and mortality in adults with OSA. This study aimed to examine the effect of single-night high flow nasal cannula (HFNC) on the SASHB and the ΔHR in children with moderate-severe OSA in comparison to continuous positive airway pressure (CPAP). We hypothesized that both SASHB and ΔHR could be reduced with HFNC and the effect would be comparable to that of CPAP.

Materials and Methods: This was a secondary analysis of a single-blinded, crossover randomized controlled trial that compared the efficacy of HFNC with CPAP to treat moderate-severe OSA in children. Eighteen children with obesity and/or medical complexity who were aged 2-18 years, with OAHI ≥5 events/hour, and recommended CPAP were recruited. Following diagnostic (baseline) polysomnography, each participant completed two additional sleep studies; a HFNC titration study and a CPAP titration study (9 received HFNC first, and 9 received CPAP first in a random 1:1 allocation order). The primary outcome of this secondary analysis was SASHBOb and ΔHROb. SASHBOb was derived from the oximetry tracing and was defined as the total area bounded by the baseline saturation level and the desaturation curve triggered by an obstructive or mixed apnea or hypopnea per hour of sleep. ΔHROb was derived from the pulse rate tracing and was defined as the mean of the pulse rate responses to each obstructive or mixed apnea or hypopnea, i.e. the difference between an event-related maximum pulse rate and an event-related minimum pulse rate during a subject-specific search window. Generalized estimating equation was used to test the treatment effect on the study outcomes.

Results: Valid oximetry and pulse rate data of 17 participants [11 males, age (mean±SD): 12.6y ±3.9, OAHI (median (IQR)): 12.6 events/h (8.3–43.2)] were available for the analysis. The OAHI was significantly reduced at both the nights of HFNC (-14.2 (SE 4.1), p=0.001) and CPAP (-17.4 (SE 4.2), p<0.001). For the SASHBOb, a significant reduction from baseline was observed at both the HFNC (-129 %min/h (SE 55), p=0.003) and the CPAP (-138 %min/h (SE 53), p=0.005) nights, and the magnitude of the reductions on the two nights were similar. For the ΔHROb, a significant reduction from baseline was only observed at the CPAP night (–2.7 BPM (SE 1.1), p=0.049), but not at the HFNC night (–1.0 BPM (SE 1.4), p=1.00).

Conclusions: This is the first study to examine the treatment effect of single-night HFNC and CPAP on the SASHB and the ΔHR in OSA children with obesity and medical complexities. The SASHB reduced significantly with either HFNC or CPAP, while reduced ΔHROb was only observed on the night of CPAP. Further studies are needed to examine the long-term treatment effects and whether reductions in the SASHB and ΔHRob in the long run correlate with improvements in clinical outcomes in children.

Effect of high intensity interval training on obstructive sleep apnea: a randomized controlled trial

O. Lins-FIlho[1,2,3], A.H. Germano[2], J.L. Porto Aguiar[4], J.R. Almeida[4], E. dos Santos[3], M.J. Lyra[2], R. Pedrosa[3,5]
[1]Federal University of Pernambuco, Physical Education, Recife, Brazil, [2]Pernambuco College of Health, Physical Education, Recife, Brazil, [3]University of Pernambuco, Sleep and Heart Laboratory - PROCAPE, Recife, Brazil, [4]Federal University of Pernambuco, Graduate Program in Physical Education, Recife, Brazil, [5]University of Pernambuco, Graduate Program in Health Sciences, Recife, Brazil

Introduction: Physical exercise has been suggested as an alternative and complementary treatment for Obstructive Sleep Apnea (OSA). In this sense, vigorous physical activity has been associated to a reduced risk of developing OSA and to an improved exercise capacity, a frequently impaired outcome in this population. However, whether high-intensity interval training (HIIT) improves OSA's severity remains unclear. Thus, this study aimed to investigate whether 12 weeks of HIIT reduces apnea-hypopnea index (AHI) and improves exercise capacity in subjects with moderate-severe OSA.

Materials and methods: In this randomized controlled trial, thirty-six adults (body mass index 34.2 ± 5.8; age 52.2 ± 9.8 years) with moderate to severe OSA (42.0 ± 22.9 e/h) were randomly assigned to HIIT (5 x 4' of walking or running on a treadmill at 90% to 95% of maximum heart rate interspersed with 3' of walking or running on a treadmill at 50 - 55% of maximum heart rate, three times/week) or control group (stretching exercises two times/week - CG). OSA parameters were assessed at baseline and after 12 weeks through overnight polysomnography. A cardiopulmonary exercise test (CPET) was performed to identify the target intensity to prescribe HIIT protocol and to assess exercise capacity. Generalized estimated equations assessed differences between time, groups, and group x time interaction for the sleep and CPET outcomes.

Results: Statistically Significant time x group interaction was observed indicating a reduction in AHI (delta changes: CG 8.2 ± 3.7 events/hour vs. HIIT -8.6 ± 4.8 events/hour; p=0.005), in Lowest SaO_2 (delta changes: CG -1.6 ± 1.6% vs. HIIT 0.4 ± 2.3%; p=0.030), in Total sleep time (delta changes: CG -31.5 ± 19.5 min. vs. HIIT 33.7 ± 19.3 min.; p=0.049), and in Sleep efficiency (delta changes: CG -3.2 ± 4.4 %. vs. HIIT 9.9 ± 3.5 %.; p=0.026). Moreover, HIIT improved maximum oxygen consumption [VO_{2max} (delta changes: CG -1.1 ± 1.0 mL/kg/min vs. HIIT 4.8 ± 0.9 mL/kg/min; p=0.000)], maximum systolic blood pressure [SBP_{max} (delta changes: CG 6.3 ± 6.3 mmHg vs. HIIT -17.7 ± 7.5 mmHg; p=0.017)], and Metabolic equivalent of task [MET (delta changes: CG -0.1 ± 0.3 vs. HIIT 1.1 ± 0.3; p=0.009)].

Conclusions: In patients with moderate-severe OSA, twelve weeks of HIIT decreases OSA severity and improves sleep quality, and exercise capacity.

Effect of positional therapy on the sleep apnea-specific hypoxic burden and pulse rate response in children with positional Obstructive Sleep Apnea

L. Xiao[1,2], C.T. Au[3,4], N. Yuen[4], C. Massicotte[1], K.C.C. Chan[4], A.M. Li[4], I. Narang[1,2,3]
[1]Division of Respiratory Medicine, The Hospital for Sick Children, Toronto, Canada, [2]University of Toronto, Toronto, Canada, [3]Translational Medicine, Research Institute, The Hospital for Sick Children, Toronto, Canada, [4]Department of Paediatrics, The Chinese University of Hong Kong, Hong Kong, Hong Kong, SAR of China

Introduction: Both elevated sleep apnea-specific hypoxic burden (SASHB) and pulse rate response (ΔHR) are associated with an increased risk of cardiovascular morbidity and mortality in adults with obstructive sleep apnea (OSA). This study aimed to examine the effect of single-night positional therapy on SASHB and ΔHR in children with positional OSA. We hypothesized that SASHB and ΔHR could be reduced after positional therapy.

Materials and Methods: This was a secondary analysis of a crossover randomised controlled trial (RCT) that examined the effect of positional therapy on OSA severity in children with positional OSA. Children aged between 4-18 years diagnosed with positional OSA at baseline sleep study (overall OAHI 5-30 events/h and a supine OAHI to non-supine OAHI ratio of ≥2 with 10-90% of total sleep time spent in supine position) were recruited. Participants underwent two nights of additional sleep studies, one with active therapy (positional device with inflated cushions), and the other with control therapy (position devices with no cushions). They were randomized to receive either active or control therapy first, followed by the other therapy on another night. The two nights were 1-4 weeks apart. The primary outcome of this secondary analysis was SASHBOb and ΔHROb. SASHBOb was derived from the oximetry tracing and was defined as the total area bounded by the baseline saturation level and the desaturation curve triggered by an obstructive/mixed apnea or hypopnea per hour of sleep. ΔHROb was derived from the pulse rate tracing and was defined as the mean of the pulse rate responses to each obstructive/mixed apnea or hypopnea, i.e. the difference between an event-related maximum pulse rate and an event-related minimum pulse rate during a subject-specific search window. Generalized estimating equation was used to test the treatment effect on the study outcomes.

Results: 24 participants [15 males (63%), age (median(IQR)): 9.0 (7.0–14.3) years, OAHI (median(IQR)): 9.3 (7.2–14.2) events/h] were enrolled, of whom 9 were randomized to receive active therapy first. Despite a significant reduction in supine sleep time [10.2% (IQR 0 - 21.6) vs. 41.6% (IQR 25.5 - 69.1)] was observed in the night of active therapy when compared to the night of control therapy, there were no significant differences in SASHBOb [63.2 %min/h (SE 20.3) vs. 81.8 %min/h (SE 21.9), p=0.11] or ΔHROb [17.6 BPM (SE 1.4) vs. 19.6 BPM (SE 1.7), p = 0.13] between the two nights. The sequence of the therapies did not significantly modify the differences in the SASHBOb and ΔHROb between the two nights.

Conclusions: In children with positional OSA, no significant reductions in SASHBOb and ΔHROb could be observed following positional therapy despite significant reduction in supine sleep time. Further studies with larger sample sizes are needed to identify which subtypes of OSA respond best to positional therapy, and to provide further insights into the roles of SASHB and ΔHR in the management of childhood OSA.

Effect of Telemonitoring on CPAP compliance during CPAP initiation

S.H. Goh[1,2], S. Png[1,2], J. Teo[1,2], P.R. Song[1,2], L.C. Leow[1,2]
[1]Singapore General Hospital, Sleep Centre, Singapore, Singapore, [2]SingHealth Duke-NUS Sleep Centre, Singapore, Singapore

Introduction: Obstructive Sleep Apnea (OSA) is caused by repeated upper airway obstruction during sleep. Continuous Positive Airway Pressure (CPAP) therapy is first line treatment for most patients, but adherence and acceptance of CPAP remains problematic. Newer telemonitoring enabled CPAP devices may allow for closer monitoring and remote troubleshooting and may influence short- and longer-term PAP compliance.

Materials and methods: We recruited 50 patients with symptomatic OSA (AHI≥5) who were started on CPAP treatment from January to April 2022. Patients were loaned a Resmed Airsense 10 APAP device and monitored weekly using the Airview system, which is a cloud based remote PAP monitoring system. A phone call is triggered when there are ≥3 consecutive nights of low CPAP usage (<4hrs/night), high AHI (>5/hr) or high mask leak (>24L/min) for further intervention.

Variables recorded at baseline included demographic, clinical variables including Epworth Sleepiness Scale (ESS), Functional Outcomes of Sleep Questionnaire (FOSQ), Health Status Score (HSS) and polysomnography parameters. CPAP usage data and ESS was recorded during subsequent follow-up visits at 1 month and 6 months. These results were compared to a historical cohort of 50 patients recruited from July to December 2021, who were similarly started on CPAP treatment without the use of CPAP telemonitoring. These patients were conventionally contacted with a phone call at 2 weeks for counselling and troubleshooting. CPAP compliance was defined as usage >4hrs/night for >70% of all nights.

Wilcoxon's rank sum test was used for comparison of continuous data and chi-square test for categorical variables between the 2 groups.

Results: 46 patients from the telemonitoring cohort had ≥1 interventions from our sleep technologist, with each patient receiving an average of 1.7 calls within the month. The use of telemonitoring during the initial 1- and 6-months period did not improve CPAP compliance when compared to historical controls. The median CPAP usage (mins) of patients on telemonitoring vs without telemonitoring at 1 month was 272±108 and 294±124 respectively (p=0.19). CPAP compliance at 1 month is lower in patients with CPAP telemonitoring (54%) compared to those without (62%), (p=0.026). Similar trend was observed at 6 months interval, where compliance of patients who were on CPAP telemonitoring during initial 1 month trial is 32% vs 55% without telemonitoring (p=0.024). ESS improved to a similar extent in both groups (p<0.003) but no significant differences were seen in FOSQ and HSS. CPAP efficacy data was similar between the 2 groups.

Conclusion: The use of CPAP telemonitoring during PAP initiation was associated with worsened PAP compliance. ESS scores improved with CPAP to a similar extent with or without the use of telemonitoring, but no significant changes in HSS and FOSQ was seen. Further research is warranted to determine the best implementation of telemonitoring to optimize PAP adherence and patient outcomes.

Effects of CPAP treatment on nocturnal desaturations in patients with Obstructive Sleep Apnea syndrome

F. Lofoco[1], M. D'Ascanio[1]
[1]Sapienza University of Rome, Rome, Italy

Introduction: Obstructive Sleep Apnea Syndrome (OSAS) is a prevalent sleep disorder characterized by recurrent upper airway collapse during sleep, leading to intermittent hypoxia and decreased oxygen saturation levels. This study aimed to investigate the effects of Continuous Positive Airway Pressure (CPAP) treatment on nocturnal desaturations in patients with OSAS. Additionally, we explored the question of whether patients with significant desaturations below 90% (T90) and low average oxygen saturation levels may require supplemental oxygen therapy in addition to CPAP.

Materials and Methods: A total of 20 patients (15 males and 5 females) diagnosed with severe OSAS underwent diagnostic polysomnography (PSG) performed in ambient air to assess their baseline oxygen saturation levels. The PSG data provided essential information, including the apnea-hypopnea index (AHI), T90, and average SpO2. The mean baseline SpO2 was recorded as 86% ± 3%, with an average T90 of 65% ± 24. Following adaptation and titration, the patients were prescribed CPAP therapy, and nocturnal pulse oximetry was utilized to monitor their oxygen saturation levels.

Results: CPAP treatment resulted in a significant improvement in mean oxygen saturation levels, with an average increase of approximately 4%. Moreover, the T90 values showed a remarkable reduction of 35%. These findings indicate that CPAP therapy effectively ameliorated nocturnal desaturations in patients with OSAS, leading to a notable increase in mean saturation levels and a significant decrease in the proportion of time spent below 90% saturation. The improvements in oxygenation suggest that CPAP alone may be sufficient for most patients, potentially eliminating the need for additional oxygen therapy.

Conclusions: The results of this study provide valuable insights into the effects of CPAP treatment on nocturnal desaturations in patients with OSAS. The observed improvements in average oxygen saturation levels and the reduction in T90 highlight the efficacy of CPAP therapy in managing nocturnal hypoxemia. These findings have important implications for clinical practice, suggesting that CPAP treatment alone may be adequate in improving oxygenation in patients with OSAS. However, further research is warranted to identify specific patient subgroups that may benefit from combination therapy.

Effects of Periodic Breathing on sleep at high altitude: a randomized placebo-controlled cross-over study using inspiratory CO_2

A. Ibrahim[1], A. Stefani[1], M. Cesari[1], J. Roche[2], H. Gatterer[2], R. Turner[2], G. Vinetti[2], M. Furian[3], A. Heidbreder[1], B. Högl[1], C. Siebenmann[2]
[1]Medical University of Innsbruck, Department of Neurology, Innsbruck, Austria, [2]Eurac Research, Institute of Mountain Emergency Medicine, Bolzano, Italy, [3]University Hospital of Zurich, Department of Respiratory Medicine, Zurich, Switzerland

Introduction: Hypoxia at high altitudes facilitates changes in ventilatory control that often lead to nocturnal periodic breathing (PB). Here, we introduce a placebo-controlled approach to prevent PB with inspired CO_2 and use this approach to assess PB effects on sleep in hypoxia. We aimed to investigate whether inspired CO_2 prevents PB, and does targeted prevention of hypoxia-induced PB influences sleep architecture.

Materials and Methods: This interventional, single-blinded, cross-over study included twelve healthy young men undergoing two sojourns (three days/nights each, separated by a 4 weeks washout period) in hypobaric hypoxia, corresponding to 4,000m altitude. During the nights, subjects' heads were encompassed by a canopy with controlled fresh air inflow, allowing control of exhaled CO_2 (and thus inspiratory CO_2) concentration. In random order, throughout one sojourn inspiratory CO_2 was increased to 1.6% (interquartile range [IQR], 1.2%-2.3%), whereas throughout the sham night it was ≤0.2%. Polysomnography was performed during the 1st and 3rd night of each sojourn.

Results: With low inspiratory CO_2, the PB percentage of total sleep time (TST) was 54.3% (IQR, 37.4%-80.8%) during the first and 45.0% (IQR, 24.5%-56.5%) during the 3rd night (p=0.042 between nights). Increasing inspiratory CO_2 reduced PB in TST (95%CI) by -38.1% (-48.1% to -28.1%) [1st night: 54.3% vs. 12.9%, 3rd night: 45.0% vs. 8.3%], the apnea-hypopnea index by -58.1/h (-76.1/h to -40.1/h), oxygen desaturation index ≥3% by -56/h (-73.2/h to -38.9/h), whilst increasing the mean oxygen saturation in TST by 2.0% (0.4% to 3.5%). Percentages of N3 and rapid eye movement sleep in TST were lower in the 1st vs. the 3rd night, independently of inspired CO_2 (all p-values<0.05). Enhancing inspired CO_2 increased N3 percentage during the 3rd night (p=0.045), but otherwise did not influence sleep architecture.

Conclusions: Increasing inspiratory CO_2 effectively prevented hypoxia-induced PB without affecting sleep macro-architecture, indicating that PB does not explain the sleep changes commonly observed at high altitude.

Effects of probiotic supplementation on health paramentes in individuals with Obstructive Sleep Apnea

L.G. dos Santos[1], C. Agrico Sales[2], L. Piva[2], A.C. Queiroz da Silva[2], C. de Melo[1], G. de Souza Assis[2]
[1]Federal University of Lavras, Post Graduate Program in Nutrition and Health, Department of Nutrition, Lavras, Brazil, [2]Federal University of Lavras, Department of Nutrition, Lavras, Brazil

Introduction: Obstructive sleep apnea (OSA) is a condition that can disrupt airflow leading to hypoxia and hypercapnia. This condition triggers comorbidities such as hyperlipidemia, insulin resistance, diabetes, and increased intestinal permeability. Currently, it affects about 98 million Brazilians, and Countinous Airway Pressure (CPAP) is the gold standard treatment. This study aimed to evaluate the impact of Lactococcus lactis LMG 27352 supplementation on anthropometric parameters and body composition, immunometabolic, quality of life, sleep, and daytime sleepiness in individuals with OSA using CPAP.

Materials and Methods: Adults individuals (n=25), both genders, using CPAP were selected. This work is a prospective, randomized, double-blind, placebo-controlled clinical trial in two stages of 12 weeks each. The Probiotic Group (GPro) received the microorganism Lactococcus lactis LMG 27352 at a concentration of 2x109.1 CFU while the placebo group (GPla) received the inert excipient cellulose. The study was approved by the UFLA Research Ethics Committee (4,383,855) and by the Brazilian Clinical Trials Registry Platform (RBR-9f4f5dc). Before and after the intervention period, the following assessments were performed: anthropometric, body composition, and biochemical, in addition to subjective assessments: food consumption, quality of life, sleep quality.

Results: As a result, there were no significant changes due to the effect of probiotic supplementation in anthropometric (ANT) and body composition (PC), quality of life (QL), sleep (QS) assessments, as well as in laboratory variables (LAB), however, it was possible to identify changes in the participants' eating habits, with an increase in caloric, protein and niacin intake only in the group supplemented with probiotics at the end of the intervention (VET (GPro TI = 1,554.02 / TII = 1,683.40 vs GPla TI = 1,522, 31/ TII = 1,380.90) ($p = 0.014$); PTN (GPro TI = 69.94/ TII = 77.65 vs GPla TI = 67.84 / TII = 58.61) ($p = 0.017$); Total fat (GPro TI=54.12/ TII = 56.66 vs GPla TI = 56.05/ TII 45.68) ($p = 0.009$); Riboflavin (GPro TI = 0.85/ TII = 0.49 vs GPla TI = 1.07/ TII = 0.40) ($p = 0.019$) and Niacin (GPro TI = 15.89/ TII = 19 vs GPla TI = 14.08 / TII = 10.48) ($p = 0.017$). no changes were observed due to the effect of supplementation on quality of life and sleep, however, lower sleep latency can be observed for GPro (TI = 39.20 ± 56.80/ TII = 26.50 ± 23.88) vs GPla (40.50 ± 62.57/ TII = 33.50 ± 17.13) ($p = 0.0722$). Finally, biochemical analyzes also did not show significant differences for the proposed intervention.

Conclusions: Supplementation with the probiotic strain of Lactococcus lactis LMG 27235 was not effective in modulating immunometabolic, anthropometric, quality of life, and sleep parameters in individuals with OSA undergoing CPAP treatment. However, further investigations in humans are needed to look for specific inflammatory markers, as well as mucosal integrity, to guarantee the result observed in the present study.

Effects of TAK-925 (danavorexton) a selective orexin 2 receptor agonist on upper airway collapsibility and pharyngeal muscle activity in adults with obstructive sleep apnea

A. Osman[1], S. Mukherjee[1,2], T. Altree[1,2], S. Proctor[1,2], R. Adams[1,2], P. Nguyen[1], C. O'Reilly[1], J. Fauska[1], B. Toson[1], A. Cai[3], B. Yao[3], D. Buhl[3], M. Naylor[3], T. Olsson[3], S. Meyer[3], L. Rosen[3], D. Eckert[1]
[1]Flinders University, Adelaide, Australia, [2]Southern Adelaide Local Health Network, Respiratory and Sleep Services, Bedford Park, Australia, [3]Takeda Development Center Americas, Inc, Cambridge, United States

Introduction: Interactions between impaired upper airway dilator muscle function during sleep and pharyngeal airway collapsibility are key pathogenic mechanisms for obstructive sleep apnea (OSA). The genioglossus muscle, the largest upper airway dilator, is a potential target for OSA pharmacotherapy development. Preclinical findings indicate orexin A (hypocretin-1) stimulates hypoglossal motoneurons, which innervate the genioglossus muscle. TAK-925, a novel orexin 2 receptor agonist, increases firing of hypoglossal motoneurons *in vitro* but its effects on upper airway physiology in people with OSA are unknown. This study investigated the effects of TAK-925 on upper airway collapsibility and genioglossus muscle activity in participants with OSA.

Materials and methods: This 3-way, double-blind randomized, cross-over, placebo-controlled study investigated the effects of ~1-hour intravenous TAK-925 (low-dose: 0.6mg [20mins] and 2.2mg [55mins]; high-dose: 1.8mg [20mins] and 6.6mg [55mins]) on 1) upper airway collapsibility and 2) genioglossus muscle activity and reflex responses to negative pressure pulses (NCT05180890). Participants were instrumented with two airway pressure sensors positioned at the level of the choanae and epiglottis. Two fine-wire electrodes were inserted into the genioglossus to record bipolar intramuscular electromyographic (EMG) activity. A nasal mask connected to a pneumotachograph and custom-designed breathing circuit delivered multiple, brief (~250ms) negative pressure pulses (~−12cmH$_2$O), every 2-10 breaths during early inspiration. Participants were studied supine and awake. Baseline genioglossus EMG activity was quantified as mean activity 100ms prior to stimulus onset. The upper airway collapsibility index (UACI) was quantified as the percent difference between nadir choanal and epiglottic pressures in response to negative pressure pulses.

Results: Thirteen participants with OSA were randomized, of which 12 (92.3%) completed all 3 visits. Participants (46% female) were aged 55±11 years with an average BMI of 29±4kg/m^2 and moderate-severe OSA. LS mean (95%CI) differences in UACI versus placebo were -9.6 (-18.2,-0.9; low-dose) and -1.2 (−10.1,7.7; high-dose)% 20mins post-infusion start and -5.10 (-15.0,4.8; low-dose) and 5.3 (-4.3,14.9; high-dose)% 55mins post-infusion start. Pre-stimulus genioglossus EMG activity was similar between conditions; mean±SD percent changes in pre-stimulus EMG activity from pre-infusion to 20mins post-infusion were 18±55, -5±32 and 3±39% and to 55mins post-infusion 16±43, 8±42, and 18±56% with placebo, low-dose, and high-dose, respectively (all P>0.05). Likewise, average genioglossus reflex excitation onset latency (32±8vs. 35±10vs. 30±11ms, p>0.05) and average peak short-latency reflex amplitude (262±95vs. 250±140vs. 266±114 %baseline EMG, p>0.05) were similar between placebo, low-dose, and high-dose regimens, respectively.

Conclusions: Modest reductions in upper airway collapsibility were observed with low-dose TAK-925 versus placebo at 20 minutes post-infusion start. However, there were no effects on genioglossus muscle activity or reflex responses to negative pressure pulses during wakefulness. The effect of TAK-925 on upper airway physiology during sleep requires further investigation.

Effects of Tonsillectomy and Adenoidectomy on Central Sleep Apnea in children with adenoid and tonsillar hypertrophy and exploration of influential factors

D. Li[1], J. Xiao[1], J. Xu[1], C. Zhao[1], Y. Zhang[1], G. Yin[1], J. Ye[1]
[1]Beijing Tsinghua Changgung Hospital, School of Clinical Medicine, Tsinghua University, Otorhinolaryngology, Head and Neck Surgery, Beijing, China

Introduction: To analyze the effects of tonsillectomy and adenoidectomy (T&A) on central sleep apnea (CSA) in children with adenoid and tonsillar hypertrophy, and explore the influential factors.

Materials and Methods: Children with central apnea index (CAI) ≥1 event/h who underwent T&A due to adenoid and tonsillar hypertrophy from June 2017 to June 2022 were included in the study. Baseline and postoperative polysomnography (PSG) parameters were compared to assess the effects of T&A on CSA in children with adenoid and tonsillar hypertrophy, and the influential factors were also analyzed.

Results: A total of 1,068 children underwent T&A after PSG, of whom 599 (56.09%) children demonstrated CAI ≥ 1 event/h. Finally, 134 children who completed PSG 3-6 months after surgery were included in the study. Compared with the baseline data, CAI was significantly reduced after surgery (before surgery (2.7) vs. after surgery (1.3), P<0.001). The postoperative CAI in 69 (51.49%) children was significantly improved (≥50%). Children with significant improvement in CSA after T&A had significantly higher preoperative CAI, apnea hypopnea index, N1 stage percentage, and arousal index than those without significant improvement in CSA (P<0.05). Moreover, improvement of CSA was linearly associated with children's age.

Conclusions: The incidence of CSA was noticeable in children with sleep-disordered breathing that was caused by adenoid and tonsillar hypertrophy. T&A could effectively improve pediatric CSA, and children with higher preoperative CAI and AHI were more likely to experience a greater improvement in CSA.

Efficacy of the ExVent accessory with the O2Vent Optima oral appliance in the treatment of obstructive sleep apnea – a clinical trial

S. Sharma[1], A. Conflitti[1], H. Reiter[1]
[1]Centre for Sleep, Toronto, Canada

Introduction: CPAP remains the most used option for treating moderate to severe OSA while custom fit MADs used primarily for mild to moderate OSA. MADs work by modifying the upper airway by changing the position of the mandible and tongue. O2Vent Optima is a novel oral appliance that incorporates both mandibular advancement to reduce pharyngeal collapsibility and an air channel that allows airflow through the device to circumvent nasopharyngeal obstruction. Previous studies have established superiority of the air channel of O2Vent Optima in the treatment of OSA. The ExVent is an optional accessory to the O2Vent Optima mandibular advancement device (MAD) and provides oral Expiratory Positive Airway Pressure (EPAP). Oral EPAP with the ExVent is designed to provide upper airway support via similar mechanisms of action of nasal EPAP devices in commercial distribution, e.g., passive dilatation of the airway, which reduces flow limitation. Nasal EPAP devices are in commercial distribution as stand-alone therapies for the treatment of OSA. The oral EPAP provided by the ExVent accessory is designed to augment the OSA therapy provided by the O2Vent Optima. ExVent is an optional accessory to the O2Vent Optima that provides Expiratory Positive Airway Pressure (Oral EPAP). The study purpose was to assess efficacy of the mandibular advancement device O2Vent Optima + ExVent as compared to Optima in the treatment of OSA.

Materials and Methods: A prospective, open-label study conducted at 3 sites included subjects with mild to moderate OSA (AHI ≥ 5 and ≤ 30).
Screening Phase
A diagnostic in-lab PSG study was performed to confirm a diagnosis of mild to moderate OSA.
Treatment Phase I
Subjects used O2Vent Optima for 6 weeks and underwent an in-lab PSG sleep night while using the O2Vent Optima.
Treatment Phase II
Subjects used O2Vent Optima + ExVent for 6 weeks and underwent an in-lab PSG sleep night while using the O2Vent Optima + ExVent.
Primary Efficacy Measure: Change in AHI between baseline vs. O2Vent Optima vs. O2Vent Optima + ExVent.

Results: Treatment with Optima, Optima + ExVent reduced AHI from 22.5±6.4/hr to 12.6±4.5/hr to 5.9±2.7/hr (p< 0.005 baseline vs. Optima and Optima + ExVent; p<0.05 Optima vs. Optima + ExVent). Average reduction in AHI with Optima was 43% and with Optima + ExVent was 72%. The lowest oxygen during sleep increased from 84.6±2.7% to 88.6±2.9% to 91.6±3.2% (p< 0.005 baseline vs. Optima and Optima + ExVent; p<0.05 Optima vs. Optima + ExVent). Patients on treatment with Optima and Optima + ExVent demonstrated no excessive adverse events or device malfunction.

Conclusions: O2Vent Optima is a novel oral appliance that incorporates both mandibular advancement to reduce pharyngeal collapsibility and an air channel that allows airflow through the device to circumvent nasopharyngeal obstruction. In the current study, both O2Vent Optima and O2Vent Optima + ExVent significantly improved OSA compared to the baseline. A greater benefit was observed with the addition of ExVent to the Optima in mild to moderate OSA.

Effortless detection of sleep apnea using a smart bed

F. Siyahjani[1], S. Babaeizadeh[1], F. Mushtaq[1]
[1]Sleep Number Labs, Research and Development, San Jose, United States

Introduction: There are several methods for diagnosing sleep apnea, but most of them can interfere with one's normal sleep. These methods may include using equipment or wearable sensors while sleeping in a lab, and the results can only be interpreted by professionals. Recently, new methods for diagnosing sleep apnea using wearables at home have been developed. These methods are designed to reduce the difficulties of using traditional methods such as laboratory polysomnography (PSG) which is considered the gold standard for sleep disorder diagnosis. However, most of these new methods still require some effort by the sleeper. In this study, a new algorithm for effortless detection of sleep apnea is proposed. The algorithm uses Deep Learning to analyze ballistocardiogram (BCG) signals collected from commercially available Sleep Number smart beds to distinguish normal breathing from apneic breathing. The proposed algorithm is built on the foundation of Internet of Things (IoT) technology, which incorporates devices with sensors, software, network connectivity, and other electronics to collect, transmit, and process data from beds in real-time.

Materials and methods: We developed and tested a deep neural network model for sleep apnea detection using laboratory PSG data collected over multiple years from 137 participants in a Sleep Center in Minneapolis, MN. Our model that uses 1-D convolutional and long short-term memory networks is trained using the study participants that were randomly divided into a training and validation group of 54 individuals, and a test group of 83 individuals, with an average apnea-hypopnea index (AHI) of 8.5 events/hour. The model identifies respiratory events every second using a 10-second segment input. Any respiratory event, such as obstructive or central, lasting at least 10 seconds was considered a positive sample. By aggregating these identified respiratory events, we estimated the Apnea-Hyponea Index (AHI) for each participant.

Results: The performance of our model is evaluated at both segment- and subject-level. In classifying 10-second segments, as determined by 5-fold cross-validation, the model achieved an accuracy of (mean±SD) 91.7±1.0% with a sensitivity of 80.6±3.1% and specificity of 92.2±1.0%. In classifying 86 unseen subjects using AHI threshold of 15, the model had an accuracy of 81.3±2.1%, with a sensitivity of 71.4±3.1% and specificity of 83.3±1.0%.

Conclusions: Our research shows that a deep neural network can effortlessly identify sleep apnea on commercially available smart beds. This technology has the potential to make it easier to monitor sleep apnea over a long period of time, which could help improve the health and well-being of many people by detecting and raising awareness about the disorder early on. This study illustrates the accuracy of the proposed technique in a single-night setting. However, collecting data over several nights may provide a more robust understanding of an individual's sleep apnea status and minimize errors. Investigating the potential benefits of multi-night data versus single-night data collection would be the subject of future research.

Elevated oxygen desaturation index among patients admitted to a tertiary care hospital in Brazil: a cross-sectional study

M.L. Nobre[1], D. Soares Paiva[2], G. Silva de Oliveira[2], L.A. Melo de Castro[2], J. Diniz Junior[3], A.K. Gonçalves[4]
[1]Federal University of Rio Grande do Norte, Health Science Postgraduate Program, Natal, Brazil, [2]Federal University of Rio Grande do Norte, Natal, Brazil, [3]Federal University of Rio Grande do Norte, Surgery Department, Natal, Brazil, [4]Federal University of Rio Grande do Norte, Department of Obstetrics and Gynecology, Natal, Brazil

Introduction: Obstructive sleep apnea (OSA) leads to increased cardiometabolic risk and quality of life impairment. However, there is insufficient awareness and diagnostic testing for this condition, particularly in developing countries. Overnight portable oxygen saturation monitoring is a cost-effective tool that can identify individuals with OSA. This study aimed to determine the prevalence of elevated oxygen desaturation index (ODI) in patients admitted to a tertiary care hospital.

Materials and methods: This cross-sectional observational study was approved by the hospital's ethics committee (CAAE: 67086722.5.0000.5292). Data were collected from 65 patients admitted to Onofre Lopes University Hospital in Natal, Brazil. Eligibility criteria included age > 18 years, no prior diagnosis of OSA, informed consent, and ability to read and understand the instructions. Patients completed a brief questionnaire that included the Epworth Sleepiness Scale (ESS), and STOP-BANG questionnaire. High-resolution pulse oximetry was used to monitor the patient's oxygen saturation during one night of sleep. An ODI greater than 5 was considered elevated, and these patients were referred to the sleep clinic for further investigation. Data are reported as mean ±SD or median (IQR) / [±SE], as appropriate.

Results: The study included 36 men and 29 women, mean age: 49.94 ± 16.15, BMI: 25.4 (7.9), ESS: 8.69 ± 4.16, minimal saturation: 88 (7.0), minutes below 90% saturation: 21.76 ±58.2, and median ODI: 4.1 [IQR: 9.5]. Twenty-six patients (40%) had elevated ODI, 7 women, and 19 men, the difference between sexes was statistically significant (p=0.019). The prevalence of elevated ODI was significantly higher in patients with: hypertension (59.3%, p=0.005), median ODI: 8.2 [±4.35], compared to those without hypertension: 2.5 [±0.76], (p= 0.003, Mann-Whitney U test); coronary artery disease (92.3%, p<0.001), ODI:14.1 [±4.83], no coronary artery disease: 2.5 [±2.23], (p<0.001, Mann-Whitney U test); and diabetes (76.5%, p<0.001), ODI: 11.4 [± 6.22], no diabetes: 2.5 [±1.61], (p<0.001, Mann-Whitney U test). There was no statistical association between the quality of sleep ("Do you sleep well" question) and elevated ODI (p=0.118). ODI was positively correlated to ESS (Spearman's rho = 0.276, p = 0.026) and STOP-BANG (Spearman's rho = 0.484, p <0.001). No correlation was found with the subjective quality of sleep assessed by visual analogic scale (Spearman's rho = 0.023, p= 0.858).

Conclusions: The prevalence of elevated ODI among the tested patients was 40%. It is crucial to emphasize that these patients are not individuals who lack any medical care; they are admitted to the hospital for various reasons. Despite this, they remain underdiagnosed for sleep disorders. These findings highlight the urgent need for healthcare professionals and patients to be aware of signs and symptoms related to OSA, enabling early diagnosis and treatment. The weak and moderate correlations of ESS and STOP-BANG, respectively, emphasize the importance of actively screening for OSA, especially in patients with hypertension, diabetes, and coronary artery disease, among whom the prevalence is significantly higher.

Endotype-phenotype relationships in OSA amongst people living with HIV

A. Spenceley[1], J. Orr[1], C. Schmickl[1], P. Deyoung[1], N. Bosompra[1], S. Ancoli-Israel[1], I. Grant[2], M. Young Karris[3], A. Malhotra[1], R. Owens[1]
[1]University of California, San Diego, Pulmonary Critical Care and Sleep Medicine, La Jolla, United States, [2]University of California, San Diego, Psychiatry, La Jolla, United States, [3]University of California, San Diego, Infectious Diseases & Global Public Health, La Jolla, United States

Introduction: Because of the efficacy and availability of antiretroviral therapy for people with human immunodeficiency virus (HIV), life expectancy and healthspan have increased dramatically for this population. As a result, focus has shifted to these individuals' symptoms and comorbidities (i.e. poor sleep and chronic fatigue). Up to 50% of adults living with HIV report poor sleep quality and recent epidemiologic studies suggest up to 70% have obstructive sleep apnea (OSA). In this study, we set out to understand how the underlying mechanisms of OSA impact the symptoms and expression of this disease in people living with HIV.

Materials and Methods: 116 individuals with well controlled HIV (PLWH) on anti-retroviral therapy were brought into our lab to perform a series of evaluations and questionnaires (including the Insomnia Severity Index, Epworth sleepiness scale, and the Functional Assessment of Chronic Illness Therapy (FACIT)-Fatigue subscale) during a day visit, then asked to return to complete an overnight polysomnogram. Ventilation from airflow captured during their overnight study was then analyzed to determine endotype traits including anatomy (passive upper airway collapsibility), respiratory arousal threshold, control of ventilation quantified as loop gain, and the eupnic ventilation . Multivariate linear regression was used to assess cross-sectional relationships between sleep apnea severity and various endotypic traits, controlling for age, BMI, and upper airway collapsibility.

Results: Among the 84 adult (73 M, 11 F) PLWH who had OSA (defined as apnea hypopnea index 3% criteria [AHI3%]>5 events/hr), participants were stratified into two groups by insomnia symptom severity: OSA only (ISI < 15; n=46) and combined insomnia and OSA (OSA+insomnia; n=38). The two groups did not significantly differ in age (median (IQR): 54 (43, 57) vs. 52 (47, 59)), AHI3% (25 (11, 51) vs. 29 (12, 50)), arousal threshold (107% of Veupnea (99, 119) vs. 114% (103, 126)), and airway collapsibility (Vpassive; 94 (82, 96) vs. 92 (84, 95)). However, there were slight differences observed in BMI (26.6 (24.6, 29.6) vs. 29.3 (27.0, 30.6); p = .07), ESS scores (7.0 (5.0, 10.0) vs. 10.0 (6.0, 16.0); p = .05), and FACIT-Fatigue subscore (higher is better; 42 (30, 48) vs. 30 (18, 35); p < .001). The multivariate linear regression model showed that the interaction between arousal threshold and insomnia was such that among those with ISI>15, a lower arousal threshold predicted more severe sleep apnea when controlling for age, BMI, and airway collapsibility. This interaction was not found amongst those without insomnia symptoms.

Conclusions: Among PLWH and OSA, we found that those who had moderate to severe insomnia symptoms were more likely to have complaints of daytime sleepiness and fatigue. OSA severity was found to be significantly related to arousal threshold amongst those with insomnia symptoms, even after adjusting for age, BMI, and airway collapsibility. These findings emphasize the high prevalence of OSA in people living with HIV and the importance of understanding the impact of underlying mechanisms of OSA and their impact on symptoms attributed both to OSA and HIV. Further research is needed to explore endotype –phenotype relationships.

Epidemiology of obstructive sleep apnea in Chile: a systematic review and meta-analysis

L. Vasconcello-Castillo[1], R. Torres-Castro[1], L. Solis-Navarro[1], C. Albertini[2], D. Zenteno Araos[3,4], A. Cisternas[5,6], M.E. Torres[7], R. Vera-Uribe[1]
[1]University of Chile, Santiago, Chile, [2]ResMed Science Center, São Paulo, Brazil, [3]Hospital Guillermo Grant Benavente, Concepción, Chile, [4]Facultad de Medicina, Universidad de Concepción, Concepción, Chile, [5]Instituto Nacional del Tórax, Santiago, Chile, [6]Clínica Alemana, Santiago, Chile, [7]Hospital San José, Santiago, Chile

Introduction: Sleep apnea is a prevalent sleep disorder characterized by repeated interruptions in breathing during sleep, leading to a disrupted sleep cycle and potentially severe health consequences. There is a significant knowledge gap regarding the prevalence of sleep apnea and its related causes in developing countries, despite the fact that the burden of sleep apnea has been widely investigated in affluent countries. Chile, a developing nation with high rates of overweight and obesity, serves as a crucial case study for figuring out how sleep apnea affects overall public health. By analyzing the existing research on sleep apnea in Chile and offering details on its prevalence, risk factors, and accompanying symptoms, this systematic review seeks to fill this knowledge gap.

Materials and Methods: A systematic review was conducted in seven databases. The included studies aimed to determine the prevalence and risk of sleep apnea and associated symptoms in the Chilean population. Two independent reviewers analysed the studies, extracted the data and assessed the quality of evidence.

Results: Of the 447 reports returned by the initial search, fifteen articles reporting on 13,157 patients were included in the data synthesis. The prevalence of apnea risk varied between 0.17 (CI 0.12-0.23 p=0.001) and 0.25 (CI 0.16-0.34, p=0.001) depending on the evaluation method. The most commonly used questionnaires to estimate the risk of OSA were the STOP-Bang questionnaire and the Epworth sleepiness scale. Only few studies reported respiratory polygraphy.

Conclusions: According to the assessment tool used, there are between 17% and 25% of people at risk for OSA in Chile, depending on the assessment instrument utilized. Further research is needed, focusing on incorporating objective assessment tools for evaluating OSA risk, to determine its frequency with greater accuracy.

Estimating obstructive sleep apnea endotypes from the oxyhemoglobin saturation signal

L. Messineo[1], A. Azarbarzin[1], N. Esmaeili[1], A. Aishah[1], D. Vena[1], G. Labarca[1], L. Gell[1], W.-H. Hu[1], H.-C. Yang[1], S. Sands[1], A. Wellman[1]
[1]BWH, Boston, United States

Background: Oximetry is a valuable tool with a wealth of information that can simplify the diagnosis of obstructive sleep apnea (OSA) and support treatment decisions. Here we present preliminary data for a novel approach for determining OSA endotypes through analysis of the oxygen saturation (SpO2) signal.

Methods: 3 SpO_2 were determined: the steady-state SpO_2 during wakefulness (SpO_{2wake}), the steady-state SpO_2 that can be achieved during sleep (SpO_2sleep), and the SpO_2 leading to an arousal from sleep ($SpO2_{arousal}$). The $SpO_{2arousal}$-SpO_{2sleep} difference is the gap that needs to be overcome to solve OSA (if positive, the gap is likely to be a function of OSA severity). For example, in a healthy participant, stable breathing occurs at a higher SpO_{2sleep} than $SpO_{2arousal}$, thus obstructive sleep apnea (OSA) does not develop. The difference between SpO_{2wake} and SpO_{2sleep} is a function of upper airway collapsibility and plant gain for SpO_2 (defined as the change in SpO_2 for a given change in ventilation). High collapsibility will lower the SpO_{2sleep}, as will an elevated plant gain (greater reduction in SpO_2 for a given drop in ventilation). The difference between SpO_{2wake} and $SpO_{2arousal}$ is a function of the ventilatory arousal threshold and chemosensitivity (controller gain). A low ventilatory arousal threshold or a high controller gain will raise the $SpO_{2arousal}$, meaning the patient wakes up easily. In OSA patients, stable breathing rarely occurs; thus, OSA onsets as SpO_{2sleep} cannot consistently stay above $SpO_{2arousal}$.

We conducted a window-by-window (5m) analysis of the oximetry trace in 4 polysomnograms thus far. SpO_{2wake} was calculated as average SpO_2 in awake windows. $SpO_{2arousal}$ was determined as the average of desaturation nadirs, provided there was at least one ≥3%desaturation in the window. SpO_{2sleep} was defined as average SpO_2 in a window where no desaturation occurred. Kaplan-Meier survival curves were used to determine median[IQR] SpO_{2sleep} and $SpO_{2arousal}$, which informed an endotype plot.

Results: The gap was associated with the apnea-hypopnea index ($R2=0.98$) and the oxygen desaturation index ($R2=0.97$). The SpO_2-derived endotype analysis also provided visual information on potential ways to solve the gap.

Conclusions: SpO_2-based endotype detection may inform clinical decisions and guide therapy response prediction.

Evaluating the Oxygen Desaturation Index in Temporomandibular Disorders: a new perspective on sleep quality, pain attribute and psychological factors

C.A.O. Machado[1], R.S.B. Felipe[1], C.M.B.M. Rezende[2], J. Stuginski Barbosa[3], L.R. Davi[1], C.d.C.A. Lopes[1], P.C. Simamoto Junior[1]
[1]Federal University of Uberlandia, Orofacial Pain, Uberlandia, Brazil, [2]Instituto de Educação Superior de Brasília, Orofacial Pain, Brasília, Brazil, [3]Bauru Orofacial Pain Group, Orofacial Pain, Bauru, Brazil

Introduction: Obstructive Sleep Apnea (OSA) is a prevalent sleep disorder (DS) in patients with painful Temporomandibular Disorder (TMD). The oxygen desaturation index (ODI), calculated as the number of oxygen desaturations per hour of valid sleep, is a widely recognized tool for OSA screening. This study aimed to assess the ODI in painful TMD patients and explore the influence of sleep quality, pain attributes, and psychological factors.

Materials and Methods: Ninety adult patients (91.1% female, mean age 41.3 ± 15.6 years) diagnosed with painful TMD were studied. The average ODI over two nights, as determined by the Biologix sleep exam, was evaluated. Patients filled out questionnaires including Stop Bang (SB), Pittsburg Sleep Quality Index (PSQI), Catastrophizing Pain Scale (PCS), Generalized Anxiety Disorder Scale (GAD-7), Epworth Sleepiness Scale (ESS), and the Graded Chronic Pain Scale (GCPS). The sensitivity threshold of the masticatory muscle and temporomandibular joint (TMJ) was gauged using an algometer and the pain duration in months was recorded. Patients were categorized into three groups based on ODI scores: control (CG - ODI <5); mild OSA-compatible (MO-ODI 5-15), and moderate/severe OSA-compatible (MS-ODI >15). Distribution among variables was checked using Shapiro-Wilk test, and significant differences were identified using ANOVA or Kruskal-Wallis rank sum test. Spearman rank test was used to determine the correlations between quantitative variables (Jamovi software).

Results: In terms of diagnosis, 13.3% had masticatory muscle disorders, 17.8% arthralgia and 68.9% both. Overall, 78.9% suffered from pain for more than 3 months. Twenty-one percent were classified as mild OAS-compatible and thirteen percent as moderate/severe OSA-compatible. Regarding correlation analysis the ODI was correlated with BMI (rho=0.370, $p = < 0.001$), O^2 sat < 90% (rho 0.621, $p = < 0.001$), Age (rho= 0.242, $p = 0.021$), ESS (rho=0.213, $p = 0.043$). The Chronic Pain Intensity was correlated with GAD7 (rho 0.403 $p = < 0.001$), PSQI (rho =0.309, $p = 0.003$) and Age (rho=0.238 $p = 0.024$). Additionally, there were correlations between GAD7 and PSQI (rho 0.372 $p = < 0.001$), PSC (rho 0.361 $p = < 0.001$) and ESS (rho=0.214 $p = 0.043$). BMI also had a positive correlation with ESS (rho=0.230, $p = 0.029$) and age (rho=0.210, $p = 0.047$).Statistical differences were found in BMI ($p = 0.024$ – MS-CG p 0.02), Sat < 90% (MO – CG - $p < 0.01$ and MS- CG - $p < 0.01$) and subjective OSA (SB – $p < 0.008$). No significant differences were identified between the other variables investigated.

Conclusions: OSA verified by the ODI showed a significant association with BMI, subjective OSA, and O^2 sat < 90% but not with pain characteristics or psychological factors. Patients with painful TMD showed correlation between OSA and obesity, O^2 sat < 90%, aging and sleepiness. A correlation between pain intensity and anxiety symptoms; pain intensity and sleep quality and pain intensity and aging was also found. Additionally, anxiety symptoms were correlated with sleep quality, catastrophizing and sleepiness. Obesity was correlated with aging and sleepiness.

Acknowledgements: Overnight digital monitoring for OSA screening serves as a convenient diagnostic tool in the clinic, improving the diagnosis and treatment process for a more tailored treatment framework

Evaluation of effective factors on pain in patients undergoing sleep apnea surgery

R. Heidari[1], M. Najafzadeh[2], R. Erfaniyan[3], E. Razmpa[1], H. Emami[1], M. Heidari[4]
[1]Otorhinolaryngology Research Center, Imam Khomeini Hospital Complex, Tehran University of Medical Sciences, Tehran, Iran, Islamic Republic of, [2]Tehran University of Medical Sciences, Tehran, Iran, Islamic Republic of, [3]Otorhinolaryngology Research Center, Amiraalam Hospital, Tehran University of Medical Sciences, Tehran, Iran, Islamic Republic of, [4]Firoozgar Hospital, Iran University of Medical Scienses, Neurology, Tehran, Iran, Islamic Republic of

Introduction: Sleep apnea is associated with complete or partial obstruction of the upper airway. This disease can cause various problems for the individual. In most cases, surgery and pharyngoplasty are needed to treat this complication. Depending on the type of surgery, its duration, the patient's age, the type of opioid prescribed after surgery, and other factors, different amounts of postoperative pain have been reported in different studies. Therefore, the aim of this study was to investigate the factors affecting postoperative pain.

Materials and Methods: This descriptive cross-sectional study was performed on patients referred to the hospital to determine the factors affecting postoperative pain for patients with obstructive sleep apnea (OSA). Patients' information was recorded: age, sex, weight, height, body mass index, duration of surgery, possible complications, and anesthesia. Patients were evaluated for pain according to VAS criteria. The first time a patient requested a drug was recorded within 24 hours after surgery and data was then analyzed.

Results: A total of 40 patients were enrolled in the study, including 14 women (35%) and 26 men (65%). The mean age of patients was 41.55 ± 7.43 years. Examination of the relationships between other variables with patients' pain intensity showed a statistically significant difference between patients' pain intensity with other variables such as history of stroke ($P = 0.005$), history of cardiovascular disease ($P = 0.048$), history of drug abuse ($P = 0.046$) and type of analgesia received after surgery ($P = 0.032$). In multivariate analysis of the studied data, no statistically significant relationship was found between any of the variables with the intensity of patients' postoperative pain. The variances of height, weight, body mass index, duration of surgery and the first time of application of analgesic after surgery did not differ in different groups of pain intensity variables. But a significant difference was found between the two variables of age and pain intensity of patients ($P < 0.05$).

Conclusions: The results of this study showed a statistically significant difference in pain intensity with a history of stroke, cardiovascular disease, history of drug abuse and also the type of analgesia received after surgery. The serious complications caused by tolerating acute postoperative pain, especially the long-term effects of experiencing severe pain, necessitates more attention to pain control.

Evaluation of in patients with sleep related breathing disorders Arnold-Chiari Malformation type 1, before and after surgical treatment

M. Dominici[1]
[1]SARAH Network of Rehabilitation Hospitals, Clinical Neurophysiology, Brasilia, Brazil

Introduction: Arnold-Chiari malformation type I (ACMI) patients have a higher prevalence of Sleep Related Breathing Disorders (SRBD), including Central Sleep Apnea (CSA) or Obstructive Sleep Apnea (OSA), compared to the general population. The efficacy of posterior fossa decompression with duraplasty (PFDD) as a treatment for SRBD in these patients is still uncertain. ACMI-related conditions like cerebellar herniation, hydrosyringomyelia, and hydrocephalus can compress or distort the structures involved in breathing during sleep, making them the main causes of SRBD. PFDD aims to alleviate these issues by accommodating these structures better, potentially reducing morbidity and mortality risks. However, there is a lack of sufficient evidence in the literature to establish PFDD as a formal indication for any type of SRBD. This study aims to evaluate the impact of PFDD on SRBD in ACMI patients.

Materials and Methods: A search was conducted in medical records to identify adult ACMI patients who underwent polysomnography before and after PFDD between 2012 and 2022. The polysomnography exams followed the criteria established by the American Academy of Sleep Medicine (AASM) for respiratory events and classified SRBD subtypes based on the International Classification of Sleep Disorders (Third Edition). Patients with other neurological impairments, lung diseases, heart failure, or respiratory depressant drug use were excluded. The pre- and post-surgical Apnea Hypopnea Index (AHI) were compared using the non-parametric Wilcoxon Signed-Rank Test, with $p < 0.05$ considered significant.

Results: Fourteen patients (7 men) aged between 25 and 75 years were included in the study. The median AHI values preoperatively and postoperatively were numerically similar for both CSA (41.5/h and 27.2/h, respectively) and OSA (34.7/h and 18.7/h, respectively). Three patients had hypoventilation before surgery, which normalized after PFDD. Considering the entire sample, the median AHI decreased from 36.6/h preoperatively to 21.1/h postoperatively. However, the Wilcoxon Signed-Rank Test did not yield statistical significance (W-value: 29.5, p-value = 0.453).

Discussion: This study has limitations, including its retrospective case series design and the inability to separate anatomical variables associated with ACMI or SRBD due to the small sample size. These limitations are common in available publications. Despite the lack of statistical significance, the clinical significance is noteworthy. The improvement in hypoventilation and reduction in SRBD severity classifications suggest a potential positive impact of PFDD. Understanding the effect of ACMI on SRBD is important for the indication of polysomnography and surgical interventions. While further research with larger samples and prospective designs is needed, the findings indicate that ACMI may contribute to SRBD and support considering polysomnography as a variable for surgical decision-making in ACMI patients.

Conclusions : Although this study had limitations, the observed improvements in hypoventilation and SRBD severity after PFDD suggest potential clinical significance. Further research is necessary to validate these findings and establish the efficacy of PFDD in treating SRBD in ACMI patients. Understanding the relationship between ACMI and SRBD is crucial for appropriate indications of polysomnography and surgical interventions, helping to guide clinical decision-making in these patients.

Evaluation of oxidative stress markers in obstructive sleep apnea and additional antioxidant therapy: a review article

A. Bastos Lira[1], C.F. de Sousa Rodrigues[1], A.B. Lira[1]
[1]Universidade Federal de Alagoas, Medicina do Sono, Maceió, Brazil

Introduction: The hypoxia and reoxygenation cycles in Obstructive Sleep Apnea (OSA) cause a change in the oxidative balance, leading to the formation of reactive oxygen species capable of reacting with other organic molecules impairing their functions. This study aimed to determine the best markers of oxidative stress in OSA and what better antioxidant agent to be used to treat the disease.
Materials and methods: Searches were conducted in three different databases (PubMed, LILACS, SCIELO), using as descriptors the terms obstructive sleep apnea, oxidative stress, and antioxidant therapy. A total of 120 articles were found but only those considered of interest to the research were selected. Thus, 10 articles were included for further analysis regarding the biomarkers of oxidative stress in OSA, and 6 articles to evaluate the antioxidant most often used for demonstration of efficacy.
Results: The thioredoxin, malondialdehyde, superoxide dysmutase, and reduced iron were the most commonly used biomarkers and showed a more consistent relationship between increased oxidative stress and OSA.
As antioxidant therapy, vitamin C and N-acetylcysteine (NAC) presented interesting results as a reduction of oxidative stress, which may become an alternative to the complementary treatment of OSA.
Conclusion: This review's findings agree mostly to measure that the markers of oxidative stress in OSA may be a contributing aspect to assessment and monitoring of patient, and the antioxidant therapy appears to be beneficial in the treatment of OSA.

Evaluation of quality of life before and after barbed pharyngoplasty in patients with obstructive sleep apnea

A. Almeida[1], I. Campos[1], L. Volpini[1], I. Ribeiro[1], D. Lana[1], V. Nickel[1], L. Godoy[1], L. Lemes[1]
[1]Rio de Janeiro State University, Otolaryngology, Rio de Janeiro, Brazil

Introduction: Barbed pharyngoplasty is a recently developed surgical technique that is being used to treat obstructive sleep apnea (OSA) in patients with palatal obstruction. It is based on the use of self-locking, knotless resorbable threads to suspend pharyngeal muscle and stabilize the palatal suture, enlarging the oropharyngeal airway. Previous surgical techniques for OSA were based on excision of tissues and shortening of the soft palate and barbed pharyngoplasty may be a less invasive approach with lower postoperative complications. Authors have been studying this technique with promising results regarding therapeutic success in OSA patients but its effect in improving patients' quality of life is still uncertain. This study aims to evaluate quality of life and sleep, excessive daytime sleepiness and polysomnographic parameters of OSA patients before and after barbed pharyngoplasty.

Materials and methods: We conducted a prospective longitudinal study from 2020 to 2023 at a tertiary university hospital. Patients older than 18 years old with OSA and palatal obstruction observed during physical examination underwent barbed pharyngoplasty performed by an ENT resident under an experient surgeon's supervision. Septoplasty with turbinectomy was performed if the patient had nasal obstruction complaint with nasal septal deviation and no improvement after 2 month nasal corticosteroids use. All patients underwent full-night polysomnography and completed the Pittsburgh Sleep Quality Index (PSQI), Functional Outcomes of Sleep Questionnaire (FOSQ), Short Form Health Survey (SF-36) and Epworth Sleepiness Scale (ESS) before and 3 months after surgery. Statistical analysis was performed using SPSS statistics software (version 21.0 for Windows). The Generalized Estimation Equation (GEE) test was used in order to analyze time effect considering $p \leq 0.05$.

Results: 10 patients were enrolled in the study, 6 were male (60%), mean age was 48.40 ± 12.79 years old. Mean body mass index was 31.87 ± 6.87 and cervical circumference 38.78 ± 4.76. There were statistically significant improvement on the following polysomnographic parameters: sleep eficiency from $79\% \pm 16.23$ to $92.16\% \pm 5.62$ (p=0.013), apnea hipopnea index from 34.81 ± 16.44 to 11.94 ± 9.29 (p=0.00), apnea index from 14.88 ± 15.67 to 3.17 ± 3.36 (p=0,00), hipopnea index from 21.14 ± 11.18 to 8.78 ± 7.87 (p=0.00). Considering quality of life, some SF-36 subsets improved after surgery, such as functional capacity, vitality and emotional aspects (p=0.037, 0.03, 0.032, respectivelly). Physical limitation, pain, general health status and mental health had no statistically significant improvement. Improvement was also observed on sleep quality assessed by PSQI total score from 8.2 ± 3.05 to 4.8 ± 2.34 (p=0.008). Daytime sleepiness on Epworth Sleepiness Scale (ESS) had no statistically significant improvement, nevertheless patients had already low preoperative ESS scores of 9.3 ± 4.94 versus 8 ± 7.04 postoperatively (p=0.436). Also no FOSQ subset improved after surgery.

Conclusions: Barbed pharyngoplasty seems to improve quality of life and sleep aspects in patients with OSA. Further studies with larger sample sizes are necessary to assess efficacy and long term benefits of the surgery.

Evaluation of the interjudge agreement of the ShOM protocol in children with Down syndrome and Obstructive Sleep Apnea

D. Silva[1], C. Corrêa[2], L. Krakauer[3], S. Weber[4]
[1]Universidade Estadual Paulista, Departamento de Oftalmologia, Otorrinolaringologia e CCP, Botucatu, Brazil, [2]Centro Universitário Planalto do Distrito Federal, Fonoaudiologia, Brasília, Brazil, [3]Private Clinic, Fonoaudiologia, São Paulo, Brazil, [4]Faculdade de Medicina Botucatu - UNESP, Departamento de Oftalmologia, Otorrinolaringologia e CCP, Botucatu, Brazil

Introduction: Obstructive Sleep Apnea (OSA) is highly prevalent in Down syndrome (DS) children with an estimated rate of between 31% and 79%. There are many underlying predisposing factors for OSA in DS such as craniofacial characteristics, hypotonic muscle pattern, hypothyroidism and a tendency towards obesity. The use of orofacial myofunctional screening tools such as the Short Evaluation of Orofacial Myofunctional Protocol (ShOM) could help to identify OSA risk as part of the speech-language pathologist's routines in the multidisciplinary sleep team

Objectives: To describe ShOM's results in children with DS and its correlation with risk of OSA and to evaluate the interjudge agreement level for reliability analysis of the protocol in this population.

Materials and Methods: In a pilot study with 16 children with DS were performed full-night polysomnography, medical evaluation, speech-language pathology screening, ShOM, a protocol for Orofacial Myofunctional Screening in children with OSA. ShOM classifies breathing mode and type, lip competence, lip tonus, tongue posture at rest and during swallowing, nasal wing dilator muscle tonus, dental occlusion, Glatzel's test and Rosenthal test. A total of 10 items are scored 0 (normal) and 1 (alteration); a sum of 10 represents the gratest number of possible orofacial myofunctional changes within this protocol. In the studied group, 7 of the original 10 items were considered, thus having a maximum score of 7. The ShOM protocol was applied by two speech therapists without prior knowledge of the polysomnographic results. For the analysis of interjudge agreement was used the Cohen's Kappa coefficient and Intraclass Correlation Coefficient (ICC). Spearman Coefficient (<0.05) was used to analyze the correlation between the ShOM's results and polysomnographic data.

Results: The sample consisted of 16 individuals; 9 females aged 4 to 15 years old, mean age 9.1 years ($\neq 3.3$). The mean AHI was 15.37 ($\neq 14.72$). 1 individual was considered with normal AHI; 1 with mild OSA; 6 with moderate OSA and 8 with severe OSA. The average ShOM score was 5.6 ($\neq 1.4$), oral breathing was observed in 13 individuals, 14 with changes in lips tonus, 9 with altered lips competence, tongue posture at rest and during swallowing altered in 16 individuals, dental occlusal alteration in 8, Rosenthal test positive at 14. Kappa interjudge agreement analysis showed strong reliability (0.61 to 0.8) for breathing mode, lips competence, tongue posture at rest and tongue posture during swallowing, dental occlusion and Rosenthal test, and moderate reliability (0,6) for lips tonus. In the ICC calculation, the total score in ShOM showed weak reliability (0.442). A positive correlation was observed between the ShOM score and the AHI ($p=0.038$).

Conclusions: All children presented orofacial myofunctional changes. Higher ShOM scores, indicating greater orofacial myofunctional impairment, were associated with higher OSA severity. The interjudge agreement demonstrated strong reliability for the qualitative tests of presence or absence of change, however, a new calibration step is suggested for reassessment of the results.

Evaluation of the outcome of COVID-19 infection in the patient's spouse using CPAP

L. Mello[1,2,3], L. Oliveira[1], R. Duarte[4], J. Rodrigues Filho[5], C. Valete[1,3]
[1]Instituto Nacional de Infectologia Evandro Chagas, Fundação Oswaldo Cruz, Rio de janeiro, Brazil, [2]Hospital Federal da Lagoa, Rio de Janeiro, Brazil, [3]Hospital Universitário Clementino Fraga Filho, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil, [4]Instituto de Doenças do Tórax - Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil, [5]Hospital Universitário Gaffrée e Guinle, Universidade Federal do Estado do Rio de Janeiro, Rio de Janeiro, Brazil

Introduction: Obstructive sleep apnea (OSA) is a chronic disease characterized by cyclical obstruction (partial or total) of the upper airway during sleep. Its pathophysiology is multifactorial and complex with the participation of anatomical and non-anatomical factors, and the direct systemic consequences are intermittent nocturnal hypoxemia and sleep fragmentation. Since the emergence of the infection caused by the new Coronavirus (SARSCoV-2) in December 2019 in the Chinese province of Wuhan, the World Health Organization has determined the so-called COVID-19 disease. As with the infection caused by SARS-Cov-1 in 2003, high viral load was associated with worse clinical prognostic outcomes. Procedures related to the development of aerosol, such as orotracheal intubation (OTI), non-invasive mechanical ventilation (BIPAP/CPAP), tracheostomy, airway aspiration, bronchoscopy, chest physiotherapy and manual ventilation prior to OTI, increase the risk of transmission and contagion by health professionals. The objective of this study is to verify whether spouses of obstructive sleep apnea (OSA) patients infected with COVID-19 could become more severely infected due to aerosolization caused by continuous use of CPAP in the same room.
Materials and Methods: A retrospective cohort study was developed with the spouses of OSA Brazilian adults using CPAP during the COVID-19 pandemic, which were categorized into two groups: adequate or inadequate CPAP adherence, according to the sleep apnea patients CPAP report. The CPAP adherence was obtained through memory card reading or remote monitoring for the period of 3 months prior to the date of the COVID-19 infection. Use of CPAP ≥ 4 hours for ≥ 70% of the nights was considered satisfactory adherence. Partners` incidence of COVID-19 and its outcome were evaluated. Data was entered and analyzed in SPSS 16.0. Frequencies of categorical variables were described. The association of the variables analyzed with adherence to CPAP was performed using the chi-square test and Fisher's exact test.
Results: 37 adults (81.1% females) were divided into two groups: 20 adherent and 17 non-adherent spouses of patients in CPAP therapy. The incidence of COVID-19 infection was 65% (n=13) in the adherent group and 47% (n=8) in the non-adherent group (p=0,272). Despite the intensity of most spouses being mild to moderate, severe intensity (> 6 symptoms) was more prevalent in the non-adherent group with 3 cases compared to 1 case in the adherent group. The only fatal outcome occurred in the adherent group, which was also the group with the highest prevalence of comorbidities.
Conclusions: Although COVID-19 infection in the spouses of patients was not associated to adherence to CPAP, our findings showed more frequency COVID-19 infection in the spouses of patients adherent to the positive pressure therapy. This finding might suggest that the aerosolization caused by CPAP use would be less harmful if performed in another bedroom.

Exploring backscatter ultrasound imaging in different demographic subgroups for assessing obstructive sleep apnea everity

P. Bosschieter[1], C. Kushida[2]
[1]Stanford School of Medicine, Sleep Surgery, OHNS, Stanford, United States, [2]Stanford School of Medicine, Sleep Medicine, Stanford, United States

Introduction: Previous studies on backscattered ultrasound imaging (BUI) have shown promise in tissue characterization and disease grading of obstructive sleep apnea (OSA). BUI can be used in assessing the severity of OSA, independent of common covariates like BMI and age. However, to fully harness the potential, it is important to explore the capability of the model regarding OSA severity across various demographic subgroups.

Materials and methods: Patients were recruited at the Stanford Sleep Surgery Clinic between July 2020 and October 2022. The presence of OSA was confirmed through attended or home sleep studies. Ultrasound radio-frequency (RF) data of the upper airway were obtained using a 30-degree standardized ultrasound scan (15 degrees above and below the Hyoid to external acoustic meatus plane). The ultrasound backscattered signals were analyzed using AmCAD-US, an FDA-cleared software that provides quantitative ultrasound backscatter analysis. The backscatter signals were stratified based on two confounding variables, where BMI of 25 kg/m^2 and age of 40 years were used as cutoff. Statistical comparisons against the OSA severity within each subgroup were performed using nonparametric Mann-Whitney tests and rank correlation.

Results: In total, 130 subjects (28 female) were recruited with a mean age of 41.3±12.8 years, a mean BMI of 27.1±4.6 kg/m^2, and mean AHI of 20.2±20.2 events/h. Nearly half (46.2%) of the participants had moderate to severe OSA. Among the participants, 37.7% had a normal BMI, and within this group, 24.5% had moderate-to-severe OSA. In the normal BMI cohort, the backscatter signal from the oropharyngeal region demonstrated a good association with AHI (ρ=0.316 with P-value=0.0269). However, within the overweight-obese subgroup, the association between the backscatter signal and AHI became stronger as the analysis region shifted from the oropharyngeal to the palatal region (ρ=0.225 with P-value=0.0436, and ρ=0.408 with P-value=0.0002 respectively). Among participants below the age of 40 (53.8%), 30% had moderate to severe OSA. The backscatter signal from the palatal region showed a high discriminatory power for severe OSA (P-value=0.0044). Conversely, in the age group of 40 and above, both the oropharyngeal and palatal regions exhibited the ability to differentiate among four OSA severity levels (no, mild, moderate and severe OSA) with statistical significance P-value=0.0150 and P-value=0.0002, respectively.

Conclusions: The utilization of a standardized ultrasound scan allows for accurate localization of specific regions within the upper airway, thereby enabling the identification of potential source contributing to the upper airway collapse. In this study, we investigated the ultrasound backscatter signals from various regions of the upper airway and observed distinct discriminatory capability for different levels of OSA severity for different population subgroups.

Factors associated with the occurrence of sleepiness at the wheel and related accidents and near-misses in patients treated by continuous positive airway pressure therapy

J. Coelho[1,2], S. Bailly[3], S. Baillieul[3,4], P. Sagaspe[1,2], J. Taillard[2], J.-A. Micoulaud-Franchi[1,2], P. Philip[2,1], J.-L. Pépin[3,4]
[1]Bordeaux University Hospital, University Sleep Medicine Unit, Bordeaux, France, [2]Bordeaux University, SANPSY UMR 6033, CNRS, Bordeaux, France, [3]Grenoble Alpes University, HP2 Laboratory, INSERM U 1042, Grenoble, France, [4]Grenoble University Hospital, University Sleep Medicine Unit, Grenoble, France

Introduction: Excessive Daytime Sleepiness (EDS) related to Obstructive Sleep Apnea Syndrome (OSAS) can impair individual's driving performance and lead to an increased risk of near-misses and accidents. Continuous Positive Airway Pressure (CPAP) therapy is effective in improving breathing during sleep and decreasing EDS. However, to few studies have explored its impact on driving outcomes, and to another extent, factors associated with driving reduction. Therefore, the aim of this study was to evaluate the factors associated with the occurrence of sleepiness at the wheel (SAW) and related accidents and near-misses in patients treated by CPAP therapy.
Materials and Methods: This study was based on the OSFP prospective national cohort and included patients investigated by respiratory physicians in private practice, general hospitals, and university hospitals, with a diagnostic of OSAS and engaged in a CPAP therapy. Ethical committee approval for setting up the database was obtained (CCTIRS no 09.521). All patients included in the database provided written informed consent. Baseline characteristics included apnea-hypopnea index (AHI), OSAS and depressive symptomatology, EDS, SAW, near-misses and accidents. Follow-up characteristics included previous data plus adherence and intolerance to the CPAP therapy. Univariate associations between follow-up characteristics and SAW, near-misses, and accidents in follow-up were calculated using cumulative incidence curve with the Kaplan-Meier method and the log-rank test. Multivariate associations were calculated using Cox models adjusted for age, sex, body mass index, gastroesophageal reflux, restless legs syndrome, sleepiness, symptomatology, depression, sleep duration, and AHI at baseline.
Results: A total of 5308 patients were included in the present study (mean age: 57.6 years ± 12.2). After treatment, there were significant reductions on the driving risk related to sleepiness compared to before treatment: accidents (1.1% after vs 2.6% before), near misses (3.1% vs 8.3%), SAW (17.5% vs 31.8%) and EDS (5.4% vs 20.4%). The cumulative incidence of SAW, near misses, and accidents related to sleepiness in the follow-up were higher among patients with low adherence compared to patients with high adherence (respectively, OR=1.76 [1.48-2.09], OR=1.64 [1.17-2.29] and OR=3.16 [1.40-7.15]). The cumulative incidence of SAW was 6-fold higher in patient with severe residual symptomatology compared to patients with no residual symptomatology (OR=5.96 [4.73-7.50]). Results were similar for near misses (OR=5.46 [3.92-7.60]) and accidents related to sleepiness (OR=15.7 [5.3-46.4]).
Conclusions: In patients with OSAS, the CPAP therapy showed a driving risk reduction in follow-up. Adherence to treatment, but especially, the presence of residual symptoms, are highly predictive of the driving risk in the follow-up. They constitute two elements to be systematically evaluated during the follow-up consultation of patients with OSAS. This study is the first having a sufficient sample to show a prospective reduction in accidents related to sleepiness, an objective but rare outcomes with critical implications. Further studies are needed to confirm these results with an interventional design.

Feasibility of in-home diagnosis and treatment of obstructive sleep apnea

T. Couto Patriota[1,2], C. Albertini[2], R. Pedrosa[1]
[1]Pronto Socorro Cardiológico de Pernambuco - PROCAPE, Sleep Laboratory, Recife, Brazil,
[2]ResMed, Clinical and Respiratory Care, São Paulo, Brazil

Introduction: Obstructive sleep apnea (OSA) is a major public health problem of pandemic proportions. In-laboratory OSA diagnosis and continuous positive airway pressure (CPAP) titration is insufficient regarding the number of patients affected. Alternative ways of OSA diagnosis and treatment are mandatory, especially in this era of COVID-19 pandemic. This study aims to describe an alternative in-home approach to diagnose and treat OSA.

Materials and Methods: We enrolled patients aged $\geq$ 18 years with moderate/severe OSA, who underwent in-home type III polysomnography and home-based titration with automatic CPAP, coupled with an oximetry sensor for 3 consecutive nights. Patients were remotely monitored for 90 days to evaluate CPAP compliance and the use of engagement tool was encouraged.

Results: 86 participants were included. The median time to diagnosis was 1 day. Time from baseline visit to acquisition and initiation of CPAP therapy was 33 (17 – 52) days. Telemonitoring ensured good compliance in the first 30 (79.2%), 60 (76.3%) and 90 (74.3%) days with an average daily use of 6.2 $\pm$ 1.4 h, 6.0 $\pm$ 1.4 and 6.0 $\pm$ 1.3, respectively. About 1/3 of the patients used the engagement tool, which significantly increased CPAP compliance: 73.5% vs 89.9% ($p<0.002$), 70% vs 87.9% ($p<0.003$) and 67.6% vs 86.6% ($p<0.001$) at 30, 60 and 90 days, respectively.

Conclusions: We demonstrated the feasibility of in-home OSA diagnosis and treatment, ensuring prompt diagnosis and good CPAP compliance. Telemonitoring and engagement tools are strategies to improve CPAP compliance.

Follow-up of Sleep Breathing Disorders Patients in the COVID-19 Pandemic with Mandibular Advancement Device Therapy and Nocturnal Digital Monitoring: an Observational Study

D. Barbosa[1], M. Alves[2], A. Machado Júnior[1]
[1]State University of Campinas (UNICAMP), Medical School of Science, Campinas, Brazil, [2]ESALQ (USP), Piracicaba, Brazil

Introduction: Type I polysomnography (PSG) is a mandatory sleep laboratory study to diagnose and monitor patients with Sleep Breathing Disorders (SBD) treated with Positive Airway Pressure (PAP) or Mandibular Advancement Device (MAD). However, the test is expensive, time-consuming, and difficult to access. Especially during the COVID-19 pandemic, when sleep laboratory services were closed, patients were unsure about using them. In addition, some patients do not accept undergoing a second type I PSG study. In Dental Sleep Medicine, this situation is frequent and is a potential problem due to the need to monitor the results. For these patients, type IV PSG study, such as Nocturnal Digital Monitoring (NDM) BIOLOGIX, a high-resolution with an OXISTAR accurate sensor and home oximetry, provides diagnostic performance in detecting severe obstructive sleep apnea. The main objective of this study is to evaluate the NDM in SBD patients' follow-up clinically controlled with MAD therapy and monitored with NDM. In addition, to observe the coherence between the data, correlating both PSG studies.
Materials and methods: We retrospectively verified the 37 clinical records of SBD patients' objective (anthropometric, initial, and final type I and IV PSG study) and subjective (Epworth Sleepiness Scale initial and final) data from April 2019 to July 2022. The MAD used was the DIORS®. Apnea-Hypopnea Index (AHI), Oxygen Desaturation Index (ODI), Oxygen Saturation (SpO2), and Heart Rate (HR) parameters were analyzed. The study was adjusted with the support of Excel software, and we adopted a significance level of 5% to interpret the results.
Results: This study included 37 SRBD patients (men 59.46%; age:47+/-11years; BMI:26.65+/-3.24kg/m2; PSG-I-AHI:14.40+/-14.87/h and PSG-IV-ODI:7.87+/-6.22). We controlled SBD with DIORS®-MAD and monitored with NDM-BIOLOGIX® (ODI:3.85+/-4.14). We found statistical significance in ODI and AHI compared to SpO2, ODI, AHI mean(standard deviation), and student t statistic for pared data observed by type I and IV PSG parameters. Also, a statistically significant correlation was found between HR and ODI with AHI.
Conclusions: In this small sample, MAD therapy was effective, and NDM was a good tool for monitoring these SBD patients treated with MAD, especially during the COVID-19 pandemic.

From apnea to aging: insights into the impact of obstructive sleep apnea and its treatment on DNA methylation and epigenetic aging

L.S. Gaspar[1,2,3], B. Santos[1,2,4], C. Carvalhas-Almeida[1,2,4], M. Ferreira[5], J. Moita[5], C. Cavadas[1,2,3,4], A.R. Álvaro[1,2,3]

[1]CNC - Centre for Neuroscience and Cell Biology, University of Coimbra, Coimbra, Portugal, [2]CIBB - Centre for Innovation in Biomedicine and Biotechnology, University of Coimbra, Coimbra, Portugal, [3]IIIUC - Institute for Interdisciplinary Research, University of Coimbra, Coimbra, Portugal, [4]FFUC - Faculty of Pharmacy, University of Coimbra, Coimbra, Portugal, [5]Sleep Medicine Centre, Coimbra Hospital and University Centre (CHUC), Coimbra, Portugal

Introduction: Obstructive sleep apnea (OSA) has been associated with multiple molecular and cellular alterations that also characterize the aging process. Yet, whether OSA aggravates or accelerates aging is still not clear. DNA methylation has emerged as one of the most robust indicators of biological aging. In this study, we proposed to evaluate the impact of OSA and OSA treatment with continuous positive airway pressure (CPAP) on DNA methylation and epigenetic aging.

Materials and methods: This study was approved by the ethical committees of the Faculty of Medicine of the University of Coimbra and of Coimbra Hospital and University Center. We included six patients with severe OSA (56 ± 3 years), before and after 4 months (short-term) and 2 years (long-term) treatment with CPAP, seven healthy subjects of the same age group (middle-age, 49 ± 3 years), and seven young adults (24 ± 1 years) as a reference. Blood samples were collected from all participants and genomic DNA was extracted from peripheral blood mononuclear cells (PBMCs). DNA methylation was screened using the Illumina ® Infinium Methylation EPIC Bead Chip array (Illumina, San Diego, CA, USA) and the iScan. We evaluated differentially methylated positions (DMPs) between groups and performed functional enrichment analysis. Epigenetic age and age acceleration were estimated using validated chronological and phenotypic clock models.

Results: Patients with OSA showed 206 significant DMPs, associated with 139 genes in PBMCs, relative to middle-aged controls (mostly hypomethylated in OSA: 86 %, adj.p < 0.05). Among these DMPs, 56 were also significantly hypomethylated at baseline (before treatment) vs after long-term CPAP (adj.p < 0.05). We did not find significant DMPs between treated patients and control subjects. Yet, the epigenetic clock model PhenoAge evidenced an increased epigenetic age acceleration in long-term treated patients compared to baseline (adj.p < 0.05).

Conclusions: OSA promotes changes in DNA methylation that seem to be reversed by CPAP treatment. However, the increased epigenetic age acceleration observed in long-term treated patients relative to baseline indicates an accelerated/aggravated biological aging in patients with OSA, even after CPAP treatment. These observations suggest that OSA impacts on aging-related mechanisms and long-term CPAP may not fully reverse its effects. This study opens new avenues in OSA research and clinical management.

Heart rate variability and oximetry indices to detect obstructive sleep apnea using machine learning algorithms

R. R. Santos[1], M. B. Marumo[2], L. E. V. Silva[3], A. L. Eckeli[4], R. Tinós[2], R. Fazan Jr.[1]
[1]School of Medicine of Ribeirao Preto - University of Sao Paulo, Department of Physiology, Ribeirao Preto, Brazil, [2]Faculty of Philosophy, Sciences and Letters at Ribeirão Preto - University of Sao Paulo, Department of Computing and Mathematics, Ribeirao Preto, Brazil, [3]Children's Hospital of Philadelphia, Department of Biomedical and Health Informatics, Philadelphia, United States, [4]School of Medicine of Ribeirao Preto - University of Sao Paulo, Department of Neuroscience and Behavior Sciences, Ribeirao Preto, Brazil

Introduction: The diagnosis of obstructive sleep apnea (OSA), a highly prevalent clinical syndrome, is made by polysomnography (PSG), a complex and expensive test, not widely available. It generates a high rate of underdiagnosis of this syndrome, which exposes untreated patients to developing life-threatening severe comorbidities. Therefore, searching for alternative methods for diagnosing OSA is of great interest. Heart rate variability (HRV) is a simple and non-invasive approach derived from ECG, used to assess the neural modulation of cardiac activity. It is well established that numerous indices of HRV are markedly altered and can be used in the prognosis of several diseases, including OSA. Machine learning (ML) can develop models using a range of attributes to categorize patients based on their clinical condition within specific diseases. So, the study aims to evaluate the ability of HRV indices, combined with other easily accessible data, to detect OSA and classify its severity using ML algorithms.

Materials and Methods: ECGs from 290 patients (172 women, 53±15 years old) were extracted from PSG exams performed at the University Hospital of Ribeirao Preto Medical School - USP. Patients were diagnosed as normal (N=47) or with OSA in its mild (N=62), moderate (N=70), or severe form (N=111). Thirty-four HRV indices calculated by linear and non-linear methods, together with age, gender, body mass index, and SpO2 indices of each patient, were considered as input attributes to train ML algorithms. The ML models were created using multilayer perceptron (MLP) and random forest (RF) methods, aiming to classify those patients according to their severity or only to detect moderate-to-severe (AHI >15) patients.

Results: MLP and RF models reached an accuracy of 51 and 68%, respectively, in classifying OSA into its severity degrees. When ML was used only to diagnose moderate-to-severe OSA, these algorithms reached 71 and 77% of accuracy. Moreover, in all models created, we highlight the relevance of attributes derived from SpO2 to build the classifiers.

Conclusions: The present study could show the possibility of creating classifiers models attractive to detect the presence and severity of OSA using HRV and SpO2 indices. In this way, our findings could help create screening tools to assist patients suffering from this condition, seeking to haste their diagnoses and, consequently, the beginning of their treatment.

High frequency of Obstructive Sleep Apnea in consecutive patients with primary hyperaldosteronism: preliminary results

S. Giampá[1], A. Pio-Abreu[2], M. Cabrini[2], L. Bortolotto[1], G. Lorenzi-Filho[3], M. Almeida[4], L. Drager[1,2]
[1]University of São Paulo Medical School, Hypertension Unit, Heart Institute (InCor), São Paulo, Brazil, [2]University of São Paulo Medical School, Hypertension Unit, Renal Division, São Paulo, Brazil, [3]University of São Paulo Medical School, Sleep Laboratory, Pulmonary Division, Heart Institute (InCor), São Paulo, Brazil, [4]University of São Paulo Medical School, Division of Endocrinology, São Paulo, Brazil

Introduction: Growing evidence suggests that states of fluid retention may predispose to upper airway obstruction during sleep due to the rostral fluid displacement, therefore contributing to the occurrence of obstructive sleep apnea (OSA). This may be present in patients with primary hyperaldosteronism (PHA), a secondary cause of hypertension linked to hypervolemia associated with excessive aldosterone production. However, the frequency of this association (PHA + OSA) and the correlation with aldosterone levels is still not well defined.

Materials and Methods: Consecutive patients with a recent diagnosis of PHA were recruited according to standardized criteria to perform a clinical evaluation including anthropometry and questionnaire completion. The Epworth Sleepiness Scale was used to determine the subjective daytime sleepiness. All patients underwent type 3 home sleep testing (Embletta® MPR Polygraphy) for the diagnosis of moderate to severe OSA (apnea-hypopnea index [AHI] ≥15 events/h). Sleep assessment was performed without knowledge of aldosterone levels. All patients underwent sleep monitoring without using spironolactone and before the surgical procedure in cases of surgery indication. For statistical analysis, Student's t-test and Pearson's correlation coefficient test were used.

Results: We evaluated 20 patients (55% men; age: 55±9 years; body mass index: 29±4 kg/m²; neck circumference: 38±4 cm; waist circumference: 97±13 cm; AHI: 31±21 events/hour; Epworth Sleepiness Scale: 10±7). The frequency of moderate to severe OSA was 75%. There were no significant differences between patients with PHA + OSA and patients with PHA alone in relation to systolic blood pressure (155±23 mmHg versus 154±34 mmHg, respectively, p=0.27) and diastolic blood pressure (90±12 mmHg versus 93±10 mmHg, respectively, p=0.85). Aldosterone levels (35.3±17.7 ng/dL) did not correlate with the OSA severity determined by the AHI (r=0.33; p=0.14).

Conclusions: Moderate to severe OSA is very common in patients with PHA. These preliminary data suggest that OSA severity is not associated with aldosterone levels.

High level of apnea-hypopnea index is associated with an increase in vaso occlusive complications in sickle cell patients

E. Stauffer[1,2,3,4], S. Poutrel[5,2], G. Cannas[5], R. Fort[2,4,5,6], A. Gauthier[2,4,7], K. Charlot[8], A. Josset-Lamaugarny[9], B. Fromy[9], Y. Bertrand[7], C. Renoux[2,4,10], P. Joly[2,4,10], C. Boisson[2,4], A. Hot[5], L. Peter-Derex[3,11], E. Nader[2,4], T. Petitjean[3,11], P. Connes[2,4]

[1]Hospices Civils de Lyon, Respiratory Function Testing and Sports Medicine, Lyon, France, [2]Claude Bernard Lyon 1 University, Laboratoire Interuniversitaire de Biologie de la Motricité (LIBM) EA7424, Team « Vascular Biology and Red Blood Cell », Lyon, France, [3]Hospices Civils de Lyon, Centre de Médecine du Sommeil et des Maladies Respiratoires, Hospices Civils de Lyon, Hôpital Croix Rousse, Lyon, France, [4]Université Paris Sorbonne, Laboratoire d'Excellence du Globule Rouge (Labex GR-Ex), Paris, France, [5]Hospices Civils de Lyon, Service de Médecine Interne, Hôpital Edouard Herriot, Lyon, France, [6]Hospices Civils de Lyon, Service de Réanimation Médicale, Hôpital Lyon Sud, Lyon, France, [7]Hospices Civils de Lyon, Institut d'Hématologique et d'Oncologique Pédiatrique, Lyon, France, [8]Institut de Recherche Biomédicale des Armées, Unité de Physiologie des Exercices et Activités en Conditions Extrêmes, Département Environnements Opérationnels, Brétigny-sur-Orge, France, [9]Laboratoire de Biologie Tissulaire et Ingénierie Thérapeutique, UMR CNRS 5305, Lyon, France, [10]Hospices Civils de Lyon, Laboratoire de Biochimie et de Biologie Moléculaire, UF de Biochimie des Pathologies Erythrocytaires, Centre de Biologie et de Pathologie Est, Lyon, France, [11]Claude Bernard Lyon 1 University, Centre de Recherche en Neurosciences de Lyon, CNRS UMR 5292, INSERM U 1028, Lyon, France

Introduction: Sickle cell disease (SCD) is the most frequent genetic disease worldwide. Obstructive Sleep Apnea (OSA) is frequently associated with SCD but the clinical, biological and physiological impact of such association is poorly described. The aims of this study were: 1) to explore the associations between OSA, and the history of several acute/chronic complications in SCD, 2) to investigate the impact of OSA on several determinants of SCD complications (hematological, autonomic nervous system (ANS) activity and microvascular reactivity).

Materials and Methods: Twenty-two homozygous SCD patients underwent microvascular reactivity test with laser Doppler flowmeter, at rest and after local hyperthermia, complete polysomnography recording and blood sampling. ANS activity was assessed using heart rate variability from the electrocardiogram performed overnight with polysomnography.

Results: Nine subjects had a positive diagnosis of OSA defined by an apnea-hypopnea index (AHI) greater than or equal to 15/h. Subjects with a positive history of vaso-occlusive complications (VOC) within 2 years before inclusion exhibited greater level of AHI (30.8 ± 31.6 vs 11.5 ± 3.9 p <0.001). OSA subjects exhibited higher blood pressure (systolic blood pressure: 126.3 ± 22.3 vs 107 ± 11.7 mmHg p=0.03; diastolic pressure: 70.1 ± 10.2 vs 61.6 ± 9.1 mmHg p=0.05). Patients with OSA tended to have a greater sympathetic activity (LF/HF = 6.1 ± 6.1 vs 2.3 ± 2.3 p=0.063). No difference regarding microvascular reactivity was observed between apnoeic and non-apnoeic patients. Cutaneous vascular conductance peak and plateau after local hyperthermia expressed in percentage of baseline was no different between OSA and non OSA subjects (peak: 889.8 ± 643.6 vs 979.7 ± 1145.1, respectively, p=0.834; and plateau: 1338.5 ± 967.1 vs 1553 ± 430.7, respectively, p=0.601).

Conclusions: AHI level was significantly higher in subjects having a positive history VOC within the two previous years. While microcirculatory function seems to not be affected by OSA in SCD, the greater blood pressure in this group suggests impaired macrovascular function. Further studies are needed to confirm the role of the ANS in the association between OSA and VOC in sickle cell patients.

Home-based measures of obstructive sleep apnea in middle-to-older aged Black, Mexican American and non-Hispanic White adults

Y. Leng[1], C. Peltz[2], S. Redline[3], K. Stone[4], S. O'Bryant[5], K. Yaffe[6]
[1]University of California, San Francisco, Department of Psychiatry and Behavioral Sciences, San Francisco, United States, [2]San Francisco VA Medical Center, San Francisco, United States, [3]Brigham and Women's Hospital, Harvard Medical School, Department of Medicine, Division of Sleep and Circadian Disorders, Boston, United States, [4]California Pacific Medical Center Research Institute and University of California, San Francisco, Department of Epidemiology and Biostatistics, San Francisco, United States, [5]Institute for Translational Research, University of North Texas Health Science Center at Fort Worth, Fort Worth, United States, [6]University of California, San Francisco and San Francisco VA Medical Center, Departments of Psychiatry and Behavioral Sciences, Neurology, and Epidemiology, San Francisco, United States

Introduction: Racial/ethnic differences may exist in sleep quality and disorders, but there are limited data directly comparing objective measures of obstructive sleep apnea (OSA) among Black, Mexican American (MA) and non-Hispanic White (NHW) populations.

Materials and Methods: To date, the ongoing Health and Aging Brain Study-Health Disparities (HABS-HD)-Dormir study has enrolled 761 participants using a community-based participatory research approach. Here we describe OSA indices assessed by in-home assessments using WatchPAT, a Peripheral Arterial Tonometry (PAT)-based home sleep testing system that is validated for the diagnosis of OSA.

Results: Participants had a mean age of 65.6±8.2 (50-90) years, comprised of 64% women; 34% MA, 24% Black and 42% NHW adults. Over half (52.0%) of the participants had moderate or more severe OSA as defined by the respiratory event index (REI based on 3% desaturations) of ³15/hour, 73.1% with REM-OSA (REM-REI ³15/hour) and 40.6% with NREM-OSA (NREM-REI ³15/hour). The median of the average snoring volume through the night was 41 (40-61) dB. The median percentage of sleep time spent with oxygen saturation below 90% (SpO_2<90%) was 1.0%. After adjustment for age, sex, Body Mass Index, cognitive status, and history of hypertension, diabetes, stroke and heart attack, Black and MA participants were 71% and 55% more likely to have REM-OSA compared to NHW participants (p=0.04), but had similar prevalence of NREM-OSA (p=0.80) and overall OSA (p=0.32). The adjusted mean percentage of sleep time spent with over 40dB snoring volume was higher among Black (22.7%, p=0.03) and MA adults (21.2%, p=0.11) than NHW adults (18.5%). The adjusted mean prevalence of nocturnal hypoxemia (SpO_2<90% time ³ 1%) was similar among Black (48.2%), MA (51.7%) and NHW (50.0%) adults; p=0.83.

Conclusions: In this middle-to-older-aged population, PAT-based measures of OSA indicate a higher prevalence in minoritized adults of REM-specific sleep apnea, a phenotype associated with increased rates of hypertension and mortality. Home-based measures that do not distinguish between REM and NREM respiratory events may underestimate sleep apnea in these groups.

Home monitoring for clinically suspected obstructive sleep apnea in pregnancy

J. Wang[1], G. Liu[1], F. Han[1]
[1]Peking University People's Hospital, Beijing, China

Introduction: Obstructive sleep apnea (OSA) is common and associated with adverse outcomes in pregnancy. As an alternative to polysomnogram, studies of home sleep apnea test (HSAT) could be useful if validated in use in this population.

Materials and methods: 92 pregnant women (34.5 ± 4.3 years old, gestational age 25.4 ± 8.9 weeks, BMI 29.9± 4.7 kg/m^2) with suspected OSA underwent HSAT with the Nox-T3 PM followed by an overnight polysomnogram (PSG) and PM recording simultaneously in the laboratory within one week. PMs were scored automatically and manually using a 3% criteria, and compared to PSGs scored by following guidelines.

Results: Apnea-hypopnea index (AHI) was 8.56 ± 10.42, 8.19 ± 13.79, 8.71 ± 14.19 on HSAT, in-laboratory PM recording and PSG (p= 0.955), respectively. Bland-Altman analysis of AHI on PSG versus HSAT showed a mean difference (95% confidence interval) of −0.15 (−1.83, 1.53); limits of agreement (= ± 2 standard deviations) was −16.26 to 16.56 events/h. Based on a threshold of AHI ≥ 5 events/h, HSAT had 91% sensitivity, 85% specificity, 84% positive predictive value, 92% negative predictive value compared to PSG. When comparing the simultaneous recordings, closer agreements were observed. Automated vs. manual analysis of PM were no different.

Conclusions: A type III PM had an acceptable failure rate and high diagnostic performance operating as a reasonable alternative for in-laboratory PSG in pregnant women.

Hypoglossal Nerve Stimulation: Experience at the VA Ann Arbor

S. Chung[1,2], J. Gallup[1,2], M. Dutt[1,2], M. Massoud[1,2], J. Barkham[1,2], Q.A. Shamim-Uzzaman[1,2]
[1]University of Michigan, Sleep Medicine, Ann Arbor, United States, [2]VA Ann Arbor Healthcare System, Ann Arbor, United States

Introduction: A hypoglossal nerve stimulator is an implantable device approved in the USA by the Food and Drug Administration for the treatment of moderate-to-severe obstructive sleep apnea (OSA)—AHI 15-100 events/hour with < 25% of events being central in nature—in patients who have nonconcentric collapse of their airway, a BMI < 40, and who have tried and failed positive airway pressure (PAP) therapy.

Materials and Methods: As part of a quality improvement (QI) project to improve care for the treatment of OSA in patients at the Veterans' Health Administration in Ann Arbor, MI (USA), electronic health records were reviewed of all patients seen at the facility's Sleep Clinic who were referred for drug-induced sleep endoscopy (DISE) as part of the work up for potential implantation of a hypoglossal nerve stimulator. Primary endpoints were to assess how many patients underwent hypoglossal nerve stimulator implantation after DISE, how many underwent a titration study after the implantation to identify appropriate stimulator settings, and how many patients were adhering to stimulator therapy after implantation.

Results: A total of 23 patients were identified who underwent DISE for evaluation of appropriateness for hypoglossal nerve stimulator therapy. Of these, 21 patients (91%) underwent stimulator implantation. All patients who underwent implantation were males, had an average age at implantation of 64 years (range 37 – 76 years), average BMI of 30 (range 24 – 38), and average pre-implant AHI of 39.3 (range 17.9 – 72.5). Of these, at the time of review, 16 patients had had an in-lab titration of the stimulator, with an average AHI reduction of 62%; 11 out of 16 (69%) had surgical success (AHI reduction >50% + AHI < 20) and 3 of the 16 (20%) identified a stimulation threshold to reduce the AHI below 5. At their last clinic follow up, 62% of patients were using the therapy at the best tolerated stimulation for at least 4 hours/night on at least 70% of nights, for an average of 5.3 hours/night (30 hours/week when only weekly use was documented).

Conclusions: Hypoglossal nerve stimulation is an established alternative therapeutic modality for the treatment of OSA in patients who have failed or are intolerant to PAP therapy. In these patients who were unable to treat their moderate-to-severe OSA with PAP, HNS afforded some treatment of OSA. Adherence to HNS therapy was better than that reported in the literature for PAP. However, our study showed lower efficacy of HNS therapy than the original STAR trial or its 5-year follow up study. Although our study was part of a QI project and not a randomized controlled trial (RCT), it may be more reflective of real world situations than the strict confines of an RCT. Of note, our project included only United States military Veterans, who may face unique challenges to therapy in comparison to the general civilian population. More research is needed to evaluate the efficacy of this treatment modality and patient tolerance to therapy, especially in the Veteran population.

Hypoxia impairs de-novo lipogenesis during adipocyte differentiation - could OSAS cause obesity?

J. Polak[1], L. Slovakova[1], K. Pospisilova[2], J. Vavra[3]
[1]Charles University, Third Faculty od Medicine, Department of Pathophysiology, Prague, Czech Republic, [2]Charles University, First Faculty od Medicine, Institute of Medical Biochemistry and Laboratory Diagnostics, Prague, Czech Republic, [3]Charles University, Faculty of Science, Department of Cell Biology, Prague, Czech Republic

Introduction: Obstructive sleep apnea syndrome, manifested by tissue hypoxia, is causally linked with the development of metabolic diseases such as Type 2 diabetes. Although there is convincing epidemiological evidence, molecular mechanisms mediating the adverse metabolic effects remain unclear. Hypoxia may play an important role and modulate metabolic pathways in young adipocytes including the utilization of glucose and acetate or the activation of the reverse tricarboxylic acid cycle (rTCA) leading to increase de novo lipogenesis and excessive fat accumulation.

The aim of the study was to investigate whether exposure to hypoxia modifies sources for *de novo* lipogenesis during adipocyte differentiation.

Materials and methods: Mouse 3T3-L1 cells were differentiated into adipocytes for 7 days - early adipocytes (EA) or 14 days - late adipocytes (LA). The cells were cultured in gas-permeable cultureware allowing exposure to sustained oxygen levels of 21% O_2 or 4% O_2. $[^{13}C_5]$-glutamine (2.5mM) was added to culture media to assess ^{13}C incorporation to newly synthesized lipids via rTCA and $[^{13}C_1]$-glutamine (2.5mM) was added to media to assess ^{13}C incorporation to rTCA metabolites (citrate, malate). The ^{13}C incorporation studies were analyzed via gas chromatography-mass spectrometry. The contribution of glucose and acetate to de novo lipogenesis was assessed using $[^{14}C]$-glucose and $[^{14}C]$-acetate (both 0.2 µCi) provided in culture media for 2h at the end of experiments. Subsequently, radioactivity in extracted lipids was measured via scintillation counter. Statistical significance was assessed by 2-way ANOVA followed by Tukey's test. Data are presented as means ± SD, N=9.

Results: Hypoxia increased palmitate accumulation in LA by 134.41% vs control. The glutamine-derived ^{13}C to lipids was increased in EA by 42% vs control. The ^{13}C incorporation in citrate was increased by 9%, in malate by 10% in EA vs control, in LA the incorporation into metabolites remained unchanged compared to control. The $[^{14}C]$-glucose incorporation to lipids was elevated by 210% in EA vs control, in LA the $[^{14}C]$-glucose contribution remained unchanged compared to control. The $[^{14}C]$-acetate incorporation to lipids increased during the differentiation by 247% vs control. All reported differences were statistically significant ($p < 0.05$).

Conclusions: Hypoxia increased intracellular palmitate content in late adipocytes. The rate of substrate utilization for de novo lipogenesis was differently affected by hypoxia during adipocyte differentiation as the contribution from glucose and glutamine (rTCA) decreased, whereas acetate contribution increased.

Impact of OSA treatment on marital relationships

C. Cascais Costa[1], V. Afreixo[2], J. Cravo[1]
[1]Centro Hospitalar Baixo Vouga, Pulmonology Department, Aveiro, Portugal, [2]University of Aveiro, Mathematics Department, Aveiro, Portugal

Introduction: Obstructive Sleep Apnoea (OSA) is a highly prevalent pathology in our population.
All the typical symptoms of this pathology can contribute to conflicts between couples, namely in the partner's sleep quality, often leading one of the spouses to change rooms.
Introducing the recommended treatment for OSA has a positive impact on the quality of life of individuals, leading to increased vitality, and improvements in physical and mental health and social relationships.
The authors carried out a study to investigate the impact of the introduction of therapy for OSA on the quality of marital relationships. They also assessed the proportion of couples who slept separately and the effect of starting treatment on this specific aspect of the relationship.
Materials and Methods: Prospective study carried out between April 2021 and April 2023, with users diagnosed with OSA in a level two hospital in Portugal.
A questionnaire was applied before and after the start of treatment, which included the age and sex of both user and partner, whether they slept together or separately, the disturbing factors of sleep quality, and questions related to satisfaction with the marital relationship.
Statistical analysis was performed using R version 4.2.2.
Results: 70 questionnaires were applied, 79% to male users, with a mean age of 58 ± 11 years. 47% of patients had severe OSA, 33% moderate and 20% mild. 41% of users reported that they slept at least once or twice a month separated from their spouse, and of these 41% always slept in separate rooms.
In 31% of cases the patient left the bedroom, in 52% the partner did, and in the remaining cases they varied who left. 55% of users who slept separately had severe OSA. The factors most reported as nuisances were snoring (86%), restless sleep (17%), and witnessed apnoea (14%).
After treatment, 72.4% started to sleep together again, there was a change in the condition before and after the intervention with statistically significant differences.
Within the group that slept separately, patients who started to sleep together reported a higher benefit in their personal lives (38% versus 81%) as well as their partners (25% versus 95%, with a statistically significant difference).
Among all patients, 69% said that their personal life had improved and when asked the same question to their spouse, 74% recognized the benefit of therapy.
Conclusions: Starting treatment positively influenced the quality of life and the marital relationship of users and their partners, which remains a little explored benefit of this therapy.

Improvement in sleep apnea-specific hypoxic burden with novel oral appliance O2Vent Optima and oral positive pressure accessory ExVent

S. Sharma[1], A. Conflitti[1], H. Reiter[1], G. Mikhailov[1]
[1]Centre for Sleep and Chronobiology, Toronto, Canada

Introduction: Evidence suggests that moderate to severe OSA patients have increased risk of major adverse cardiovascular events (MACE; composite of coronary heart disease, heart failure, stroke, or cardiovascular mortality) and that OSA-specific hypoxic burden (HB) is associated with increased risk of cardiovascular disease (CVD) mortality. Sleep apnea-specific hypoxic burden (SASHB) appears to be more predictive of OSA-related risk than AHI but has not been studied as a measure of efficacy in patients treated with oral appliance therapy. This is the first assessment of the ability of novel oral appliance combined with a positive pressure accessory (O2Vent Optima + ExVent) to reduce SASHB, rather than AHI, to define therapeutic efficacy.

Materials and methods: Data previously obtained from a clinical study to assess efficacy of the mandibular advancement device O2Vent Optima + ExVent in the treatment of OSA were analyzed. Study participants with OSA (n = 8 mild, n = 4 moderate) The subjects completed a PSG study to obtain the baseline AHI and confirm a diagnosis of mild to moderate OSA. Home Use Phase: Subjects used the O2Vent Optima + ExVent for up to 3 months and logged usage hours. Subsequent to the Home Use Phase subjects underwent an in-lab PSG sleep night while using the O2Vent Optima + ExVent.

Results: Treatment with Optima + ExVent reduced AHI from 10.58±4.22/hr to 5.2±2.17/hr (p< 0.0001) SASHB from 22.46±14.07 %min/h to 11.71±5.27 %min/h (p < 0.005). Average reduction in AHI with Optima + ExVent was 52% while average reduction in SASHB was 83%.

Conclusions: In the population studied, O2Vent Optima + ExVent significantly improved SASHB in addition to the AHI. Sleep apnea-specific hypoxic burden likely provides a more meaningful assessment of OSA treatment efficacy as it accounts for the risk associated with the disease.

Acknowledgements: Centre for Sleep and Chronobiology for their generous support.

Inflammatory biomarker levels and severity of obstructive sleep apnea in children residing at high altitude

M.A. Bazurto-Zapata[1], E. Dueñas-Meza[1], M.I. Escamilla-Gil[1], M. Suarez[1], P. Triana[2], A.M. Santos[3], D. Gozal[4], L.F. Giraldo-Cadavid[1]
[1]Fundacion Neumologica Colombiana, Sleep Center, Bogota, Colombia, [2]Universidad de la Sabana, Epidemiology, Chia, Colombia, [3]Universidad de la Sabana, Inmunology Laboratory, Chia, Colombia, [4]Marshall University, Health Affairs, Huntington, United States

Introduction: Obstructive sleep apnea (OSA) has a high prevalence in children. Intermittent hypoxia (IH) caused by OSA could lead to the activation of signaling pathways closely linked to tissue damage. Serum biomarkers related to inflammation have been found in patients with OSA and other inflammatory diseases, including asthma. No studies have evaluated the impact of altitude-associated hypoxia on these inflammatory mechanisms. The aim of this study was to establish the levels of inflammatory biomarkers at high altitudes in children with OSA with and without asthma and in children with asthma without OSA and to correlate these biomarker with the AHI and desaturation indices.
Materials and Methods: A cross-sectional, analytical, prospective study was conducted on 309 children aged 5 to 16 years in Bogotá (2640 meters above sea level), Colombia. All children underwent a complete medical history and full polysomnography according to standards of AASM. After obtaining consent from the patients, venous blood samples were collected. Serum was separated into cryovials and stored at -80°C until processing and then measuring the biomarkers.
Results: Among the total children, 84/309 (27.2%) had OSA without asthma, 49/309 (15.9%) had asthma without OSA, 129/309 (41.8%) had both OSA and asthma, and 47/309 (15.2%) were healthy controls. The Spearman correlation coefficient (ρ) between the obstructive AHI and levels of inflammatory biomarkers showed a weak positive correlation with erythrocyte sedimentation rate (ESR) (ρ: 0.2; p = 0.018). After adjusting for body mass index (BMI), age, asthma, and sex through quantile regression, a weak positive and significant association was found with insulin-like growth factor 1 (IGF-1) (ρ = 0.1; p = 0.046) and pro-B-type natriuretic peptide (proBNP) (ρ = 0.2; p = 0.005), while the correlation with ESR persisted (p = 0.004). The oxygen desaturation index (ODI) showed a weak positive and significant correlation with interleukin-6 (IL-6) (ρ = 0.1; p = 0.036), high-sensitivity C-reactive protein (hs-CRP) (ρ = 0.1; p = 0.032), and ESR (ρ = 0.3; p = 0.003). The adjustment through quantile regression for BMI, age, asthma, and sex revealed persistent statistical significance for the association between ODI and IL-6 (p = 0.006), hs-CRP (p = 0.016), and ESR (p < 0.001). A significant correlation was found with proBNP (ρ = 0.1; p = 0.009) and hypoxia-inducible factor 1 (HIF-1) (ρ = 0.1; p = 0.028) after adjustment. ProBNP was higher in children with OSA (0.74; 0.3 to 1.3) than in healthy controls (0.26; 0.1 to 1.7; p = 0.011). IL-10 was higher in children without OSA (114.1; 82.6 to 213.4) but this association disappeared after adjusting for BMI, age, sex, and asthma.
Conclusions: We found a relationship between proBNP, the presence of OSA, AHI, and ODI, which may make it a potential biomarker of cardiovascular morbidity in children with OSA. Similarly, the correlation between ODI and HIF-1 supports the presence of these two biomarkers as potential indicators of morbidity in children with OSA. The ODI showed a stronger association with inflammatory biomarkers than the AHI.

Influence of ethnic and gender on the pressure of non-invasive ventilation in patients with obstructive sleep apnea hypopnea syndrome

X.-l. Jiang[1], J. Shi[1], Q. Zhang[1], H. Yang[1], S. Ma[1], M. Han[1], H. Wang, F. Han[1,1]
[1]Xinjiang Second Medical College/Karamay Central Hospital, Department of Respiratory and Critical Care Medicine, Karamay, China

Objective: To analyze the pressure of 239 patients with obstructive sleep apnea hypopnea syndrome (OSAHS) of Han and Uygur nationality treated with non-invasive ventilation at night.

Methods: From April 2021 to December 2022, 239 patients with OSAHS underwent polysomnography (PSG) and Pressure titration treatment in sleep center of Karamay Central Hospital, Physical examination included height, weight, neck circumference (NC), abdominal circumference (AC) and the body mass index (BMI). polysomnography (PSG) and Pulse Oximetry were performed at night. The recording parameters include apnea-hypopnea index (AHI), the number of desaturations ≥4% per hour (ODI_4), mean oxygen saturation ($MSaO_2$),The lowest oxygen saturation ($LSaO_2$) and the percentage of time when oxygen saturation is lower than 90% in the total recording time (SIT_{90}). Automatic titration positive airway pressure(Auto-CPAP) (Resmed S9, Resmed company, Australia) to perform non-invasive ventilation treatment for patients with OSAHS, The recording parameters include 95th percentile pressure (P_{95}), median pressure, minimum pressure (Pmin) and maximum pressure (Pmax) during non-invasive ventilation at night.

Results: Among 239 patients with OSAHS, Included 199 Han patients with OSAHS whose mean age is (54 ± 14) years and 40 Uygur patients with OSAHS whose mean age is (55 ± 11) years, 162 male patients with OSAHS whose mean age is (50 ± 13) years and 77 female patients with OSAHS whose mean age is (61 ± 12) years. Han and Uygur patients with OSAHS were matched with age[(54 ± 14) years vs.(55 ± 11)years)], AHI[(40 ± 23) evens/h vs. (34 ± 25) evens/h], ODI_4[(42 ± 22) evens/h vs. (36 ± 24) evens/h], $MSaO_2$ [(91 ± 2.2)% vs. (91 ± 2.6)%] and $LSaO_2$[(74 ± 10)% vs. (75 ± 9)%], There are significant differences in NC[(38 ± 8) cm vs. (41 ± 4) cm], AC [(95 ± 21) cm vs. (110 ± 14) cm], P_{95} [(4.6 ± 6.5) cm H_2O vs. (8.4 ± 6.3) cm H_2O] and median pressure value [(3.5 ± 5.1) cmH_2O vs. (6.3 ± 5.2) cmH_2O] between Han and Uygur patients with OSAHS groups(P<0.05). We selected 101 male and 63 female patients with OSAHS were matched with age[(59 ± 9) years vs. (58 ± 8)years], AHI[(35 ± 20) evens/h vs. (35 ± 25) evens/h], ODI_4[(37 ± 21) evens/h vs. (39 ± 24) evens/h], $MSaO_2$ [(91 ± 2.2)% vs. (91 ± 2.0)%] and $LSaO_2$[(76 ± 8)% vs. (74 ± 8)%], There are significant differences in NC [(39 ± 8) cm vs. (37 ± 4) cm],BMI[(28.3 ± 3.4) kg/m^2 vs. (30.5 ± 6.6)kg/m^2] and Pmax [(13.9 ± 3.2)cmH_2O vs. (12.7 ± 3.5)cmH_2O] between male and female patients with OSAHS groups (P<0.05).

Conclusion: The pressure value of patients with OSAHS treated with non-invasive ventilation is related to ethnic and gender. The P_{95} and median pressure in Uygur patients with OSAHS is higher than the Han patients with OSAHS, And the Pmax in male patients with OSAHS is higher than the female patients with OSAHS.

Insomnia and sleepiness behavior by gender in patients with moderate and severe OSA. Impact on comorbidities

L. Vargas-Ramirez[1], F. Valderrama[1], D. Cano[1], L. Rodríguez[1], M.C. Gómez[1]
[1]Instituto Neumológico del Oriente, Bucaramanga, Colombia

Introduction: Insomnia and daytime sleepiness are clinical phenotypes in obstructive sleep apnea (OSA) that can impact their association with comorbidities.
The objective is to describe the behavior of these phenotypes in the Colombian population.
Materials and Methods: Cross-sectional study. Patients were referred for polysomnography, and standardized questionnaires were conducted on the night of the study. Institutional ethics committee approval was obtained. Descriptive and stratified bivariate analysis by gender, sleepiness, insomnia, and obesity. Gender differences in each of the groups were assessed using the non-parametric Mann-Whitney U test.
Results: 481 patients, 59.5% men, average age 58.3 years, average BMI 30.7, 52.6% married, secondary education 31.5%, university education 16.3%, and primary education 15.8%: 24.6% retired, 20.3% homemakers, and 19.4% self-employed. The severity of OSA was higher in men than in women, more pronounced in non-obese patients with sleepiness: men 37.7/h vs. women 29.1/h, p 0.025, and without sleepiness: men 39.6/h vs. women 29.5/h, p 0.001.
Of the total number of patients who reported an Epworth score >10, 61.2% were men, and 38.8% were women.
In the case of patients who reported onset insomnia defined as a subjective sleep latency >30 minutes, 49.3% were women, and 50.7% were men.
There were no differences in the total hours of sleep reported by patients regardless of whether they experienced daytime sleepiness.
Both, men and women with daytime sleepiness reported an average of 6 hours of sleep, while women without daytime sleepiness reported 5.74 hours compared to 6.15 hours in men, which was not statistically significant.
Women who reported onset insomnia reported 5.5 hours of sleep compared to 5.62 hours in men, with no statistically significant difference.
There were differences in the frequency of comorbidities among phenotypes: Men without sleepiness have a higher prevalence of hypertension. Hypothyroidism is more common in women regardless of sleepiness. Diabetes is more common in women without sleepiness.
Depression is more common in women with daytime sleepiness, and there were no differences by gender in those who reported onset insomnia.
Women with onset insomnia have a higher prevalence of hypertension and heart disease.
Conclusions: Men and women with moderate to severe OSA sleep less than the recommended time for their age group. Daytime sleepiness is more common in men and is not influenced by the hours of sleep. Comorbidities vary by gender depending on the clinical phenotype.

Integration of machine learning-based expert systems for patients with obstructive sleep apnea receiving oxygen-enriched positive airway pressure treatment

D. Bliznuks[1], A. Svaža[2], S. Kistkins[2], P. Osipovs[1], E. Kviesis-Kipge[1], D. Freimanis[3], D. Zariņa[3], V. Pīrāgs[3]
[1]Riga Technical University, Smart Computing Technology Institute, Riga, Latvia, [2]Sleep Disease Centre, Riga, Latvia, [3]Pauls Stradiņš Clinical University Hospital Research Institute, Riga, Latvia

Introduction: Despite the widespread supplementation of CPAP/APAP and BiPAP therapy with additional oxygen, potential hazards due to inaccurate dosing causing hypoxia and hyperoxia have been identified in patients with Obstructive sleep apnoea (OSA) and chronic obstructive lung disease (COPD). The personalized dosage of the oxygen flow remains unknown for each person receiving therapy. To address this challenge, there is a pressing need to develop an automated diagnostic system that eliminates the requirement for constant expert monitoring of respiratory status, enabling positive pressure dynamics and oxygen dosage prediction.

Materials and methods: The aim of the study was to develop and clinically validate the monitoring and prediction of pressure/oxygen treatment strategy systems for patients' using non-invasive ventilation devices in treating COPD and OSA patients. The system comprised a custom-designed printed circuit board capable of capturing vital and respiratory parameters (such as pulse, RR, SpO_2, and $tcCO_2$). It utilized mobile 4G to transmit data to a central processing center, for clinical validation patients with OSA and OSA-COPD overlap have been initially identified by Pauls Stradins Clinical University Hospital (Riga, Latvia) electronic medical records and outpatient cards of the Sleep Disease Center (Riga, Latvia). Following the signature of the informed consent as well as the criteria for inclusion and exclusion, patients were connected to a polysomnography system using a standardized setup and protocol to verify AHI before and after the intervention. The study was divided into two main clinical phases: adaptation of patients to positive pressure dynamics followed by intervention with standard oxygen titration in a range of 0-5 L/min maintaining eucapnic or reducing hypercapnic condition within the SpO_2 target range according to clinical guidelines. Dynamic Markov's chain approach was used to survey a patient's respiratory state, proposing optimal airway pressure and oxygen supply. Markov chain elaborated on an expert pulmonologist's knowledge of a known patient's respiratory state and transition between the patient's conditions. The probability coefficients of the transitions were tuned by using a machine learning-based approach, to dynamically optimize previously described non-invasive interventions.

Results: The study included 13 OSA patients, aged 66 ±8 years with an BMI of 39.2 ±8.3 kg/m2. Pre-interventional $tcCO_2$ >50 mmHg and SpO_2 <90%. Despite the small sample size, k-fold cross-validation was conducted involving all 13 patients. The expert system assessed pressure dynamics up to 20 cmH_2O and the oxygen titration range of 0-5 L/min. A patient monitoring system was capable of detecting real-time respiratory changes in OSA patients on oxygen-enriched positive airway pressure therapy. AHI significantly decreased during intervention compared to non-intervention ($p<0.05$), maintaining the oxygen target range and reducing hypercapnia ($p<0.05$) compared to non-oxygenated intervention.

Conclusions: The proposed clinical decision support system for positive airway pressure devices holds great potential for enhancing the monitoring of patients' respiratory conditions and offering timely and accurate oxygen supplementation for individuals undergoing oxygen supplementation during CPAP/APAP therapy.

Intraoral pulse oximetry to quantify sleep apnea related hypoxemia: proof of principle

D. Vena[1], N. Esmaeili[1], R. Radmand[2], Y. Mendelson[2], B. Radmand[2], S. Sands[2], A. Azarbarzin[1]
[1]Brigham and Women's Hospital and Harvard Medical School, Medicine, Boston, United States, [2]iNOS Technologies, Boston, United States

Introduction: Determining the severity of obstructive sleep apnea (OSA) and individual responses to oral appliance therapy are currently limited by the use of sleep study data from a single night of measurement, which hampers the ability to account for night-to-night variability or to monitor changes over time. Nightly monitoring solutions are needed to objectively guide a successful therapy titration or to identify inadequate response that requires additional intervention. The current proof-of-principle study evaluated the feasibility of collecting pulse oximetry data from the soft tissues inside the oral cavity (intraoral) via a custom oral appliance to specifically assess OSA-related hypoxemia (i.e. oxygen desaturation index).

Methods: In an ongoing study, 5 patients completed nocturnal data collection with wireless intraoral biosensor consisting of pulse oximetry using an internal reflection oximetry sensor housed within a custom oral appliance directed at the soft tissue of the buccal mucosa (iNOS technologies, Boston MA). Concomitant overnight home polysomnography included traditional finger-based oximetry (Nox A1 with Nonin 3150, Nox Medical, Iceland). Intraoral data and Nonin data were first aligned using calculated pulse rate from respective photoplethysmography (PPG). Preliminary beat-by-beat SpO_2 was calculated using the amplitude of red and infrared signals. Biomarkers of signal error (intraoral SpO_2 versus delay-adjusted Nonin SpO_2)—based on signal-to-noise, red-versus-infrared waveform differences, and beat-by-beat SpO_2 variability—were combined (regression) to identify high-quality SpO_2 values to include in a moving-average signal for analysis. We quantified 1) mean SpO_2 bias for each subject (intraoral versus reference) and 2) how closely intraoral SpO_2 tracked reference SpO_2 changes using bias-subtracted absolute error (median and 95th centile). Oxygen desaturation index (4% criteria) was calculated using all available 20-min windows of data with concurrent intraoral and reference SpO_2 signals and averaged to provide a single value per subject.

Results: Data from 5 subjects were collected. An average of 3.8 hours of recording per subject were collected, which provided an average 3.3 hours of SpO_2 signal per subject for analysis. Bias in mean SpO_2 ranged from -1.7 to 2.6% across subjects. Median and 95th centile absolute errors for intraoral SpO_2 were 0.8% and 4.0% respectively (N=59838 samples of second-by-second data). Bias in mean pulse rate ranged from -0.3 to 1.3 beats/min across subjects. Median and 95th centile absolute errors for intraoral heart rate were 0.8 to 5.2 beats/min respectively. Intraoral oxygen desaturation index closely matched reference values in four of five subjects (individual data; Subject 1: 54 vs. 53 /hr; Subject 2: 2 vs 1 /hr; Subject 3: 7 vs. 29 /hr; Subject 4: 12 vs. 16 /hr; Subject 5: 6 vs. 7 /hr) and correlated well between modalities (N=5, Pearson R=0.90, P=0.037).

Conclusion. The current study demonstrated, for the first time, that oximetry information is available from intraoral tissues, and confirmed the proof-of-principle that intraoral oximetry provides a means to quantify the severity of sleep apnea related hypoxemia. Future work will involve inclusion of additional available biosignals to improve signal error assessment (accelerometry) and evaluation of the utility of intraoral SpO_2 to guide successful oral appliance treatment titration.

Investigating the association between pediatric OSA and orofacial motor skills

L. Trawitzki[1], F. da Silva Dias[1], L. Azevedo[1], W. Anselmo Lima[1], F. Valera[1], D. Garcia[1], C. De Felício[1]
[1]University of São Paulo / Ribeirão Preto Medical School, Department of Ophthalmology, Otorhinolaryngology, and Head and Neck Surgery, Ribeirão Preto, Brazil

Introduction: A possible impairment in orofacial motor control in pediatric obstructive sleep apnea (OSA)was previously suggested. However, a comprehensive analysis of the orofacial motor skills in children with OSA is lacking. Thus, this study aimed to carry out a detailed and comparative investigation of the muscles and orofacial motor skills of children with OSA.

Materials and Methods: This study involved the participation of twelve children with OSA (OSA group) and 12 healthy children of the sex-and age-matched population (control group). The diagnoses were made at the same hospital, according to the American Academy of Sleep Medicine. The Research Ethics Committee of the institution approved the study.

The orofacial muscles and motor skills were assessed using the orofacial myofunctional evaluation with scores protocol, bite force (BF) measures, tongue strength, and electromyographic muscle analysis (EMG) during swallowing.

The sample size was calculated based on data previously reported. For a 80% statistical power (type II error, beta) and alpha (type I error) set at 5%, no variable required more than 10 participants per group.

Parametric or nonparametric statistic tests were used for group comparisons. The effect size (ES) of Rosenthal's r was used for the Mann-Withney test and partial eta squared for ANOVA to quantify the magnitude of differences independent of sample size.

Results: Demographic and clinical characteristics of the AOS and Control groups were, respectively: female sex % (50% x 66.6 %); age (9.7±1,5 x 10.0±1.3 years); BMI (17.3±1.7 x 17.6±1.6 Kg/m2); cervical circumference (28,8 ± 1,3 cm), P > 0.05 for all comparisons.

Myofuncional orofacial evaluation: The OSA group had lower scores (worst conditions) in appearance/posture, mobility of components, and orofacial functions than the control group (P <.0001). The BF and tongue strength in protrusion (TSP) and swallowing (TSS) were lower in the AOS group (BF = 210.2±86.1; TSP = 32.1±10.4; TSS= 25,9±8,2) than Control group (BF = 294.8±107.0; TSP = 42.8±5.4; TSS= 36.4±7.5), P < 0.02.

The mean EMG activity during MVC, the peak of activity (RMSµV), and the maximum velocity (µV/s) during spontaneous swallowing were lower in the AOS group than in the Control group (P < 0.006). There was a significant difference among muscles, but not group x muscle interaction. The integral (%*s) value of the suprahyoid and masseter muscles was higher in the OSA group compared to the control group in the water swallowing (50 mL) task (P < 0.003). The effect size ranged from moderate to large for all differences between groups.

Conclusions: The results showed that children with OSA, in addition to the previously described miofunctional characteristics, presented impaired orofacial motor skills, evidenced by the reduced ability to the recruitment and coordination of muscles in order to produce pressure/force, perform movements, and orofacial functions appropriately. The study contributes to the understanding of non-anatomical factors associated with pediatric OSA and to the development of therapeutic strategies.

Is the increased risk for obstructive sleep apnea in healthy individuals and with cerebrovascular diseases associated with impaired functioning?

C.M.C. Camerino[1], E.A.D. Lima[1], S.S.D. Castro[1], A.B.V. Junior[1], M.A.S. Neto[1], C.F. Leite[1]
[1]Federal University of Ceará, Fortaleza, Brazil

Introduction: Individuals with cerebrovascular health conditions are considered at risk for the development of obstructive sleep apnea (OSA). The clinical manifestations and repercussions of OSA can interfere with biological, psychological and social aspects of these subjects. The aim of this study was to investigate the existence of an association between the risk of OSA and impairment in functioning considering healthy individuals or individuals with cardiovascular comorbiditie.

Materials and Methods: This is a cross-sectional, observational study in which individuals were recruited from outpatient clinics for the treatment of heart and cerebrovascular diseases, as well as active individuals from the community. Clinical and sociodemographic data of the participants were documented. To assess functioning and risk of OSA, the 12 item WHODAS 2.0 (World Health Organization Disability Assessment Schedule) and STOP-BANG (STOP: Snore, Tired, Observed Apnea and Pressure and BANG: Body mass index (BMI), Age, Neck Circumference and Gender), were used. Symptoms of anxiety and depression, daytime sleepiness and cognition were measured using assessment instruments such as the Hospital Anxiety and Depression Scale (HADS), Epworth Sleepiness Scale (ESS), and Mini Mental State Examination (MMSE). Data were analyzed using descriptive and inferential statistics using the Statistical Package for the Social Sciences (SPSS) version 20.0, considering a significance of 5% ($p < 0.05$).

Results: A total of 373 individuals were recruited, with a median age of 66 (57-72). Of these, 313 were accessed in a specialized outpatient service and 60 in a unit focused on care for the elderly. The WHODAS score was 13 points (7-22), and the STOP-BANG score was 4 points (3-5). Of the participants, 46.1% were at moderate risk of OSA and 37.5% at high risk. Among subjects with moderate risk of OSA, worse functioning was observed in subjects with coexistence of hypertension and post-stroke. The high risk of OSA was found in individuals with coexisting coronary artery disease, stroke or arrhythmia, with worse functioning compared to healthy individuals. In the regression analysis, female gender, cognitive impairment, age, and depression were also associated with worse functioning of the subjects. BMI and sleepiness did not maintain a significant association with functioning by regression analysis.

Conclusion: Moderate and high risk of OSA is associated with worse functioning in individuals with cardiovascular and cerebrovascular diseases, as well as gender, age, depressive symptoms and cognitive decline.

Keywords: Sleep Apnea, Obstructive. Cardiovascular Diseases. Stroke. Functional Status

Lemborexant treatment improves polysomnographic sleep parameters in adults with mild, moderate, or severe Obstructive Sleep Apnea

M. Moline[1], J.Y. Cheng[1], N. Hall[1], D. Shah[1], G.K. Zammit[2]
[1]Eisai Inc., Nutley, United States, [2]Clinilabs Drug Development Corporation, Eatontown, United States

Introduction: Obstructive sleep apnea (OSA) and insomnia commonly coexist, a clinical condition abbreviated as COMISA (comorbid insomnia and sleep apnea). Lemborexant (LEM) is a competitive dual orexin receptor antagonist approved for the treatment of adults with insomnia. Studies 102 (NCT03471871) and 113 (NCT04647383) demonstrated the respiratory safety of LEM in subjects with mild, moderate, or severe OSA who did not report insomnia. Since LEM provided significant benefit on sleep onset and sleep maintenance for subjects with insomnia in 2 phase 3 studies compared with placebo (PBO), it was of interest to analyze the sleep parameters after LEM treatment in subjects with OSA who did not complain of insomnia.

Materials and Methods: Studies 102 and 113 were double-blind, placebo (PBO)-controlled, crossover studies in adults with untreated mild (apnea-hypopnea-index [AHI] ≥5 to <15 events/hour), moderate (AHI ≥15 to <30), or severe (AHI ≥30) OSA without insomnia. Subjects were randomly assigned to two 8-night treatment periods (separated by ≥14-day washout period) treated with LEM 10 mg (LEM10) or PBO. Latency to persistent sleep (LPS), sleep efficiency (SE), and wake after sleep onset (WASO) were evaluated using polysomnography on Days 1 (D1) and 8 (D8).

Results: This analysis included 39, 13, and 20 subjects with mild, moderate, or severe OSA, respectively. LPS in LEM-treated subjects did not statistically differ from PBO on D1 or D8. SE was significantly higher on D1 in subjects with mild (LEM10, 90.43; PBO, 80.31; P<0.001), moderate (LEM10, 88.83; PBO, 84.02; P=0.016), and severe (LEM10, 87.76; PBO, 77.84; P<0.001) OSA compared with PBO. SE was significantly higher in subjects with mild (LEM10, 86.65; PBO, 80.59; P=0.003) and moderate (LEM10, 88.45; PBO, 80.70; P=0.004) OSA, and trended towards significance on D8 in subjects with severe (LEM10, 85.60; PBO, 80.63; P=0.055) OSA. WASO was significantly lower (improved) on D1 in subjects with mild (LEM10, 33.30; PBO, 76.76; P<0.001), moderate (LEM10, 44.26; PBO, 64.71; P=0.008), and severe (LEM10, 42.03; PBO, 91.49; P<0.001) OSA. WASO was significantly lower on D8 in subjects with mild (LEM10, 51.74; PBO, 70.52; P=0.015) and moderate (LEM10, 49.16; PBO, 75.15; P=0.008) but not severe (LEM10, 59.85; PBO, 74.46; P=0.161) OSA. LEM was well tolerated.

Conclusions: Even though the subjects did not report insomnia, LEM improved sleep maintenance variables versus PBO on D1 regardless of OSA severity, and on D8 in subjects with mild and moderate OSA, with a trend for improvement in the sleep maintenance variable of SE in subjects with severe OSA. LPS did not differ between treatments; however, this was not unexpected since patients with OSA may not have sleep onset difficulties. These findings suggest LEM may be an option to be considered when patients with OSA may require a hypnotic.

Level two polysomnography: what tipped the scale? A retrospective study

M. d'Almeida[1], T. Câmara[1], O.C. d'Almeida[2], O. Santos[1]
[1]Centro Hospitalar do Médio Tejo, Pulmonology, Torres Novas, Portugal, [2]University of Coimbra, Faculty of Medicine; Coimbra Institute for Biomedical Imaging and Translational Research (CIBIT), Institute for Nuclear Sciences Applied to Health (ICNAS), Coimbra, Portugal

Introduction: Sleep apnea-hypopnea syndrome (SAHS) is a prevalent sleep-related breathing condition and one of the most frequent diagnoses in the Pulmonology Department. The current gold-standard diagnostic tool is level 1 polysomnography though it is an expensive and laborious test requiring an in-lab overnight sleep. Level 2 polysomnography can be used when video sleep monitoring is not required and an outside hospital study is feasible. We aimed to identify the most relevant risk factors associated with severe SAHS in our patients.

Materials and Methods: We conducted a 1-year retrospective observational study on eighty-seven patients referred to the sleep lab, at Centro Hospitalar do Médio Tejo, Portugal, for level 2 polysomnography between January 1 to December 31, 2022. Patients with poor pulse oximetry or EEG recordings, that performed the exam under PAP therapy, or who had no Epworth Sleepiness Scale (ESS) score at the time of the exam, were excluded from analyses. The final cohort included 76 patients [60.5% males; mean age, 56.3±13.98 y, body mass index (BMI), 30.1±5.62 kg/m2; ESS, 6.2±4.84; respiratory disturbance index (RDI), 22.5±22.34 respiratory events per hour of sleep]. Binary logistic regression was applied to evaluate the predictive value of sex, age, BMI, or ESS on severe SAHS (RDI≥30, 23.7%). The receiver operating characteristic (ROC) curve was used to estimate the optimal threshold based on Youden's index. Statistical analyses were run in SPSS.

Results: Our results showed a statistically significant regression model explaining 27.4% (Nagelkerke R2) of the variance in severe SAHS and correctly classifying 80.3% of cases. Males were 6.12 times more likely to have severe SAHS than females. Increasing BMI was associated with an increase of 18.0% in the likelihood of exhibiting severe SAHS (OR = 1.18; 95%CI [1.05, 1.33]) and achieved good overall diagnostic accuracy (area under ROC curve = 0.75, 95%CI [0.64, 0.87]). BMI greater than 27.74 kg/m2 provided sensitivity and specificity of 94% and 50%, respectively. Age and ESS were not significant predictors of severe SAHS.

Conclusions: Our results suggest that male and obese patients are the group of patients that are more at risk of severe SAHS, as assessed by level 2 polysomnography, independently of their age and ESS score.

Lipid metabolism and neuromuscular junction as common pathways underlying the genetic basis of erectile dysfunction and obstructive sleep apnea

L. Adami[1], M. Oliveira[1], L. Cunha[1], S. Tufik[1,2], M. Andersen[1,2]
[1]Sleep Institute, Sao Paulo, Brazil, [2]Universidade Federal de São Paulo, Psicobiologia, Sao Paulo, Brazil

Introduction: Erectile dysfunction (ED) affects 13% to 21% of men between 40 and 80 years old and implies a negative impact on quality of life to those individuals. Its incidence is higher in sedentary men with comorbidities, such as diabetes, obesity and obstructive sleep apnea (OSA). This sleep disturbance, observed in approximately 40% of men, leads to low testosterone and altered libido. OSA and DE are multifactorial traits and genetic variants of risk have been identified for those phenotypes, and both have shown associations with the same comorbidities (e.g. diabetes and obesity). We tested if ED and OSA share genetic variants of risk and identified molecular, cellular and biological interactions between those 2 conditions

Materials and methods: We manually curated 2 gene sets, one associated to ED and the other, with OSA. ED gene list was created by merging genes implicated by 9 previously published studies which addressed populational genetics findings for these traits, while OSA gene list was generated by merging 12 previously published studies of the same kind. Both gene lists are heavily driven by hits from genome-wide association studies (GWAS) and the SNPs implicated were linked to genes using Ensembl Variant Effect Predictor (VEP). Using Fisher's exact test with a statistical threshold of *p-value*<0.05, the overlap between ED and OSA gene lists was defined. Benjamini-Hochberg test was used to identify enriched Gene Ontology (GO) and Kyoto Encyclopedia of Genes and Genomes (KEGG) terms that were over-represented among the intersect gene list, using a statistical threshold of adjusted *p-value*<0.1. A protein-protein interaction (PPI) network analysis was performed via the String database in Cytoscape 3.9.1, using the interest gene list as input, 0.7 as confidence threshold and a maximum of 10 additional interactors.

Results: There were 35 overlapping genes between the gene list associated with ED (205 genes total) and the genes associated with OSA (2,622 genes total), indicating significantly more overlap than expected by chance (*p-value*=0.02). Enriched pathways among the intersect list included processes related to lipoprotein particle binding and cellular response to low-density lipoprotein particle stimulus, neuromuscular junction, neuron projection fasciculation, axonal fasciculation and extension. The PPI network retrieved 21 nodes, being 12 of them from the intersect gene list plus 9 interactors. Among those interactors there are key regulators of pathways, such as glycolipids metabolism, adhesion cellular, corpus cavernosum formation, sexual dimorphism, calcium signalization, neural cell growth, and chromatin remodeling.

Conclusions: Our findings suggest that biological pathways related to lipid metabolism and the neuromuscular junction are common in the joint presence of both phenotypes. ED involves vascular and neural events through physiological stimuli combined with the nitric oxide, while OSA has a relationship with systemic inflammatory response and cycles of hypoxemia/normoxemia which may lead to lipid accumulation. The presented overlapping gene set, with its highlighted biological pathways, may serve as preliminary findings for new functional investigations of OSA and ED shared genetic mechanisms.

Long COVID-19 fatigue and obstructive sleep apnea: Is there a relation?

L. Pires[1], R. Ribeiro[1], I. Belchior[1], C. Saraiva[1], T. Fatal[1], M.J. Guimarães[2], A. Moniri[3], M. Drummond[4]
[1]Centro Hospitalar Universitário do Algarve, Pulmonology, Portimao, Portugal, [2]Hospital da Luz Guimarães, Pulmonology, Guimarães, Portugal, [3]Universidade do Algarve/Hospital Particular do Algarve, Otorrinolaringologia, Faro, Portugal, [4]Faculty of Medicine of the University of Porto/Centro Hospitalar de São João, Centro de Responsabilidade Integrado Sono e VNI,, Porto, Portugal

Introduction: Fatigue has been reported as the most frequent long-COVID-19 symptom. There is a physiological plausibility for relation between OSA and long-COVID-19 fatigue, by Intermittent nocturnal hypoxemia, endothelial dysfunction, oxidative stress and low grade systemic inflammation. OSA activates the renin-angiotensin-aldosterone system (RAAS) and angiotensin-converting enzyme 2 (ACE2), which is the entry receptor for SARS-CoV-2. The aim of this study is to evaluate if untreated OSA is associated with COVID-19 long-term fatigue.

Materials and Methods: The study was conducted in three Portuguese Hospitals and data collection was performed by physicians who conduct the post-COVID-19 medical consultation, from november 2020 to december 2021. It's an observational prospective cohort study: Population - Symptomatic patients with previous COVID-19; Exposure - OSA; Control - Without OSA; Outcome - Fatigue. We used a consecutive, non-random sampling technique at the baseline since the first apointment (t1), and after recruitment the follow up was at 6 months (t2). Inclusion criteria: ≥18 years; previous COVID-19 with SARS-CoV-2 in PCR or antigen positive test; long-COVID symptoms defined by WHO. Exclusion criteria: concomitant neurological disorder; patients who were on invasive mechanical ventilation; patients with persistent fatigue symptoms 6 months before SARS-CoV 2 infection; refusal or inability to respond; previous OSA. The instruments used were the Chalder Fatigue Scale (t2), portable monitoring device type III (t1).
All statistical analyses will be made using IBM® SPSS® Statistics v.27. The local Ethical Committee approved the project. Written informed consent was obtained from all participants included.

Results: A total of 112 patients attended the post-COVID-19 consultation, 29 patients meet the exclusion criteria and 83 patients were enrolled (41 men, 42 women): 33 had mild COVID-19 acute disease, 14 moderate and 36 severe. The average age was 53,9 years (min22max89), the BMI was 29,3 Kg/m^{2}. Fatigue was present at acute disease in 71 patients, and remain after six months in 67 patients, and 49 (73%) had criteria for OSA in the sleep test at T2. The distribution of OSA severity was: mild 21 (42,8%) , moderate 11 (22,4%) and severe (17) 34,6%.

Conclusions: We found a high incidence of OSA in patients with long-COVID fatigue, this association is important for the development of future recomendations for long COVID-19.

Acknowledgements: Prof Ana Marreiros

Long-term morbidity and prevalence of revision surgery after implantation of a breathing synchronized hypoglossal nerve stimulator

J. Huseynov[1], P. Friebe[1], N. Rotter[1], J.T. Maurer[1]
[1]Universitätsklinikum Mannheim, Department of Otorhinolaryngology, Head and Neck surgery, Mannheim, Germany

Introduction: Morbidity after implantation of a breathing synchronized hypoglossal nerve stimulator has previously been described over a period up to a maximum of 5 years. In our university medical center the therapy has been used since 2010. Thus, we observe a period of 13 years. It is still unknown for which reasons and how often revision surgery is required.

Materials and Methods: This paper retrospectively analyzes all revision surgeries after implantation of a hypoglossal nerve stimulator with respiratory sensing (Inspire Upper Airway Stimulation, UAS) since 2010 in our hospital. The reasons for the revision, the method of the operation, and the postoperative period in our patient population as well as the current evidence are presented.

Results: Since 2010, we implanted 173 patients (m=150, f=23) with Inspire UAS. A total of 32 revisions and 6 explantations were successfully performed in 26 patients. The implantable pulse generator (IPG) was changed 17 times in 16 patients, including n=14 for battery depletion after 6-13 years, n=1 for loss of IPG function after cardioversion, n=2 for technical defect. IPG replacement was performed n=12 under local anesthesia and n=5 under general anesthesia. 13 revisions were performed because of lead malfunction and breakage (n=9 sensing lead model 4323; n=4 stimulating lead) in 10 patients. Excessive scarring at the cervicothoracic junction in 3 patients and skin atrophy at the edges of the IPG in 1 heavily working patient led to multiple revisions (n=9 and n=2, respectively). Implant explantation was performed due to stimulation-induced insomnia (n=3, in n=2 an additional MRI was required), muscle tenseness (n=1), and hypersalivation (n=1). One explantation (n=1) was performed after 9 years of successful UAS therapy after battery depletion instead of an exchange of the IPG, because an oral device applied for the first time was equally successful.

Conclusions: The reasons for revisions observed in our patient population have not yet been described in the literature. Technical reasons have to be taken into consideration by the manufacturer and have already been incorporated into the improvement of the hardware. Long-term care in specialized medical centers after implantation of a hypoglossal nerve stimulator is required.

Mandibular advancement device versus CPAP in lowering 24-hour blood pressure in patients with obstructive sleep apnoea and hypertension - protocol and early results

Y.-H. Ou[1], J. Colpani[2], S.-P. Chan[1,3], W. Loke[2], C.S. Cheong[4], W. Kong[5], C.W. Chin[6,7], P. Kojodjojo[5], P. Wong[8], P.A. Cistulli[9,10], C.-H. Lee[1,3,5,11]
[1]National University of Singapore, Medicine, Singapore, Singapore, [2]National University of Singapore, Dentistry, Singapore, Singapore, [3]National University Heart Centre, Cardiovascular Research Institute, Singapore, Singapore, [4]National University Hospital, Otolaryngology-Head and Neck Surgery, Singapore, Singapore, [5]National University Heart Centre, Cardiology, Singapore, Singapore, [6]National Heart Centre Singapore, Cardiology, Singapore, Singapore, [7]Duke-NUS Medical School, Cardiovascular ACP, Singapore, Singapore, [8]Raffles Hospital, Medicine, Singapore, Singapore, [9]University of Sydney, Medicine and Health, Camperdown, Australia, [10]Royal North Shore Hospital, Respiratory and Sleep Medicine, St Leonards, Australia, [11]National University of Singapore, Cardiovascular Translation Research Programme, Singapore, Singapore

Introduction: Obstructive sleep apnea (OSA) is the most common secondary cause of hypertension. Although treatment of OSA using continuous positive airway pressure (CPAP) reduces blood pressure (BP), adherence to CPAP is often suboptimal. A mandibular advancement device (MAD) is a guideline-endorsed alternative therapy for OSA. However, there is limited evidence on the relative efficacy between MAD and CPAP on BP reduction, especially in patients with hypertension. We aim to evaluate the impact of MAD versus CPAP on 24-hour mean arterial BP in patients with moderate-to-severe OSA, hypertension, and high cardiovascular risk.

Methods: This is an investigator-initiated, randomized, controlled, non-inferiority trial funded by a competitive research grant. We recruited Asian participants with a history of hypertension and high cardiovascular risk for in-laboratory overnight polysomnography (scored according to the latest AASM guidelines). Those with OSA (apnea-hypopnea index ≥ 15) will be treated with either MAD or CPAP in a 1:1 ratio. The primary endpoint is the difference in 24-hour mean arterial BP between baseline and 6-month follow-up. The secondary endpoints include other measures of ambulatory BP monitoring, arrhythmia based on a four-day electrocardiographic monitoring, biomarker and proteomic analysis, cardiovascular magnetic resonance-derived myocardial fibrosis and remodeling, and quality-of-life questionnaires. The between-group difference in the primary endpoint will be calculated using an analysis of covariance (ANCOVA). Subgroup analyses will be conducted on the primary endpoint based on the pre-specified baseline subgroups.

Results: Using a non-inferiority margin of 1.5 mmHg, 220 participants are needed to demonstrate non-inferiority of MAD (versus CPAP) with a statistical power of 90% and anticipated attrition of 20%. Recruitment began on 1st Oct 2019 and ended on 5th Dec 2022. After 306 participants underwent successful polysomnography, 220 participants with OSA (moderate, n=76; severe, n=144) were recruited and randomized. The median apnea-hypopnea index is 38.2 events/h in the OSA group (n=220) and 7.3 events/h in the non-OSA group (n=86). Compared with the non-OSA group, the OSA group has more males (86% vs. 74%, p=0.023), higher body mass index (28.3 ± 4.5 kg/m^2 vs. 25.7 ± 3.4 kg/m^2, P<0.001), neck circumference (39.5 ± 3.5 cm vs. 37.5 ± 3.1cm, P<0.001), and waist-hip ratio (1.0 ± 0.1 vs. 0.9 ± 0.0, P<0.001). The OSA group also has a higher mean ESS score than the non-OSA group (8.0 ± 4.9 vs. 6.6 ± 4.1, P=0.028). There was no difference between OSA and non-OSA groups regarding cardiovascular risk factors, concomitant medical conditions, number of antihypertensive medications, and types of medications (p=NS for all). In multivariate logistic regression, only age (odds ratio: 1.05, 95% confidence interval: 1.01-1.09, P=0.008) and body mass index (odds ratio: 1.21, 95% confidence interval: 1.07-1.38, P=0.003) were independently associated with OSA.

Conclusions: The prevalence of OSA is high in patients with existing hypertension and high cardiovascular risk factors. Age and body mass index are independent predictors of OSA. The primary endpoint of the trial will be presented in the last quarter of 2023 at an international conference.

Minimally invasive modified tongue suspension suture technique: an effective approach for managing tongue obstruction in obstructive sleep apnea

J.H. Bae[1], B.-Y. Kim[1]
[1]Ewha Womans University, College of Medicine, Otorhinolaryngology, Seoul, Korea, Republic of

Introduction: Obstructive sleep apnea (OSA) is characterized by recurrent episodes of obstructive apnea and hypopnea during sleep. It affects a significant percentage of middle-aged adults, leading to increased cardiovascular risk and mortality. Continuous positive airway pressure (CPAP) is the primary treatment for OSA, but it has limitations in long-term compliance. For patients who do not respond to or cannot tolerate CPAP, surgical interventions such as soft tissue and skeletal surgery are considered. However, treating tongue collapse, a common issue in OSA, is challenging and associated with various risks. To address these challenges, we developed a minimally invasive modified tongue suspension suture technique to stabilize the tongue base.

Materials and Methods: Using nasopharyngeal endoscopy, we identified the level of airway narrowing at the tongue and performed uvulopalatopharyngoplasty along with tongue base traction using the modified tongue suspension suture technique. Four patients with severe OSA, confirmed by polysomnography and unresponsive to CPAP, underwent this technique.

Polydioxanone (PDO) Thread: We utilized polydioxanone (PDO) threads with a length of 1,000 mm, equipped with multiple spikes and a cone anchor. The cone helps securely fix the thread to the tissue, eliminating the need for ties. Our technique involved the use of two threads instead of one, providing improved stability. The threads gradually disappear over time, while the tissue remains in place to some extent.

Results: Under general anesthesia, the patient was positioned supine with the neck extended. After disinfecting the oral cavity, a small incision was made, and the tongue was fully exposed. The suture passer with PDO suture was used to pass through the chin and tongue base, with the cone anchored on the mandibular periosteum. The suture was tightened, creating an enlarged retrolingual air space. All four patients showed significant improvement in sleep and quality of life without complications.

Conclusions: Obstructive sleep apnea affects multiple anatomical structures, including the tongue. Tongue collapse is challenging to address effectively. Our modified tongue suspension suture technique offers a safe and effective approach for managing OSA patients with tongue obstruction, potentially enhancing the success rate of surgical treatment for OSA.

My two front teeth

V. Arunthari[1], J. Call[2], M. Punj[1], B. Colaco[1]
[1]Mayo Clinic Florida, Pulmonary, Allergy and Sleep Medicine, Jacksonville, United States, [2]Mayo Clinic Florida, Internal Medicine, Jacksonville, United States

Introduction: Hypoglossal nerve stimulation (HNS), aimed at tongue protrusion to treat obstructive sleep apnea hypopnea syndrome, is now an acceptable treatment for obstructive sleep apnea (OSA) in patients who have failed positive airway pressure therapy (PAP). Once the device is implanted and activated, voltage to stimulate the nerve and produce tongue movement, is titrated over time until a desired setting is reached. Long term follow-up of HNS patients has shown discomfort due to electrical stimulation and tongue abrasion to be the most common adverse effects. We present a case of patient presenting with a previously unseen possible adverse effect.

Case Presentation: A 70-year-old female with a history of moderate obstructive sleep apnea with apnea-hypopnea index (AHI) of 26 events per hour underwent hypoglossal nerve stimulator implantation. The device was successfully activated, and patient subsequently underwent an HNS polysomnogram titration which demonstrated a residual AHI of 3.0 events per hour at an amplitude of 1.3 volts. Three months after activation, the patient observed a visible gap in her lower front teeth. This was confirmed clinically with her dentist after comparison to prior dental x-rays. Patient was evaluated for and fitted with a retainer to use along with continued use of HNS therapy as a remedy to halt further worsening of the gap.

Figures: Image 1 showing facial photograph highlighting gap in dentation. Image 2 showing prior dental xrays.

Conclusions: Our case suggests a previously unreported possible adverse effect associated with HNS therapy to treat OSA. Changes in dental alignment have not been reported with HNS therapy thus far. Poor prior dentition or a history of dental issues may be factors to consider with HNS therapy. Awareness of and screening for this possible effect, may prompt referral to a dentist to stymie further dental misalignment and maintain continued use of HNS therapy. In our patient, the dentist recommended use of a retainer with HNS therapy.

Nasal cycle during sleep

S. Chiba[1]
[1]Jikei University School of Medicine/Ota Memorial Sleep Center, ENT, Tokyo, Japan

Introduction: Nasal patency is well known to be influenced by several endogenous and exogenous factors. In 1895, Kayser observed periodic cycles of congestion and decongestion that alternated between the right and left nasal sides, termed the "Nasal Cycle." Hasegawa defined the nasal cycle as "the alternating congestion and decongestion of the nasal airways producing a resistance change." We have already reported that nasal cycle duration during sleep is longer than in wakefulness (Kimura et al. Laryngoscope, 123:2050–2055, 2013). And it is speculated that nasal cycle is influenced by postural change, change of autonomic nerve activity and sleep stage. Purpose of this study is to clarify the mechanism of nasal cycle during sleep using Polysomnography(PSG).
Materials and Methods: We utilized PSG and portable rhinoflowmeter (Rhinocycle, Rhinometrics, Lynge, Denmark), measuring airflow independently through each nostril during sleep on 29 healthy subjects.
Results:
1, NC was found in 24 of 29 patients during PSG.
2, In 5 of 29 cases, NC with the postural change was found.
3, In 21 of 29 NC was found NC during REM sleep, 7/29 during light sleep and 1/29 during wake, however no case in slow wave sleep.
4, The NC tended to be found in REM sleep for the sleep latter half, and, furthermore, in REM sleep which duration showed longest.
Conclusions: We speculated that the NC was associated with a function of the REM sleep. This study shed some light on nasal cycle and function during sleep; however, further investigation is needed to better understand the relationship between nasal cycle, nasal obstruction, oral breathing, and other cyclic physiological phenomena such as sleep cycle.

Night to night variability of Pulse Wave Amplitude Drop Index

A. Waeber[1], M. Betta[2], G. Bernardi[2], G. Heiniger[1], T. Imler[1], J. Haba-Rubio[1], G. Solelhac[1], R. Heinzer[1]
[1]Center for Investigation and Research in Sleep - Centre Hospitalier Universitaire Vaudois, Lausanne, Switzerland, [2]Scuola IMT Alti Studi Lucca, Lucca, Italy

Introduction: The peripheral pulse wave can be recorded during sleep using pulse oximetry-based photo-plethysmography signal. Its amplitude varies throughout the night due to blood flow regulation by vessels and autonomic system. The Pulse Wave Amplitude Drop index (PWADi), defined as the number of amplitude drops per hour of sleep, is a quantitative measure of these variations. Recent research on three prospective cohorts showed an association between the PWADi assessed over one night and cardiovascular risk in patients with obstructive sleep apnea: fewer drops per hour of sleep were associated with higher CV risk. However, the assessment of PWADi in this study was made on a single night and night-to-night variability of this signal is currently unknown. Therefore, we aimed to assess PWADi's intra-individual variation over two different nights.

Materials and methods: Nested within the Hypnolaus cohort, a Swiss population-based cohort, 18 participants underwent two consecutive polysomnographies. The pulse oximetry–based photoplethysmography signal was analyzed to extract PWADi for each of the 36 nocturnal recordings, using a previously validated automated algorithm. While the original paper used a 30% threshold for drops definition, we explored different thresholds (20%, 30%, and 40%) in this analysis. PWADi variability was assessed using intraclass correlation coefficient and Bland-Altman metrics. All analyses were performed using RStudio.

Results: The studied sample comprises 18 participants (14 males), with a median age of 66.5 years (IQR 55.25-72), a median BMI of 25.5 kg/m² (IQR 24.32-28.02), and a median apnea-hypopnea index of 18.56 h^{-1} (IQR 11.12-23.45).

When using a 30% threshold, the mean PWADi on the first and second nights were 44.98 h^{-1} (SD 26.94) and 45.05 h^{-1} (SD 26.39) respectively. The mean difference between consecutive measurements was -0.08 h^{-1} (SD 8.64). The lower and upper limits of agreement, which define the range of expected difference between two measurements in 95% of cases, are -17.02 h^{-1} and 16.87 h^{-1} respectively. Moreover, the intraclass correlation coefficient (ICC, 95% Confidence Interval) between the first and second nights was 0.95 [0.87-0.98].

With a 20% threshold, mean PWADi on the first and second nights were 59.23 h^{-1} (SD 29.36) and 60.21 h^{-1} (SD 30.23) respectively. Mean difference was -0.98 h^{-1} (SD 9.58), and ICC was 0.95 [0.87-0.98].

With a 40% threshold, mean PWADi on the first and second nights were 31.78 h^{-1} (SD 22.80) and 31.05 h^{-1} (SD 21.56) respectively. Mean difference was 0.73 h^{-1} (SD 7.74), and ICC was 0.94 [0.85-0.98].

Conclusions: The PWADi, assessed using pulse oximetry–based photoplethysmography signal, appears to be a reproducible and stable metric with low night to night variability. These findings suggest that a single night PWADi measurement may be sufficient to estimate sleep-apnea associated CV risk. Similar results were found when using alternative thresholds for PWAD definition (20 and 40%). However, further studies should assess the long-term evolution of PWADi, given that its underlying physiological determinants, such as autonomic and vascular function, may change overtime.

Nocturnal actigraphy: Is there a difference according to OSA severity?

L. Costa[1], C. Dallegrave[1], J. Lovisi[1], D. Silva[1], B. Gonçalves[2], L. Godoy[1], L. Lemes[1]
[1]University of the State of Rio de Janeiro, Rio de Janeiro, Brazil, [2]Copacabana Tecnologia da Informação, São Paulo, Brazil

Introduction: Obstructive sleep apnea (OSA) is a highly prevalent condition that affects patients' quality of life and health, leading to cardiovascular, metabolic and neurological consequences. Objective sleep evaluation is crucial for proper diagnosis and treatment of this condition, with polysomnography (PSG) currently being the gold standard. Although PSG provides more direct results, its cost is relatively high, in addition to requiring a specialized team to conduct and interpret the results. Actigraphy, on the other hand, utilizes a simple and portable wrist-worn device, mostly easy to set up and is less expensive than PSG.
In this study, actigraphy and polysomnography were simultaneously collected during sleep laboratory studies. The aim was to investigate the use of actigraphy technology as a source of diagnostic clues for the suspicion of obstructive sleep apnea.

Materials and Methods: The study included 12 patients, 5 males and 7 females, who were seen at the UERJ otorhinolaryngology outpatient clinic with various complaints related to sleep quality. The patients were divided into two groups based on the apnea-hypopnea index (AHI): with mild apnea in Group 1 (AHI > 4 and <15 events / hour), and patients with moderate or severe apnea in Group 2 (AHI ≥ 15 events / hour). We used the Miband 5 device adapted for actigraphy to record movement and heart rate during one night of sleep for each patient. Polysomnography was performed using the Neurovirtual BWIII device, capable of measuring various physiological sleep variables, including cardiorespiratory and neurological parameters. The collected data were statistically analyzed to determine if the nocturnal movement recorded by actigraphy could provide clues for the diagnostic suspicion of obstructive sleep apnea.

Results: We observed that patients in Group 2 (n= 9) exhibited greater nocturnal movement compared to patients in Group 1 (n=3). This difference in movement was particularly evident when assessing the average movement during the 5 consecutive hours of reduced movement, known as L5. This discrepancy could suggest that analyzing nocturnal movement through actigraphy may provide diagnostic clues for OSA. A possible association between increased nocturnal movement and higher AHI was also found. However, we identified some outliers among patients taking beta-blockers or antihypertensive medications, who exhibited lower nocturnal movement than expected, despite the severity of their apnea.

Conclusions: Based on the results of this study, we observed that the study of actigraphy may represent a promising source of diagnostic clues for obstructive sleep apnea. The increased nocturnal movement observed in patients with apnea suggests a possible relationship between motor activity during sleep and the severity of the disease.

Acknowledgements: We would like to express our gratitude to the patients who participated in this study and the professionals at UERJ who contributed to data collection. We are also thankful to the research team for their support and guidance throughout the project.

Nocturnal hypercapnia in obese patients with obstructive sleep apnea

K.J. Hwang[1], J. Kim[2], S.J. Han[3]
[1]KyungHee University Medical Center, Neurology, Seoul, Korea, Republic of, [2]Pusan Medical Center, Neurology, Pusan, Korea, Republic of, [3]Wonkwang University Sanbon Hospital, Neurology, Sanbon, Korea, Republic of

Introduction: As obesity increases, the frequency of obstructive sleep apnea and obesity hypoventilation syndrome increases also. However, there are only limited publications that include patients known to have obesity-related sleep hypoventilation is present. The study aimed to compare characteristics of in obese patients with obstructive sleep apnea (OSA), and to identify determinants of hypercapnia in OSA patients.

Materials and Methods: We investigated 143 untreated patients who were diagnosed with obese patients with OSA (Body mass index >30 kg/m^2). All patients underwent standard polysomnography (PSG) with nocturnal end-tidal CO_2 ($ETCO_2$) and sleep related questionnaires.

Results: Of 143 obese subjects with OSA (49 females/94 males, mean age of 45.97 ± 13.71 years old, BMI of 34.18 ± 3.87 kg/m^2). Hypercapnia group (n=74, $ETCO_2$ >55mmHg) had higher neck circumference (40.68±3.30 VS 42.01±3.62 cm, *p=.023*), Epworth Sleepiness Scale scores (7.81±4.49 VS 10.65±5.52, *P =.001*), apnea-hypopnea index (39.21±27.96 VS 63.77±29.11, *P <.001*), oxygen desaturation index (29.58±24.04 VS 56.03±28.89, *P < .001*), maximum apnea length(35.81±18.78 VS51.68±24.48, *p<0.001*) compared with subjects with pure OSA (n = 68, $ETCO_2$≤55mmHg). Hypercapnia group also had lower waking PaO2 (93.91±1.71VS91.37±4.02, *P < .001*), and nadir SpO2(82.53±6.34VS 7.49±10.92, P < .001). Maximum Co2 retention correlated with BMI and length of apnea(r =0.338, *P=0.008*).

Conclusions: Nocturnal hypercapnea reflects pathophysiologic features of sleep apnea, which are not captured by the apnea-hypopnea index. This study expands the indications of capnometry beyond apnea detection and ability to early detect patients who may be at risk of the development of obesity hypoventilation syndrome.

Nocturnal hypoxemia and risk of falling in older adults - a systematic review

A.S. Oliveira[1], F. Perrucho[1], R.B. Silvão[1], V.C. Machado[1], C.M. Guimarães[1], A.C.S. Santos Junior[2], M. Meira e Cruz[3,4,5], C. Salles[1,6,2]

[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]Jorge Amado University Center, Salvador, Brazil, [3]European Sleep Center, Lisbon, Portugal, [4]University of Lisbon, Sleep Unit, Cardiovascular Center, Faculty of Medicine in Lisbon, Lisbon, Portugal, [5]College Sao Leopoldo Mandic, Campinas, Brazil, [6]Federal University of Bahia, University Hospital Professor Edgar Santos, Salvador, Brazil

Introduction: Falling is one of the leading causes of death in those aged 60 or older. According to studies, the expenses of fall-related health care can exceed $14,000 per fall, and nocturnal hypoxemia influences the chances of this event occurring. Sleep disorders can affect bone resorption, increasing the risk of falls in older adults directly through hypoxemia, inflammation, increased sympathetic tone, changes in melatonin, and/or other hormonal factors. Studies have shown that lower testosterone levels have been associated with more sleep time with SaO2<90%; on the other hand, low testosterone has also been associated with an increased risk of falls. The objective of this study is to evaluate the association between polysomnographic variables and the risk of falls in older adults.
Materials and Methods: A search was conducted in the PubMed Central, PubMed, LILACS, SciELO, VHL, and Cochrane Library databases, using the following terms listed in the DeCS/MeSH: "accidental falls"; "elderly"; "sleep disorder". Inclusion criteria were: studies that included assessment of sleep-disordered breathing associated with falls; older adult over 65 years old; recording of oxyhemoglobin saturation. Exclusion criteria were: abstracts; congress proceedings; studies involving animals; posters; reviews; letters; symposiums.
Results: By searching the databases, 1341 articles were found, and through manual search 12 more were identified; of these, 03 met the eligibility criteria. Among the main results were: Cauley et al. showed that men with nocturnal hypoxia during sleep were also more likely to have abnormal resting SaO2 and an AHI (apnea–hypopnea index), indicating sleep-disordered breathing. The study by Onen et al. found that half of the patients analyzed had an association between nocturnal oxyhemoglobin desaturation and falls, with SaO2 values below 90% for 10% or more of the sleep time up to 36%. Two studies showed an association between nocturnal hypoxemia (≥10% of sleep time with SaO2< 90%) and an increased risk of falls. Sleep periods in which oxygen saturation (SaO2) was below 90% for 3.5-10.5% of total sleep time were found to be associated with an increased chance of at least one episode of falling. Cauley et al. pointed out that the associations between nocturnal hypoxia and falls were also independent of AHI, suggesting that intermittent nocturnal hypoxia alone increases the risk of falls. Increased sleep time with SaO2<90% was associated with a 30 to 40% increase in fracture risk (p = 0.049). Stone et al. noted that nocturnal hypoxemia is an independent risk factor for recurrent falls.
Conclusions: This systematic review highlights the significance of considering nocturnal hypoxemia as a potentially relevant risk factor for falls in patients with prolonged SaO2<90%. Studies have shown that interventions to control nocturnal hypoxia may reduce the risk of falls in older adults; therefore, it is essential to emphasize the need for randomized placebo-controlled clinical trials to confirm this hypothesis.

Non-ablative laser treatment for snoring and obstructive sleep apnea - a controlled randomized double-blind clinical trial

V. Mendes[1], L. Azevedo[2], D. Zezell[1]
[1]Energy and Nuclear Research Institute IPEN-CNEN - University of São Paulo, Center for Lasers and Applications, São Paulo, Brazil, [2]School of Dentistry at the University of São Paulo, Special Laboratory for Lasers in Dentistry -LELO, São Paulo, Brazil

Introduction: By preventing the progression of sleep breathing disorder (SBD) , the risk of developing chronic diseases highly prevalent in society, such as hypertension and type 2 diabetes, is reduced. This study aimed to clinically evaluate the effect of non-ablative treatment with Nd:YAG (1064 nm) and Er:YAG lasers (2940 nm) in sleep breathing disorder (SBD), in a longitudinal, interventional and prospective study.

Materials and Methods: After approval from the Research Ethics Committee (CEP FOUSP CAAE: 44068621.8.0000.0075) and clinical trial registration - WHO - Rebec UTN code: U1111-1284-3764, thirty volunteers, in the city of São Paulo, Brazil, with clinical status from snoring to moderate OSA, both sexes, 25 to 65 years old, BMI < 40kg/m^2 were blinded and randomized in control and laser groups. Patients received three treatment sessions, 14 days apart. In the control group (12 volunteers), only a guide light was used without delivering laser energy. 18 volunteers of laser group were treated with non-ablative high-intensity irradiation with the association of Nd:YAG and Er:YAG lasers. Entire soft palate, uvula, palatoglossal and palatopharyngeal arches were punctually irradiated with four to five shoots per point and six scans in each line. Parameters were selected to deliver energy efficiently and safely in a five-step sequence wich enable tissue thermal sensitization, gradually. Outcome measures were performed before, after treatment and at three and six months follow up visits, including photographic record, type IV polysomnography and analysis of snoring noise. The main outcome of the study, analysis of the upper airway lumen variation according to the Modified Mallampati Index was performed independently and blinded and as well as the statical analysis. Oxyhemoglobin desaturation index (ODI), snoring time during sleep and peak amplitude of snoring noise were also analysed. Observation of the variability of each outcome allowed analysis of the differences between experimental periods compared to baseline for each variable and the behavior of the laser group compared to the control group. Fisher's corrected chi-square test with a significance level of α = 5% was applied.

Results: The main clinical outcome is the expansion of the upper airway lumen, in all study periods analyzed after irradiation [variation between control and laser groups: (0.0 ± 0.0); (-25.0 ± 50.0) with p = 0.00060]. Therefore, improvement in ODI [variation between control and laser groups: (19.6 ± 67.6); (-18.1 ± 88.2) with p = 0.018]; improvement in snoring time (64.8 ± 179.1); (-1.5 ± 85.0) with p = 0.034 and in snoring noise peak amplitude (-8.3 ± 12.3); (-12.4 ± 15.8) with p = 0.029. No major adverse events or side effects were observed.

Conclusion: Non-ablative laser treatment is effective in rehabilitation of patients with Sleep Breathing Disorder. In the protocol used in this study, the procedure is performed in outpatiente basis, without medication or anesthesia. Increasing the lumen of the upper airway by decreasing tissue flaccidity, leads to the improvement of oxyhemoglobin desaturation index (ODI), snoring time during sleep and peak amplitude of snoring noise.

Obesity hypoventilation syndrome prevalence and its impact in sleep oxygen saturation in 3 cities located at different altitudes

M.A. Bazurto-Zapata[1], L. Vargas[2], C. Diaz-Bossa[3], F. Fernandez[1], E. Duenas Meza[1], W. Rubiano[1], C. Torres Duque[1], M. Gonzalez-Garcia[1], D. Cano[2]
[1]Fundacion Neumologica Colombiana, Sleep Center, Bogota, Colombia, [2]Instituto Neumologico del Oriente, Sleep Center, Bucaramanga, Colombia, [3]Neumomed, Sleep, Medellin, Colombia

Introduction: Obesity is related with comorbidities such as Obesity Hypoventilation Syndrome (OHS) which increases morbidity and mortality. There is no data that compares prevalence of OHS and its impact in oxygen saturation during sleep at different altitudes. The aim of the study was to establish the prevalence of OHS in adults inhabiting 3 Colombian cities located at different altitudes.
Materials and methods: Cross sectional, observational, analytic study in adults (BMI ≥30 Kg/m^2), who were referred for polysomnography in 3 sleep centers in 3 cities located at different altitudes (Bogotá: 2640 m.a.s.l., Medellín (1538 m.a.s.l.) and Bucaramanga (959 m.a.s.l.). Patients with other causes of hypoventilation were excluded. Patients underwent clinical evaluation, polysomnography, arterial blood gases and spirometry. Hypoventilation was defined differently within each city: $PaCO_2$: Bucaramanga ≥41 mmHg, Medellín ≥40 mmHg and Bogotá ≥ 38 mmHg. To determine the differences between cities, the continuous variables with and without OHS were analyzed with ANOVA or Kruskal-Wallis and the qualitative variables with Chi^2. SPSS version 25.
Results: 183 participants were included (Bucaramanga: 68, Medellín: 55 and Bogotá: 60). 62,8% were women, without differences by city (p=0,610s). The prevalence of OHS was: 10,4% (Bucaramanga: 8,8%, Medellín: 7,3%, Bogotá: 15%; p=0,346); 93,4% had sleep apnea (AHI≥5/h) (p=0,580). Patients with OHS had lower SpO_2 in both NREM and REM. Higher the altitude, lower SpO2 during sleep (Table and Figure 1).
Conclusions: OHS prevalence in 3 cities located at different altitudes was 10.4%, which is similar to data found at sea level. SpO2 during sleep was significantly lower in both patients with OHS and living at higher altitudes.

Obesity, obstructive sleep apnea hypopnea syndrome (OSAHS) and bariatric surgery. 559 operated patients recorded, cohort followed for 1 year

S. Benyoussef[1], X. Marcano[1], S. Bercker[1], H. Ruffa[1], M. Dahman[2], L. Lerousseau[1]
[1]CH Antibes Juan les Pins, Centre Pluridisciplinaire Antibois du Sommeil de l'Adulte, Antibes, France,
[2]CH Antibes Juan les Pins, Bariatric Surgery Unit, Antibes, France

Introduction: The prevalence of obstructive sleep apnea syndrome (OSAHS) in patients undergoing bariatric surgery is evaluated between 60% and 80% in the literature. Bariatric surgery most often results in effective and durable weight reduction as well as management of comorbidities including OSAHS. We are evaluating the results of our cohort of patients operated between 2017 and 2021 after 1 year.

Materials and methods: 559 patients selected for a bariatric intervention by Sleeve Gastrectomy or Gastric Bypass (GBP) were recorded in search of OSAHS. Continuous positive airway pressure management (CPAP) was proposed for an apnea-hypopnea index (AHI) ≥ 15 in the presence of symptoms of OSAHS. An inspection of the recording was proposed 1 year after the surgery.

Results: 450 patients (81%) had an AHI ≥ 5. 262 patients had moderate (17%) to severe (42%) OSAHS to treat. 217 patients accepted CPAP treatment (83%). 1 year the after surgery (GBP 85%) the average weight loss was 44 kg and -37% of the initial weight (BMI 27 kgm-2). 66% of patients fitted with CPAP returned the equipment before being re-recorded (129 contacted patients said they became asymptomatic). 65 patients were re-registered, 80% have an AHI < 15, 13 patients are continuing treatment with CPAP (average AHI 30). At 1 year, 93% of patients had their equipment removed (asymptomatic or AHI<15).

Conclusions: In our bariatric surgery population, these results confirm the high prevalence of OSAHS. Adherence to treatment is excellent. At 1 year, only a few patients (7%) still have an indication for treatment (persistence of symptoms and AHI ≥ 15).

Obstructive sleep apnea and atrial fibrillation – more than AHI

S. Sousa[1], M.M. Oliveira[2], D. Grencho[3], J. Dias[4], S. Dias[5], M. Drummond[6], A. Bugalho[7]
[1]Pulmonology Department, CUF Tejo Hospital and CUF Descobertas Hospital, Lisbon, Portugal; Nova Medical School, Pneumology, Lisboa, Portugal, Lisboa, Portugal, [2]CUF Hospital/Central Lisbon Hospital and University Center, Lisbon, Portugal 4 Faculty of Medicine, Lisbon University Cardiovascular Center (CCUL), Lisbon University,, Cardiology, Lisboa, Portugal, [3]Faculty of Medicine, Lisbon University, Lisboa, Portugal, [4]CUF Hospital, Pneumology, Lisboa, Portugal, [5]ciTechCare, Escola Superior de Saúde de Leiria, Politécnico de Leiria Comprehensive Health Research Center (CHRC) Universidade NOVA de Lisboa (NMS/UNL), Lisboa, Portugal, Lisboa, Portugal, [6]Sleep and Non Invasive Unit, Centro Hospitalar e Universitário São João Medicine Faculty of Porto University, Portugal, Sleep and Nin Invasive Unit, Porto, Portugal, [7]Pulmonology Department, CUF Tejo Hospital and CUF Descobertas Hospital, Lisbon, Portugal; Nova Medical School, Pneumology, Lisboa, Portugal

Introduction: There is a close relationship between obstructive sleep apnea (OSA) and atrial fibrillation (AF). The apnea hypopnea index (AHI), the most common parameter to grade severity, has been shown to predict the risk for mortality but is insufficient to characterize this complex disease.
Objective: We characterized the prevalence and severity of OSA in AF patients and assess sleep apnea markers that could be associated with AF prognosis.
Methods: We conducted a prospective study in AF patients (paroxysmal or persistent). Anthropometric measurements and respiratory polysomnography parameters were collected and assessed.
Results: Sixty-one AF patients were included (mean age 62,59 years old; 70% male). All were submitted to clinical evaluation and polysomnography. Mean Epworth Sleepiness Scale (ESS) was 6.61. All patients included in our study had an AHI ≥ 5/h with a mean AHI of 41,6/h (min – 11, max - 126). The group 1 included 37 patients with severe OSAS (AHI ≥ 30/h) and the group 2 included 24 patients with mild/moderate OSAS (AHI 5-29.9/h). The group 1 had statistically significant higher levels of hypoxic burden ($p = 0.004$) and arousal index ($p = 0.003$) but no difference regarding ESS. There was no correlation between ESS and arousal index ($p = 0.2$) or between Body Mass Index and AHI ($p = 0.11$).
Conclusions: OSAS was highly prevalent in the studied population although most patients had few or no symptoms of hypersomnolence. Hypoxic burden and arousal index, both associated with transient sympathetic activation, may be useful in OSA-AF patient stratification beyond AHI. Further prospective studies with larger population are needed to stablish the relationship between these sleep markers and arrythmia prognosis.

Obstructive sleep apnea and its association with different forms and severity of Chagas disease

L. Cruz[1], L. Oliveira[1], C. Serrano[1], V. Viana[1], L. Paes[1], E. Soares[1], M. Mediano[1], C. Valete[1]
[1]FioCruz, Rio de Janeiro, Brazil

Introduction: Chagas disease (CD) is an infection caused by the parasite Trypanosoma Cruzi, which has two clinical stages: acute and chronic phase. In the chronic phase it can manifest itself in the indeterminate, cardiac, digestive and cardiodigestive forms. Obstructive Sleep Apnea (OSA) increases cardiovascular risk and its gold standard treatment is the Continuous Positive Air Pressure Device (CPAP). Although CD is widely studied in terms of clinical manifestations, treatment and diagnosis, there are few findings in the literature that evaluate its association with OSA. CD is still a disease with high morbidity and mortality rates, mainly due to its chronic cardiac form and the treatment of these patients is still a challenge. OSA is associated with increased cardiovascular risk and metabolic dysfunction and, therefore, may have a negative impact on the evolution of patients with CD. In our literature search, we found only two studies that associate OSA with CD. The objective of this study was to identify the prevalence of Obstructive Sleep Apnea and its association with different forms of Chagas disease.

Material and methods: Comparative prospective cross-sectional observational study in patients with CD treated at the Laboratory of Clinical Research in Chagas Disease (LapClin-Chagas). Patients were invited during the medical appointment at LapClin-Chagas to participate in the study, and those who agreed, were submitted to the STOP-BANG Questionnaire (STQ) and Epworth Questionnaire (EQ). Clinical, epidemiological and complementary exam data were collected from the medical records of all patients included. The data was entered and analyzed in SPSS 16.0. Frequencies of categorical variables and measures of central tendency and dispersion of numerical variables were described. The association between OSA and sociodemographic and clinical variables were obtained Mann-Whitney test and Chi Square test.

Results: 99 patients were included in the study. Of these, 67% are female and the average age is 68 years. The median STQ score was 4 (ranging from 1 to 7) and 79.8% of the patients had a score greater than 2. The mean STQ score was higher in men than women (p value 0.047). Patients with a score on the EQ greater than 10 had a higher score on the SBQ (p value 0.006). The median EQ score in patients with STQ score less than or equal to 2 was 5.50 and 7 in patients with STQ score greater than 2. There was no association between the SBQ score and the clinical forms of Chagas disease. 97% of patients never underwent polysomnography and only one patient has a diagnosis of OSA and uses CPAP.

Conclusion: There was no association between the SBQ score and the clinical forms of Chagas disease. However, there was an association with male gender and excessive daytime sleepiness diagnosed by EQ. We observed that the vast majority of patients never underwent polysomnography despite the fact that most of them were at medium or high risk for sleep apnea, which shows low awareness of these patients about this disease.

Obstructive Sleep Apnea, but not markers of Sleep Irregularity nor Sleep Duration, is associated with Metabolic Syndrome: the ELSA-Brasil study

B. Parise[1], N. Lapi-Ferreira[1], R. Santos[1], S. Giatti[1], A. Aielo[1], A. Pelepka[1], L. Cunha[1], S. Silvana[1], P. Lotufo[1], I. Bensenor[1], L. Drager[1]
[1]University of Sao Paulo, Sao Paulo, Brazil

Introduction: Obstructive Sleep Apnea (OSA) is associated with metabolic impairment and the incidence of metabolic syndrome (MetS). Recent evidence suggests that sleep duration (SDUR) and markers of sleep irregularity may contribute to MetS, but the relative role of these associations are not clear. We aimed to evaluate the associations of OSA, markers of sleep irregularity and SDUR with MetS.

Material and Methods: Participants of the ELSA-Brasil study underwent clinical and sleep assessments including: 1) OSA (defined by the apnea and hypopnea index ≥15 events per hour by a portable sleep monitoring); 2) objective measurements of SDUR using a wrist actigraphy for 7 consecutive days; 3) markers of sleep irregularity using actigraphy data: Standard deviation (SD) of the SDUR; SD of sleep latency onset; recovery sleep at the end of week (catch-up sleep). MetS was diagnosed according to the National Cholesterol Education Program Adult Treatment Panel III (NECP III), if 3 of the 5 following factors were present: 1) waist circumference ≥88cm for women, ≥102cm for men; 2) triglycerides ≥150mg/dL or any anti hypertriglyceridemia medications; 3) decreased high density lipoprotein cholesterol (<40mg/dL for male, <50mg/dL for women) or when on specific drug treatment; 4) arterial blood pressure ≥130mmHg systolic or ≥85mmHg diastolic blood pressure or antihypertensive treatment; 5) blood glucose ≥110mmg/dL or antihyperglycemic medication. A multivariate analysis was used to determine the independent associations of sleep irregularity with MetS. For OSA, we adjusted for age, gender, race, physical activity intensity, smoking, per capita income, excessive daytime sleepiness, insomnia, SDUR and variables of sleep irregularity. For SDUR and variables of sleep irregularity, we adjusted for the same demographic and anthropometric parameters plus the presence of OSA.

Results: We studied 1,720 participants (age 49±8 years; 43.4% men, 26.7% fulfilled the MetS diagnosis; 33% with OSA). Mean SDUR was 394 ± 59.0 hours. After adjustments, OSA was independently associated with MetS, even when adjusted for SD of SDUR (OR: 2.50; 95% CI: 1.97, 3.17); p.<0.001), SD of sleep onset latency (OR: 2.49; 95% CI: 1.96, 3.15; p<0.001) or catch-up-sleep (OR: 2.51; 95% CI: 1.98, 3.18; p<0.001). In contrast, we did not observe significant associations between sleep irregularity variables and SDUR with MetS.

Conclusion: OSA, but not sleep irregularity nor SDUR, was independently associated with MetS.

Acknowledgements: The authors thank the investigators of the ELSA-Brasil and all participants included in this study.

Obstructive sleep apnea in the follow-up of cancer patients – more than just a comorbidity?

P. Magalhães Ferreira[1], I. Carvalho[1], D. Rodrigues[2], M. Redondo[2], F. Carriço[2], M. van Zeller[2], M. Drummond[2,3]
[1]Centro Hospitalar Universitário de São João, Pulmonology Department, Porto, Portugal, [2]Centro Hospitalar Universitário de São João, Sleep and Non-invasive Ventilation Unit, Porto, Portugal, [3]Faculty of Medicine, University of Porto, Porto, Portugal

Introduction: Current developments in the field of Obstructive Sleep Apnea (OSA) have suggested higher risk of cancer in this population, particularly due to intermittent hypoxia. Our goal with this work was to assess the prevalence of OSA in all-type cancer patients and its potential impact on cancer prognosis.

Materials and Methods: Retrospective study including patients with a cancer diagnosis that were afterwards diagnosed with OSA during a 10-year period between December 2012 and December 2022. T-student and Mann-Whitney tests were applied for continuous variables and the chi-square test was used to compare categorical variables. Survival was determined by Kaplan-Meier curves and compared by log-rank test. A multivariate analysis was performed using Cox proportional hazard model.

Results: A total of 186 patients were included, 53.2% male, with mean age at the time of OSA diagnosis of 62.5 ± 10.9 years. The majority (90.3%) were overweight, with 63% being obese [median BMI 31.5 kg/m^2 (17.8; 50.8)]. More than half (53.2%) were non-smokers and only 17.7% had excessive alcohol intake. Cardiovascular and metabolic comorbidities were frequent (64% and 54.8%, respectively), while only 21.5% had concomitant respiratory disease. The most prevalent primary malignancies were breast (27.4%), colorectal (17.7%) and lung cancer (16.1%). Only 10.8% of patients had disseminated disease at the time of diagnosis, which led to 90.9% of them being proposed to curative-intent treatment. Less than half (48.9%) the patients presented excessive daytime sleepiness, as assessed by the Epworth Sleepiness Scale (ESS); median ESS score was 9 (0;24). Seventy-seven (41.4%) patients presented severe OSA as determined by the apnea-hypopnea index (AHI); median AHI at diagnosis was 24.2 (5.2;123). Median mean nocturnal peripheral oxygen saturation (SpO2) was 92.1% (74;97.2) and median cumulative time spent with SpO2 below 90% (T90%) was 8.7% (0;100), with roughly a third of patients having nocturnal hypoxaemia (NH) (32.3%). OSA severity correlated moderately with T90% (r=0.533, p<0.001). Most patients (n=132) were proposed to Positive Airway Pressure (PAP) therapy. Treatment was well tolerated by the majority, which continued adherent (both >70% days of usage and >4h of usage per night) throughout follow-up (93.5%). Twelve patients stopped PAP due to intolerance. Of the 60 patients with NH, 50% showed oncologic disease progression (versus 31% of the patients without hypoxaemia; p=0.012). Median overall survival (OS) since cancer diagnosis was significantly worse for patients presenting NH [137 months (119.8;154.2) versus 265 months (155.9;374.1); p<0.001]. Patients with severe OSA presented significantly worse OS versus mild/moderate OSA [153 months (105.5; 200.5) versus 385 months; p<0.001]. Patients who were systematically adherent to PAP treatment presented better OS versus non-adherent patients [mean OS 281.9 months (235.8;320.0) versus 154.8 months (132.3;177.3); p=0.031]. After adjusting for confounders, only NH [HR 7.17 (3.18; 16.13); p<0.001] and time to OSA diagnosis [HR 0.97 (0.96;0.98); p<0.001] remained independent predictors of worse OS.

Conclusions: OSA severity and specifically NH in cancer patients was significantly related to worse OS, as was also time to OSA diagnosis. Our study suggests a potential impact of OSA treatment in these patients' prognosis that still requires further investigation.

Obstructive sleep apnea severity is associated with longitudinal cholinergic basal forebrain volume changes in late middle-aged and older adults

M.-È. Martineau-Dussault[1,2], V. Daneault[1,3], C. André[1,2], A.-A. Baril[1,4], J. Legault[1,2], N.A. Marchi[1,2,5], D. Lorrain[6,7], C. Bastien[8,9], C. Hudon[8,9], J. Carrier[1,2], N. Gosselin[1,2]
[1]Center for Advanced Research in Sleep Medicine, Hôpital du Sacré-Coeur de Montréal, CIUSSS du Nord de l'Ile de Montréal, Montreal, Canada, [2]Université de Montréal, Department of Psychology, Montreal, Canada, [3]Centre de Recherche de l'Institut Universitaire de Gériatrie de Montréal, CIUSSS du Centre-Sud-de l'Île-de-Montréal, Montreal, Canada, [4]Université de Montréal, Department of Medicine, Montreal, Canada, [5]Center for Investigation and Research in Sleep, Lausanne University Hospital and University of Lausanne, Lausanne, Switzerland, [6]Research Centre on Aging, University Institute of Geriatrics of Sherbrooke, CIUSSS de l'Estrie – CHUS, Sherbrooke, Canada, [7]University of Sherbrooke, Department of Psychology, Sherbrooke, Canada, [8]CERVO Research Center, Québec City, Canada, [9]Université Laval, École de Psychologie, Québec City, Canada

Introduction: Obstructive sleep apnea (OSA) is highly prevalent in older adults and associated with cognitive decline and increased risk of dementia. Cross-sectional neuroimaging studies show that greater OSA severity is associated with both gray matter atrophy and hypertrophy, but how these changes progress over time remains unclear. Here, we characterized OSA-related longitudinal changes in gray matter volume in late middle-aged and older adults.

Materials and methods: We included 63 participants aged 56 years old and over (age: 68.3 ± 7.6 years; 27 women) with no to severe OSA (apnea-hypopnea index [AHI]: 10.7 ±13.1 events/h, from 0.0 to 84.2) at baseline. They underwent an overnight polysomnography, a neuropsychological evaluation, and a brain magnetic resonance imaging (MRI) session. After baseline examinations, those with OSA were then referred to a sleep apnea clinic where a treatment was proposed. The present study only included controls and those with OSA who refused to be treated. After a mean follow-up of 26 months (range: 9.6 to 41.9 months), participants were evaluated again with MRI and neuropsychological tests. Brain images were preprocessed using the Computational Anatomy Toolbox (CAT12). Seven regions of interest were selected, namely the anterior cingulate cortex; the dorsolateral prefrontal cortex; the posterior insula; the thalamus; the amygdala; the hippocampus; and the basal forebrain cholinergic system (Ch1-2-3 and Ch4 nuclei). For each ROI, mean tissue volumes were estimated for each region unilaterally (where appropriate), and normalized by the total intracranial volume. A delta score was computed to reflect longitudinal changes in GM volume (follow-up-baseline volumes). Normality of variables was assessed using the Kolmogorov-Smirnov test and variables were log-transformed when necessary. Partial correlations were performed in the whole sample between the AHI and delta GM volume scores, controlling for sex, age, and time interval between the two MRI sessions. All P values were FDR-adjusted, and results were considered significant when $p<0.05$.

Results: We found that more severe OSA was associated with an increased volume of the right basal forebrain Ch4 nucleus (nucleus basalis of Meynert) over time, as measured with the calculated delta ($r=0.38$; $p=0.02$).

Conclusions: These results suggest that OSA is associated with a longitudinal increase in Ch4 (i.e., nucleus basalis of Meynert) volume, which may reflect OSA-related inflammatory and/or edema processes, or an early compensatory upregulation of cholinergic activity. As this region is known to degenerate early in Alzheimer's disease, future studies should investigate the impact of OSA treatment on these associations.

Obstructive sleep apnea syndrome in the slim snorers

K. Pandyan[1], P.V. Krishnan[2]
[1]Subbaiah Institute of Medical Sciences, Department of ENT, Shivamogga, India, [2]Madras ENT Research Foundation, Department of Snoring and Sleep Disorders, Chennai, India

Introduction
Obstructive sleep apnea (OSA) is one among the most common sleep-disordered breathing which is characterized by repeated cessation or reduction in airflow during sleep. OSA occurs in both non-obese and obese individual. Our study was designed to compare the clinical, Drug induced sleep endoscopy findings (DISE) & polysomnographic (PSG) data between the non-obese and obese patients with OSA.

Materials and Methods
We carried out a retrospective study which included all the patients diagnosed with OSA between September 2022 to May 2023. We had a total of 67 patients and they were further classified into non-obese and obese groups based on the body mass index (BMI) <27.5 and ≥27.5, respectively.
The PSG and clinical data were evaluated and compared between the two groups. During DISE the groups were also assessed for the pattern of obtrusion at each anatomic level using the VOTE scoring system. Data were analysed using Statistical Package for the Social Sciences (SPSS) software program, version 20.0 (SPSS, Chicago, Illinois). A value of $P < 0.05$ was considered statistically significant.

Results
There were 67 patients of OSA, of which 13 (19.4%) were non-obese and 54 (80.6%) were obese with a mean BMI of 26.52 ± 3.39 kg/m2, and 34.14 ± 7.34 kg/m2, respectively. Characteristics, such as male predominance, higher BMI, neck circumference, and AHI, were significantly higher in obese group ($P < 0.05$) as compared to non-obese.
Mild OSA (AHI 5-15) was significantly higher in non-obese patients (39.13% vs. 5.55%, $P < 0.00001$), whereas severe OSA (AHI >30) was higher in obese patients as compared with non-obese (66.66% vs. 30.43%, $P = 0.002$). The obese group had significantly higher oxygen desaturation index (46.14 ± 11.32 vs. 32.24 ± 17.26, $P < 0.001$), the minimal oxygen saturation was also lower in the obese group (65.5 ± 11.00 vs. 81.5 ± 6.50, $P < 0.001$).
DISE reporting showed that palatal collapse was the most common (81%), multilevel collapse was more common in obese (78.12% vs 16.42%,).
The most frequently observed multilevel collapse pattern was a combination of palatal and tongue base collapse (32.8%). Based on the anatomical level of obstruction there was no statistically significant difference in airway obstruction at the velum ($p = 0.142$), oropharynx ($p = 0.516$), lateral pharyngeal walls ($p = 0.784$), tongue base ($p = 0.953$), or supraglottis ($p = 0.416$) between obese and non-obese groups.
Overall, the OSA in non-obese patients was mild-to-moderate as compared to that of the obese and no significant differences were observed between them as regard to age, gender, excessive daytime sleepiness (ESS), adenoid or tonsillar enlargement, and remaining polysomnographic parameters

Conclusions:
The severity of OSA in non-obese is generally less as compared with obese and its early identification requires a high index of suspicion. Non-obese patients with OSA are a subgroup of individuals with fewer clinical, polysomnographic, and pathophysiological features. Non anatomical contributors to OSA, such a low threshold for arousal, are likely to be particularly important in OSA pathogenesis in nonobese patients with OSA. The early recognition of the disease, in them helps in the treatment of OSA and prevention of its long-term cardiovascular risks

Obstructive sleep apnoea and cancer risk: results of a case-control analysis using data from the Cancer Lifestyle and Evaluation of Risk (CLEAR) Study

Y.S. Bin[1,2], K. Cook[1,2], V. Nair-Shalliker[3,4], K. Sutherland[1,2], P. Cistulli[1,2,5]
[1]University of Sydney, Charles Perkins Centre, Sleep Research Group, Sydney, Australia, [2]University of Sydney, Faculty of Medicine and Health, Sydney Medical School, Northern Clinical School, Sydney, Australia, [3]University of Sydney, The Daffodil Centre, Sydney, Australia, [4]Macquarie University, Faculty of Medicine and Health Sciences, Sydney, Australia, [5]Royal North Shore Hospital, Department of Respiratory Medicine, Sydney, Australia

Introduction: Animal and cellular models suggest that obstructive sleep apnoea (OSA) plays a role in the development of cancer. Epidemiological studies have found inconsistent associations and typically lack control for lifestyle risk factors contributing to both OSA and cancer. We examined associations between OSA and common cancers in a case-control study.

Materials and Methods: We analysed data from the New South Wales CLEAR Study which recruited adults with newly diagnosed cancer (n=8551 cases) and cancer-free controls (n=2230). Self-reported OSA was compared in women and men with a verified cancer diagnosis and controls of the same gender. Covariates included age, body mass index, smoking, passive smoking, alcohol intake, physical activity, skin colour, and time spent outdoors.

Results: OSA was more common in cancer cases than controls: 2.9% vs. 1.9% in women and 7.9% vs. 5.9% in men. For women, OSA was not significantly associated with melanoma (AOR 1.58, 95% CI 0.76-3.29), lung (1.54; 0.59 - 3.99), breast (1.35; 0.79-2.31), or bowel cancer (1.26, 0.61 - 2.59) after adjustment for potential confounders. For men, OSA was not significantly associated with bowel (1.37; 0.92-2.03), prostate (1.31; 0.94 -1.82), lung (0.96; 0.45-2.01), or melanoma (0.92; 0.58-1.48) after control for covariates.

Conclusions: Further analysis will consider rarer cancers and the role of shiftwork, sleep duration, and napping. Preliminary results support a link between OSA and common cancers only through shared risk factors. Information on OSA treatment is missing from this study. OSA treatment together with self-reported OSA may lead to under-estimation of any OSA-cancer association.

One stone two birds: cardiovascular therapies improve obstructive sleep apnea

R. Lin[1], W. Yan[1], M. Yi[1], Y. Zhang[1]
[1]Central South University, Department of Respiratory Medicine, Xiangya Hospital, Changsha, China

Introduction: Obstructive sleep apnea (OSA) and cardiovascular co-morbidities have a mutually reinforcing effect, but existing studies have focused only on the improvement of the associated co-morbidities by OSA treatment. We want to provide fresh guidelines for the treatment of OSA from a comorbidity standpoint.

Materials and Methods: The proposal was registered with PROSPERO (CRD42022351206). Original studies of OSA patients who contained co-morbidities of cardiovascular and received related treatment were included in the analysis. The change of mean Apnea–Hypopnea Index (AHI) was included as primary outcome and estimated by weighted mean difference (WMD), subgroups of treated medicine, intervention duration and disease severity were also considered.

Results: We found that antihypertensive therapy can improve OSA respiratory events, with the amount of AHI improvement being diuretics > aldosterone-angiotensin inhibitor (AAI) > Renal sympathetic denervation (RDN) (-19.41/h, $p=1.0\times10^{-5}$ vs. -9.19/h, $p=0.003$ vs. -2.32/h, $p=0.19$). While longer treatment duration (>4weeks) (-12.78/h, $p=0.002$) or participants with higher baseline AHI (>35/h) (-14.74/h, $p=1.0\times10^{-5}$) may obtain greater improvements.

Conclusions: Antihypertensive therapy can benefit respiratory events in OSA patients combined with hypertension, and among them, those treated with diuretics, for longer durations (>4weeks), or in severe OSA (baseline AHI >35/h) showed greater improvements. These findings provide evidence for OSA treatment and can be recommended to clinicians after further validation.

On the relationship between Hypoxic Burden and standard PSG variables for obstructive sleep apnea diagnosis and prediction

G. Dorffner[1,2], G. Gruber[2], M. Lagler[2]
[1]Medical University of Vienna, Institute of Artificial Intelligence, Vienna, Austria, [2]The Siesta Group, Vienna, Austria

Introduction: Hypoxic Burden has been introduced as a potential diagnostic and predictive biomarker for obstructive sleep apnea syndrome (OSAS) and its outcomes. It presents a novel framework that puts emphasis on the cumulative depth and extent of desaturations as the result of respiratory events like apneas and hypopneas, rather than counting the frequency of such events. In this retrospective study we compare the capability of Hypoxic Burden to differentiate between OSAS patients and healthy subjects and to predict OSAS outcomes with the more common biomarkers Apnea Hypopnea Index (AHI) and Oxygen Desaturation Index (ODI). The goal was to explore the particular strengths of the novel framework side by side with the more traditional framework.

Materials and methods: We took data from 22 OSAS patients and 22 age- and gender-matched controls from the SIESTA database. AHI and ODI values were calculated using the Somnolyzer sleep scoring software (Vienna: The Siesta Group), whereas values for Hypoxic Burden (HB) were calculated using the public platform hypoxicburden.thesiestagroup.com. Three different versions of HB were investigated: one taking all apneas and hypopneas with a 4% desaturation into account (HB4), one taking all apneas and hypopneas with a 3% desaturation or an arousal into account (HB3pa), and one calculating the area under the oxygen saturation curve independently of any scored events (HBtot). Healthy controls had been identified by anamnesis and sleep questionnaires, but had not been screened for undiagnosed OSAS. To investigate the diagnostic capabilities of the biomarkers, t-tests to compare the means between the two groups were calculated. Spearman correlation coefficients were calculated between HB and the standard variables AHI and ODI, to test the relationship between novel and standard biomarkers, as well as between all those variables and potential risk and outcome markers, namely the score from the Pittsburgh Sleep Quality Index (PSQI), the Body Mass Index (BMI) and the Systolic Blood Pressure (SBP) at rest. A significance level of 0.05 was used and a Bonferroni correction for multiple testing was applied.

Results: All HB variables were significantly correlated with both AHI (0.744 for HBa, 0.657 for HB3pa, and 0.778 for HPtot, $p<0.001$ in all cases) and ODI (values in a similar range). Separation between the groups was highly significant for all variables ($p<0.001$ for HBtot, AHI and ODI). Correlation with PSQI was significant for AHI only (r=0.445), correlation with SBP was significant for HBtot (r=0.387), AHI (r=0.518) and ODI (r=0.493). BMI was predicted well by all variables (e.g. r=0.529 for HBtot, r=0.665 for ODI).

Conclusions: Results confirm that Hypoxic Burden is a viable biomarker for classifying OSAS or predicting its outcomes, as had been shown previously in literature. However, no superiority over more standard PSG-based variables could be shown for this data set. More research will be needed to discern potential advantages from a quantitative variable exploring the depth and amount of impact on breathing during sleep, as opposed to the standard of mainly counting events.

Optimising the referral system for obstructive sleep apnoea: a review of the GP work-up and a prioritisation criteria

J. Lim[1], E. Prakash[2], C. Frampton[3], P. Szulakowski[4]
[1]University of Auckland, Auckland, New Zealand, [2]University of Otago, Dunedin, New Zealand, [3]University of Otago, Psychological Medicine, Dunedin, New Zealand, [4]Tauranga Hospital, Respiratory and Sleep Medicine, Tauranga, New Zealand

Introduction: Obstructive sleep apnoea (OSA) is one of the most frequent chronic respiratory diseases and its prevalence has been increasing given the obesity pandemic. With the effects of COVID-19 on staffing and resources, they have placed a strain on the Te Whatu Ora Bay of Plenty (BOP) Sleep Service in New Zealand, leading to increased wait-times for sleep diagnostics and management. The study evaluates the effectiveness of the OSA referral system by reviewing referrals made to the BOP Sleep Service during the COVID-19 pandemic. It assesses the work-up done by GPs in reviewing patient risk factors prior to referral. Areas for improvement and utility of a referral prioritisation criteria were also explored to help optimise allocation of resources to an already strained service.

Method: A retrospective study was done looking at 70 consecutive referrals made by GPs from the BOP region in March and April 2021, and an exclusion criteria was used. Data was collected on patient demographics, Epworth Sleepiness Scale (ESS) score, sleep study results, current medications, co-morbidities, blood tests done in the community, and whether they were professional drivers. Patients either underwent a pulse oximetry Level 4 sleep study, a respiratory polygraphy Level 3 sleep study, or both, and their respective oxygen desaturation index (ODI) or apnoea-hypopnoea index (AHI) were recorded. For consistency, we used the ODI measured in those that underwent a single sleep study, and the Level 3 ODI measured in those that underwent both. We categorised patients into a severity of OSA/Sleep Disordered Breathing according to ODI and analyses were performed comparing the final diagnosis with different variables.

Results: Out of 70 patients, 64 (91.4%) were diagnosed with OSA, of which 20 were severe, 31 moderate, and 13 mild. There was a positive relationship between the severity of OSA and average BMI and STOP-Bang scores, but no conclusive relationships with other demographic parameters. A significant percentage of patients with no OSA (95.7%) or mild OSA (87.2%) were concurrently using a medication with adverse effects like drowsiness or fatigue compared to patients diagnosed with moderate and severe OSA. 50% of patients not diagnosed with OSA had a mental health condition which could also present with symptoms similar to those seen in OSA. Renal function tests and haematology blood tests were conducted within 12 months in >80% of the referrals. Whereas, less common blood tests such as thyroid function tests, iron studies, and vitamin B12/folate levels were not conducted within 12 months in >40% of referrals.

Conclusions: The positive diagnostic yield in 91.4% of patients shows that the current system fulfils its role by accepting patients who have a high probability of OSA or work in high-risk jobs. The combination of a GP work-up prior to referral and a referral prioritisation criteria for suspected OSA, have shown to create an effective tool in assessing which patients should be referred and which should subsequently be accepted for further diagnostics. However, recommendations are made to continue optimising the referral system.

Orofacial myofunctional therapy in severe obstructive sleep apnea: case series study

A. Prikladnicki[1], V.C. Alexandre de Souza[2], V. Ieto[3], A. Lima[4]
[1]Federal University of Rio Grande do Sul, Health Sciences: Cardiovascular Sciences and Cardiology Program, Porto Alegre, Brazil, [2]Federal University of Minas Gerais, Health Sciences: Child and Adolescent Health, Belo Horizonte, Brazil, [3]Sleep Speech-Language Therapist, São Paulo, Brazil, [4]Sleep Speech-Language Therapist, Pernambuco, Brazil

Introduction: Severe obstructive sleep apnea (severe OSA) is a health condition with cardiovascular, cognitive and psychosocial consequences. The gold standard treatment is the continuous positive airway pressure (CPAP) recommended by physicians. Since only 50% of subjects diagnosed with severe OSA achieve CPAP adaptation nightly and a minimum of 4 hours of use, other options of treatments are required. Orofacial myofunctional therapy (OMT) is an effective treatment for mild and moderate OSA; nevertheless, with low or none evidence to severe OSA.

Objective: To evaluate the effects of OMT in patients with severe OSA who refused to use CPAP.

Materials and methods: 4 patients (3 men and 1 woman) with ages of 45, 47, 61 and 70 years old, respectively, diagnosed with severe OSA based on type I polysomnography as baseline and type I or type III as follow-up were submitted to an evaluation and customized personalized orofacial myofunctional therapy (OMT). The duration of OMT comprised 3 to 6 months with oropharyngeal exercises and functional approach (breathing, chewing and swallowing functions). The exercises and functional therapy were carried out daily, concomitantly, at home. The OMT of the four subjects was led by speech-language therapists (SLT) certified in Sleep Speech-Language Therapy (*Fonoaudiologia do Sono)* by the Brazilian Sleep Association. All participants gave a written consent to this work be presented in the World Sleep Congress 2023.

Results: The individuals AHI pre OMT were 33.6, 41.2, 36.0, 35.1 events/hour; minimum saturation pre OMT 86% (0.8% of the night < 90%), 76% (14,5% of the night < 90%), 90% (0.0% of the night < 90%), 81% (1.8% of the night < 90%), respectively. AHI post OMT were 4.1; 7.0; 6.7 and 5.5 events/hour; minimum saturation post OMT were 87% (0.1% of the night < 90%), 87% (0.2% of the night < 90%), 90% (0.0% of the night < 90%) and 91% (0.0% of the night < 90%). All the patients received the medical recommendation of CPAP use nightly and after OMT were allowed to discontinue the use of the CPAP.

Conclusions: OMT may be an effective alternative treatment to patients with severe AOS that received an interdisciplinary evaluation by sleep medical team and refused to use CPAP.

Acknowledgements: We would like to thank the patients who agreed to take part into this World Sleep Congress with their clinical cases. Thank you so much for each one of you.

OSA as a consideration in upper jaw surgery

M.V. Firmalino[1], T. Kim[1], J. Stone[1], S. Liu[2]
[1]University of Texas Southwestern/ Parkland Memorial Hospital, Oral & Maxillofacial Surgery, Dallas, United States, [2]Stanford University, Otolaryngology - Head & Neck Surgery (OHNS), Palo Alto, United States

Introduction: Segmental LeFort I osteotomy is useful for the management of transverse and vertical maxillary discrepancies. However, some patients in need of orthognathic surgery may also have risk factors for obstructive sleep apnea (OSA) in which clinicians must be conscious about how surgery will affect the soft palate, the most commonly involved area of obstruction (77.9%). [1] Furthermore, in patients who need palatal expansion and maxillary advancement for the purpose of increasing airway volume and treating OSA, it is important to consider whether the segmental LeFort I osteotomy will provide similar advancement of the palate compared to the single-piece LeFort. The purpose of this study is to identify any differences in length of the hard palate between the two groups in order to determine whether the palatal island advances in conjunction with the maxillary arch in a segmental Lefort. The investigators hypothesize that the distance between the anterior nasal spine (ANS) and posterior nasal spine (PNS) will be greater in that of a segmental than a single-piece LeFort.

Materials and Methods: CBCT is a reliable imaging method for cephalometric assessment and was used to identify the ANS and PNS point on sagittal cut. [2] Distance between the two points were measured preoperatively and >6 weeks postoperatively, the time at which initial bone healing in the maxilla occurs.[3] The difference between postoperative and preoperative ANS-PNS length was found and the means were compared between the two groups. A retrospective cross-sectional study design was implemented. Extrapolation of data and statistical analysis was performed using two-sample t-tests. Statistical significance was determined to be $P < 0.01$ with 99% confidence interval (CI) to account for any variation in measurements.

Results: 108 patients ages 18-45 who underwent segmental or single-piece Le Fort I osteotomy from 2018 to 2022 was collected by running an electronic health record report with the above criteria. Of these, 59 patients were excluded because imaging was taken outside of the study timeframe, imaging was not reliable for measurement, or procedure performed was a 2-piece Le Fort osteotomy without creation of a palatal island. 24 patients were male and 25 were female, totaling 49 patients. 29 patients underwent single-piece LeFort and 20 patients underwent segmental LeFort. The mean difference between pre- and postoperative ANS-PNS distance was 0.21mm in the single-piece group and 2.14mm in the segmental group. The postoperative palatal length proved to be significantly greater in the segmental LeFort group at >6 weeks ($P < 0.01$) with a CI = 99%.

Conclusions: This study serves as an initial analysis of the position of the hard palate when performing a segmental LeFort osteotomy. By observing an increase in palatal length when producing a palatal island, we can assume there to be a similar effect on the soft palate.

In addition to using palatal expansion for transverse discrepancies >7mm[4], it may be reasonable to opt for palatal expansion with subsequent single-piece maxillary advancement for patients with risk factors for OSA or for patients undergoing maxillary advancement to treat their OSA.

Acknowledgements: N/a

Outcomes of inspire therapy in a community sleep medicine practice TN, USA

I. Shrestha[1], D. Prok[1], A. Chandra[1], A. Chandra[2]
[1]Advanced Center for Sleep Disorders, Chattanooga, United States, [2]Brigham and Women's Hospital, Massachusetts, United States

Introduction: Sleep-induced apnea and disordered breathing is a common disorder producing nocturnal hypoxemia and sleep fragmentation. It causes intermittent, cyclical cessations or reductions of airflow, with or without obstructions of the upper airway (OSA). The anatomically compromised, collapsible airway, the sleep-induced loss of compensatory tonic input to the upper airway dilator muscle motor neurons will cause the pharyngeal airway to collapse which will hinder the ability of the sleeping subject patient to compensate for this airway obstruction.

There is a positive correlation of sleep-disordered breathing with high body mass index and snoring, breathing cessation at night, nocturnal wandering or confusion, daytime sleepiness and depression. Upper airway stimulation (UAS; Inspire Medical Systems, Maple Grove, MN, USA) works on unilateral hypoglossal nerve stimulation that has an implantable pulse generator, stimulation lead placed on the 12th nerve, hypoglossal nerve and respiratory sensing electrode.

Materials and Methods: Patients are referred for Inspire based on the eligibility criteria to get approved for Inspire. After implant activation, patient are followed in office and after patients reports subjective improvement in symptoms, the patients are assessed with a home sleep apnea test (HSAT). Then the in-lab polysomnographic (PSG) fine tuning study is done usually within 2–6 months after implant to optimize therapy. After therapeutic titration, patients come to the office for follow-up to assess symptoms, stimulation thresholds, and device settings. Out of all the patients who had Inspire activated in the office, 15 were randomly selected to assess the outcomes of AHI and EPWORTH. The patients who had completed the baseline AHI, repeated sleep study post implant, and those who had the EPWORTH completed before and after the implant were selected. Exclusion criteria included patients who already has the Inspire implant active prior to first visit within our office, non-complaint to Inspire therapy, patient who have not kept schedule follow up, and patients who have not had repeat assessment of AHI via sleep study. The AHI outcome and EPWORTH outcome does not correlate with the same patient.

Results: Out of all the patients selected, the average AHI was decreased by 23.07/hr post-inspire therapy compared to the pre inspire. The average EPWORTH was decreased by 5.46 post-inspire therapy compared to the pre inspire. With the paired sample t-test used for a quantitative analysis between pre and post test scores of AHI, we observed that t value is 7.57 and p-value (two-tailed) is 0.000003. Similarly for the EPWORTH, the t value is 4.40 and p-value (two-tailed) is 0.000601. Both the p values are statistically significant.

Conclusions: Therefore, we can conclude that the Inspire implant is effective and the patient have the lower AHI and improvement in the excessive daytime sleepiness with consistent use of Inspire therapy.

Acknowledgements: We would like to thank our patients, staff, and Inspire team for helping us provide excellent care to the patients and help us gather the data.

Over ten years of follow-up of Severe Obstructive Sleep Apnea patient treated with Mandibular Advancement Device: A Challenging Case Report

D. Barbosa[1], A. Machado Júnior[1]
[1]State University of Campinas (UNICAMP), Medical School of Science, Campinas, Brazil

Introduction: The non-adherence to Continuous Positive Airway Pressure (CPAP) therapy for Obstructive Sleep Apnea (OSA) patients therapy is common. In the final guideline recommendations of the American Academy of Sleep Medicine and American Academy of Dental Sleep Medicine, the Mandibular Advancement Device (MAD) is an option therapy for these patients. The MAD maintains the mandible anterior position, tongue, and hyoid bone to improve the upper airway space patency, supporting the oropharyngeal and hypopharyngeal muscles' tonicity during sleep.
Polysomnography (PSG) is a mandatory sleep laboratory study for diagnosing and monitoring OSA patients, mainly when severe OSA patients non-adherent to CPAP are indicated to MAD therapy. During the COVID-19 Pandemic, an out-of-center type IV PSG, which provides diagnostic performance in OSA severity detection, was a solution for monitoring these patients. The BIOLOGIX is a Nocturnal Digital monitoring (NDM) with high-resolution oximetry and an accurate OXISTAR® sensor. Although few studies were published on severe OSA patients with MAD therapy monitored with this tool, we present a challenging case report with severe OSA treated with MAD and monitored with NDM during the COVID-19 Pandemic. This study aims to present a severe OSA case report treated with MAD for more than ten years and followed up during the COVID-19 Pandemic with NDM.
Materials and methods: The case report is a 45-year-old male, Caucasian, morbidly obese, after being diagnosed with OSA with severe Apnea-Hypopnea Index (AHI), non-adherent to CPAP therapy referred to MAD adaptation by a Sleep Physician. The low titration pressure of CPAP allowed us to anticipate a good outcome with MAD therapy. The DIORS® - MAD was selected to treat this patient. A multidisciplinary team approach was recommended to optimize MAD responses with septum deviation surgery, physiotherapy, and weight loss. PSG type I and IV studies were done during the patient follow-up.
Results: 7 PSG type I and 7 PSG type IV studies were analyzed. It is essential to mention that all polysomnography studies were administered at the same sleep lab except the last PSG. Although the patient continued being obese at 40.12 to 35.8, the following results with MAD showed moderate to mild snoring, Epworth Sleepiness Scale de 14 to 9; Oxygen Saturation at 76 to 87%; AHI at 131.7 to 9.4 ev/h, Arousal Index at 102.6 to 13.6 ev/h, and Sleep efficiency at 75 to 85.2%. Although better respiratory parameters were observed with CPAP, the patient has been controlled and adherent with MAD for more than ten years.
Conclusions: Lessons learned about patient therapy: CPAP results in better AHI reduction than MAD. The patient was non-adherent to CPAP. The physician considers MAD as an option for this patient. MAD is effective in treating severe OSA. The NDM is a good tool for OSA monitoring, mainly during the COVID-19 Pandemic. A multidisciplinary sleep team was essential to help this patient with MAD in search of better results related to adaptation and adherence.

Oxygen saturation (SpO2) to predict obstructive sleep apnea therapy response

A. Aishah[1], R. Radmand[1], L. Messineo[1], L. Gell[1], N. Esmaeil[1], A. Azarbarzin[1], S. Sands[1], D. Vena[1], A. Wellman[1]

[1]Brigham and Women's Hospital and Harvard Medical School, Longwood, United States

Introduction: Current therapies for Obstructive Sleep Apnea (OSA) have varying efficacy and tolerability. With a trial-and-error approach to the clinical management of OSA, many are left untreated and thus suffer deleterious health consequences. This process strongly depends on the OSA severity metric, the apnea-hypopnea index (AHI), which fails to capture the extent of upper-airway collapsibility contribution to OSA in an individual. This study used oxygen saturation (SpO2), a critical signal collected during sleep studies, to predict response to mandibular advancement device (MAD) therapy for OSA. It was hypothesized that certain SpO2 metrics, such as mean desaturation (average change in SpO2 from pre-event baseline), minimum SpO2, mean SpO2, and hypoxic burden would predict MAD therapy response in people with OSA.

Material and methods: Fifty OSA patients (Age: 59±12 yrs, BMI: 27±5 kg/m2, 26:24 Male: Female) recommended for MAD therapy by their physician/dentist performed pre- and post-treatment at-home sleep tests (HST), where an SpO2 signal was also recorded. Those with a pre- to post-treatment AHI reduction of 50% and post-treatment AHI<10 events/h were classified as responders to MAD therapy; all others were classified as non-responders. Logistic regression analysis was performed to determine associations between MAD treatment response and the following SpO2 metrics during sleep: mean desaturation, minimum SpO2, mean SpO2, and hypoxic burden (total area under respiratory event-related desaturation curve).

Results: Of the 50 patients (pre-treatment AHI: 28±18 events/h), 19 were responders and 31 were non-responders (post-treatment AHI: 6±2 events/h), 23±14 events/h, respectively). Those with milder mean desaturations (Odds Ratio (OR) [95% CI]: 6.9 [1.4, 33.3], p=0.02) and hypoxic burdens (OR [95% CI]: 5.4 [1.1, 26.4, p=0.04) were more likely to respond to MAD therapy. No associations were observed between minimum SpO2, mean SpO2, AHI, and treatment response.

Conclusions: Mean desaturation and the hypoxic burden are better predictors of MAD therapy outcome than AHI. There is potential for further research and innovation into using SpO2 signals to develop simplified methods to characterize OSA and predict therapy response. Given that the SpO2 signal can also be obtained from wearable technology, this would make multi-night, non-invasive, and efficient monitoring feasible for future clinical OSA management.

Oxygen saturation variability and machine learning in the correlation and prediction of obstructive sleep apnea severity

R. R. Santos[1], L. E. V. Silva[2], A. L. Eckeli[3], R. Fazan Jr.[1]
[1]School of Medicine of Ribeirao Preto - University of Sao Paulo, Department of Physiology, Ribeirao Preto, Brazil, [2]Children's Hospital of Philadelphia, Department of Biomedical and Health Informatics, Philadelphia, United States, [3]School of Medicine of Ribeirao Preto - University of Sao Paulo, Department of Neuroscience and Behavior Sciences, Ribeirao Preto, Brazil

Introduction: The diagnosis of obstructive sleep apnea (OSA), a highly prevalent clinical syndrome, is made by polysomnography (PSG), a complex and expensive test, not widely available. It generates a high rate of underdiagnosis of this syndrome, which exposes untreated patients to developing life-threatening severe comorbidities. Therefore, searching for alternative methods for diagnosing OSA is of great interest. Although pulse oximetry signal (SpO_2) is a crucial variable in diagnosing OSA, the nonlinear dynamics of SpO2 over time have yet to be explored. Additionally, machine learning (ML) can develop models using a range of attributes to categorize patients based on their clinical condition within specific diseases, such as OSA. So, the study aims to analyze the nonlinear dynamics of SpO_2, using several entropy and fractal indices and their correlation with OSA severity by the apnea-hypopnea index (AHI), a PSG-derived index used to diagnose and classify OSA patients. Further, machine learning models were created using traditional, nonlinear, and combined SpO_2 indices, seeking to predict the AHI of these patients.
Materials and Methods: SpO2 signals (1 Hz) were extracted from the PSG screenings performed at the University Hospital of Ribeirao Preto Medical School - USP (249 subjects, 52±15 years old, 42% of males). Patients were diagnosed as normal (N=39) or with OSA in mild (N=60), moderate (N=55), or severe forms (N=95). The predictability of patterns within the SpO_2 series was estimated by six different entropy approaches, namely Fuzzy (FuzzyEn), Dispersion (DispEn), Distribution (DistEn), Attention (AttEn), Phase (PhaseEn), and Multiscale Entropy (MSE). At the same time, fractal indices were obtained from the Detrended Fluctuation Analysis (DFA) short- and long-term scaling exponents (α_1 and α_2). The mean, minimum, and percentage of SpO_2 below 90% (T_{90}) were selected as traditional metrics for comparison. Kruskal-Wallis' test with Dunn's post hoc was performed to identify differences between groups, while Spearman's correlations test was performed to analyze the correlation of those indices with AHI. Lastly, machine learning regression models were created to predict the AHI by traditional, nonlinear, and combined SpO_2 indices. The models' performance was calculated by the Spearman correlation coefficient (r), and root mean squared error (RMSE).
Results: The normal group differed significantly from OSA individuals for all indices except AttEn and DFA α_2. Severe OSA patients showed significantly different values for all indices calculated compared to the other groups. In the correlations analysis with AHI, traditional indices reached a maximum coefficient with T_{90} (r=0.60), lower than most nonlinear indices, highlighting FuzzyEn and MSE-1 (both r=0.80). From machine learning techniques, models created to predict the AHI using only nonlinear indices were superior to those using only the traditional ones (r=0.82, RMSE=16.43 vs. r=0.57, RMSE=25.25), and reached similar values when combined.
Conclusions: Most nonlinear dynamic indices of SpO_2 outperformed traditional SpO_2 indices, either correlating with AHI or by machine learning models created to predict it, showing the potential of these metrics as a screening method to differentiate OSA patients and their severity.

Phrenic nerve stimulation for the treatment of central sleep apnea in patients with heart failure

Y. Wang[1]
[1]Charité-Universitätsmedizin, Sleep Medicine Center, Berlin, Germany

Introduction: Central sleep apnea (CSA) is associated with increased morbidity and mortality in patients with heart failure (HF). We aimed to explore the effectiveness of phrenic nerve stimulation (PNS) on CSA in patients with HF.
Materials and Methods: This was a prospective and non-randomized study. The stimulation lead was inserted into the right brachiocephalic vein and attached to a proprietary neurostimulator. Monitoring was conducted during the implantation process, and all individuals underwent two-night polysomnography.
Results: A total of nine subjects with HF and CSA were enrolled in our center. There was a significant decrease in the apnea–hypopnea index (41 ± 18 vs 29 ± 25, p = 0.02) and an increase in mean arterial oxygen saturation (SaO2) (93% ± 1% vs 95% ± 2%, p = 0.03) after PNS treatment. We did not observe any significant differences of oxygen desaturation index (ODI) and SaO2 < 90% (T90) following PNS. Unilateral phrenic nerve stimulation might also categorically improve the severity of sleep apnea.
Conclusions: In our non-randomized study, PNS may serve as a therapeutic approach for CSA in patients with HF.

Physical discomfort and longer sleep time important influencing factors in CPAP adherence in moderate and severe obstructive sleep apnea patients

Y.-C. Chen[1,2], M.-T. Chen[2], S.-S. Pan[3], C.-Y. Lin[3]
[1]National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Nursing, Tainan, Taiwan, [2]National Cheng Kung University, Nursing, Tainan, Taiwan, [3]National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Otolaryngology, Tainan, Taiwan

Background: Obstructive sleep apnea (OSA) is a common sleep disorder prevalent worldwide, and continuous positive airway pressure (CPAP) is the most effective way to treat it. However, adherence to CPAP is suboptimal among OSA patients due to the adverse effects of CPAP treatment, and efforts to improve it are hampered by the limited evidence regarding the range of these adverse effects of CPAP therapy in OSA patients. In addition, the nature of the relationship between clinical side effects and adherence to CPAP among OSA patients remains unclear.

Purpose: Our study aimed to investigate the relationships between clinical adverse effects and adherence to CPAP among patients with moderate to severe OSA.

Materials and methods: A prospective study design was conducted among moderate and severe OSA patients with home-based CPAP use between January 2021 and December 2021. Good adherence to CPAP was defined as the subject using CPAP for at least 4 hours per night for at least 70% of the 90-day monitored period. Subjects using CPAP were questioned about the adverse effects of CPAP and their demographic data and clinical risk factors were assessed. The relationships between clinical adverse effects and adherence to CPAP were analyzed using multiple logistic regression.

Results: The average age of the 103 subjects was 49.09 years, the proportion of males was 81.6%, and the average AHI(/h) was 49.31 times/hour. 46.6% (48/103) showed good adherence to CPAP. Physiological factors (i.e., oral dryness or nasal congestion) and device-related symptoms (i.e., inability to inhale, pressure intolerance, or air leakage) were the main contributors to the clinical adverse effects of CPAP. Patients with good CPAP adherence had less nasal congestion following CPAP treatment (p= 0.007) and higher mask discomfort (p= 0.035) compared to those with poor CPAP adherence. Longer mean sleep time (AOR= 2.908, p= 0.046), and fewer complaints of physiological discomfort (AOR=0.369, p= 0.015) significantly correlated to good CPAP adherence.

Conclusion: Longer mean sleep time and fewer complaints of physical-related discomfort were important factors in patient adherence to CPAP treatment. Suggested is making patients aware of the clinical side effects of CPAP, particularly when they complain of physical discomfort and lower mean sleep time in initial CPAP use. This study shows this will improve CPAP adherence among moderate and severe OSA patients.

Polysomnographic findings after adenotosillectomy or adenoidetomy and related factors of surgical outcomes in Chinese pediatric obstructive sleep apnea: a long-term single-center retrospective study

J. Xiao[1], D. Li[1], J. Xu[1], C. Zhao[1], Y. Zhang[1], G. Yin[1], J. Ye[1]
[1]Beijing Tsinghua Changgung Hospital, School of Clinical Medicine, Tsinghua University, Otorhinolaryngology-Head and Neck Surgery, Beijing, China

Introduction: To assess changes in polysomnography (PSG) parameters after adenotonsillectomy or adenoidectomy in Chinese children with obstructive sleep apnea (OSA).

Materials and Methods: Consecutive Chinese pediatric OSA subjects who underwent adenotonsillectomy or adenoidectomy from June 2017 to June 2022 were included. The baseline and postoperative PSG parameters were analyzed and compared. Factors that might influence the efficacy of surgery were also assessed.

Results: A total of 1,068 children underwent adenotonsillectomy or adenoidectomy during the study period, of whom, 595 children were diagnosed with OSA by PSG and were involved in the analysis of preoperative PSG results. Regarding the respiratory event, 443 subjects exhibited hypopnea dominant, 94 subjects are central apnea dominant, only 58 subjects showed obstructive apnea dominant. 169 children completed postoperative PSG at 3-6 months after surgery and were included in outcome analysis. Compared with the baseline data, the surgery significantly decreased apnea-hypopnea index (AHI) (11.5 to 2.2 events/h, $P < 0.001$) and oxygen desaturation index (ODI) (7.0 to 1.9 events/h, $P < 0.001$), and the postoperative stage 1 (N1) sleep duration was significantly shortened ($P < 0.05$), while postoperative rapid eye movement (REM) sleep duration was prolonged ($P < 0.05$). The overall surgical success rate was 87.57% (148 /169). Subgroup analysis showed that the PSG parameters were more significantly improved in the hypopnea-dominant group than those in the other two groups. Adenotonsillectomy exhibited a higher efficacy compared with adenoidectomy in improving respiratory events and sleep architecture although the surgical success rate did not significantly differ between the two groups.

Conclusions: Hypopnea was the dominant respiratory event of pediatric OSA. Adenotonsillectomy or adenoidectomy could significantly decrease the incidence of respiratory events and improve sleep quality in children with OSA. Moreover, hypopnea-dominant group was more likely to get a greater improvement in PSG parameters, and adenotonsillectomy exhibited a higher efficacy than adenoidectomy in improving critical PSG parameters.

Positive airway pressure therapy in patients with sleep apnea and heart failure: differences between compliant and non-compliant patients

M. Marçal[1], V. Caldeira[1], S. Gonçalves[2], P. Duarte[1]
[1]Centro Hospitalar de Setúbal, Pulmonology Department, Setúbal, Portugal, [2]Centro Hospitalar de Setúbal, Cardiology Department, Setúbal, Portugal

Introduction: Sleep apnea (SA) is a common sleep disordered breathing (SDB) in patients (pts) with heart failure (HF) (20-70%) and may contribute to the progression and worse prognosis of the disease. Effective treatment of SA with positive airway pressure (PAP) therapy seems to improve morbidity and mortality, however, PAP compliance can be a challenge.

Aims: To assess compliance to PAP therapy over a short-term course in a group of pts with SA and HF and identify differences between the compliant and non-compliant group.

Materials and Methods: Screening of SDB was implemented in pts with recently diagnosed HF followed by a multidisciplinary team. Pts with positive screening (2 positive answers in survey symptoms; overnight pulse oximetry with oxygen dessatuation index ≥ 5/h or <5/h with symptoms/comorbidities and/or SpO_2 time < 90% (T90) greater than 20% of total recording) were submitted to home sleep apnea test and pulmonology evaluation. All SA pts (apnea-hypopnea index (AHI) ≥ 5/hour) who started PAP therapy and had reassessment after 1 month of therapy were included. Descriptive retrospective analysis of data regarding pts identified between January 2022 and January 2023 was carried out, including compliance to PAP 1 month after its start (> 4h of nightly PAP use on 70% of nights). Statistical analysis was performed with IBM SPSS Statistics 27 and a p value < 0,05 was considered statistically significant.

Results: During this period 41 pts met the referral criteria (87,8% male, mean age 65,76 ± 10,92 years). Most pts had ischaemic HF (n=14; 34,1%), with reduced ejection fraction (EF) (n=21; 51,2%) and NYHA ≥ 2 (n=32; 78,1%); main comorbidities were hypertension (n=34; 82.9%), dyslipidemia (n=33; 80.5%) and coronary disease (n=19; 46,3%). The average body mass index (BMI) was 30.54 kg/m2. Only 17,1% reported excessive daytime sleepiness using Epworth Sleepiness Scale. The majority of pts had moderate SA (n=20; 48.8%; mean AHI 30.15 ± 15.71 events/h) and obstructive SA (n=38; 92,7%). None of the pts showed a periodic breathing pattern. 82.9% (n=34) of pts started auto PAP and 17.1% (n=7) continuous PAP therapy.

After the first month of therapy, 56.1% of the pts had poor treatment compliance, with median use of 2,52h/per night ± 1,57, most referring lack of motivation as the main reason. This group of pts has a mean age (p=0,014) and BMI (p=0,001) significantly lower than the group compliant with therapy. Compliance seems to be independent of gender (p=0,08), severity of HF (p=0,163) and NYHA (p=0,828), severity of SA (p=0,457), type of events (p=0,705), presence of daytime sleepiness (p=0,112), other daytime (p=0,433) or nocturnal (p=0,580) symptoms related to SA or type of PAP (p=0,209). Mean EF (p=0,386), AHI (p=0.539) and median T90 (p=0,977) did not differ significantly between groups.

Conclusions: In our study, we recognized high rates of poor PAP compliance over a short-term course which may compromise the effectiveness of treatment. We only identified age and weight as possible factors influencing PAP adherence. Further clinical investigation is warranted to phenotype this group of pts, identify low compliance predictors and optimize personalized treatment.

Positive Airway Pressure therapy predicts lower mortality and Major Adverse Cardiovascular Events incidence in medicare beneficiaries with Obstructive Sleep Apnea

D. Mazzotti[1], L. Waitman[2], J. Miller[3], K. Sundar[4], N. Stewart[5], D. Gozal[6], X. Song[2]
[1]University of Kansas Medical Center, Internal Medicine, Kansas City, United States, [2]University of Missouri-Columbia, Columbia, United States, [3]University of Nebraska Medical Center, Lincoln, United States, [4]University of Utah, Salt Lake City, United States, [5]University of Kansas Medical Center, Kansas City, United States, [6]Marshall University, Huntington, United States

Introduction: Positive airway pressure (PAP) is the first line treatment for obstructive sleep apnea (OSA). Randomized controlled trials (RCTs) have established that PAP may be beneficial, in the short-term, to cardiovascular functions. However, evidence on prevention of major adverse cardiovascular events (MACE) is limited. RCTs are expensive and time-consuming, leading to delayed changes in clinical guidelines. Causal inference methods combined with availability of PAP therapy data enables the design of observational studies that complement RCTs. Here, we applied Inverse Probability of Treatment Weights (IPTW)-adjusted Cox proportional hazard (PH) models using Medicare claims to examine causal associations between PAP initiation or PAP adherence and incidence of MACE and mortality.

Materials and Methods: Medicare beneficiaries (>65 years) with ≥5 years of consecutive enrollment to part A and B and ≥2 distinct OSA claims were collected from multi-state (KS, MO, IA, WI, NE, MN, TX, UT, ND, SD, IN), multi-year (2011-2017) Medicare fee-for-service claims data. Evidence of PAP initiation was based on PAP claims after first OSA diagnosis. PAP adherence was based on total counts of PAP claims in the first year since initiation. We explored multiple empirical discretization techniques (e.g., quantiles of count distribution) to approximate the degree of PAP adherence. Prescription time-distribution matching was used to minimize immortal time bias. MACE was defined as the first claim of myocardial infarction, coronary revascularization, stroke, or heart failure. All-cause mortality was based on the Medicare beneficiary summary file. We used doubly robust Cox PH models with variations of IPTW (derived by generalized ordinal and Poisson regression with regularizations) to control for measured confounders. We identified 11 covariates, including demographics, comorbidities, and proxies of socio-economic status.

Results: Our sample included 225,132 eligible Medicare beneficiaries with evidence of OSA (median [Q1, Q3] age 74 [71, 79] years; 45.3% women; median [Q1, Q3] follow-up 3 [1.9, 4.7] years. Five-year cumulative MACE incidence rate was 40.6% and mortality rate was 18.1%. In IPTW-adjusted models, OSA patients with evidence of PAP initiation (50.1%) had significantly lower all-cause mortality risk (HR [95%CI] 0.57 [0.56-0.59]) and MACE incidence risk (0.90 [0.88-0.92]). Analysis of PAP adherence based on first-year claims distribution revealed that higher quartiles (e.g., higher PAP utilization) were progressively associated with lower mortality (Q2: 0.80 [0.75-0.86], Q3: 0.68 [0.64-0.72], Q4: 0.65 [0.61-0.70]) and MACE incidence risk (Q2: 0.91 [0.86-0.97], Q3: 0.87 [0.82-0.91], Q4: 0.85 [0.80-0.90]).

Conclusions: PAP utilization based on claims was associated with lower all-cause mortality and MACE incidence in Medicare beneficiaries suffering from OSA. Results might inform future trials assessing the importance of OSA therapy initiation and maintenance towards minimizing cardiovascular risk and mortality in older adults.

Obstructive sleep apnea in people with tinnitus.

W. Fonseca[1], M.R. Rosa[1], G.A. Alves[1], F. Bahmad Junior[2], R.J. Ferreira[1]
[1]Universidade Federal da Paraíba, Ciências da Saúde, Joao Pessoa, Brazil, [2]Universidade de Brasília, Otorrinolaringologia, Brasília, Brazil

Introduction: Obstructive sleep apnea (OSA) can result in changes in sleep architecture, generating negative health consequences by leading to systemic hypoxia. In the long term, it can bring about several physiological damages, such as cardiovascular and auditory symptom alterations. Tinnitus is a symptom present in a large portion of the population with hearing loss, and the perception of it may be closely related to OSA. It is an auditory sensation in the absence of any external sound stimulus, which negatively affects quality of life and interferes with concentration, sleep, social activities and even emotional stability.

Materials and Methods: This is an observational, non-interventional and prospective study. The search consisted of 38 volunteers diagnosed with obstructive sleep apnea, of both sexes, aged between 27 and 84 years. They underwent an anamnesis regarding sleep and tinnitus complaints, vocal and tonal audiometry and impedancemetry tests, in addition to type 3 polysomnography and the Epworth Sleepiness Scale (ESS). For those with tinnitus, the *Tinnitus Handicap Inventory* (THI) and the visual analogue scale (VAS) were applied.

Results: In the studied sample, there was a greater number of men (52.6%), mean age of 49.33 and Body Mass Index (BMI) of 31.08. In the ESS, there was an above-normal average of 11.3 and 27.89 in the Apnea and Hypopnea Index (AHI), in which 46.2% (n=18) had a severe classification in the AHI. Most patients, about 73.7% (n=28) had hearing loss and 47.4% (n=18) reported tinnitus, most of which were mild on the VAS. It was noticed that individuals with a severe degree of apnea obtained a higher tinnitus rating on the THI and reported a higher score on the VAS, demonstrating greater tinnitus annoyance.

Conclusions: Obstructive sleep apnea is more common in obese men. In addition, we can observe a greater degree of tinnitus annoyance in patients who had severe obstructive apnea, requiring further studies that can relate the two symptoms and corroborate their association for a better tinnitus therapy.

Predictors for Hypoglossal Nerve Stimulation therapy success

B. Colaco[1], M. Punj[1], J. Call[2], B. Taylor[3], V. Arunthari[1]
[1]Mayo Clinic, Division of Pulmonary, Allergy and Sleep Medicine, Dept. of Internal Medicine, Jacksonville, United States, [2]Mayo Clinic, Dept. of Internal Medicine, Jacksonville, United States, [3]Mayo Clinic, Division of Cardiovascular diseases, Dept. of Internal Medicine, Jacksonville, United States

Introduction: In patients who have failed positive airway pressure (PAP) therapy, hypoglossal nerve stimulation (HNS) is now an acceptable alternative to treat obstructive sleep apnea (OSA). Qualifying criteria for HNS therapy include an apnea-hypopnea index (AHI) of >15 but <65 during a sleep study within the previous 2 years, BMI <32 kg/m2, less than 25% central apneas, and evidence of anterior-posterior collapse at the level of the velopharynx during drug-induced sleep endoscopy. In our experience with HNS therapy, some patients have responded well with appropriate reduction in post implantation AHI whereas others have struggled to achieve adequate AHI reduction despite all patients meeting the inclusion criteria. Therefore, we did a quality analysis to identify factors which could correlate with reduced post HNS therapy AHI.

Methods: Pearson product-moment correlation coefficients were calculated to measure the strength of the linear association between post-HNS AHI and age, sex, BMI, pre-implantation AHI, pre-implantation oxygen saturation nadir, HNS voltage, and pre-implantation mean oxygen saturation. Due to the preliminary nature of our data and the current small sample size, we refrained from performing regression analyses at this time. In addition, we also explored the relationship between baseline AHI and the pre-to-post implant change in AHI (delta AHI).

Results: 62 patients with OSA who were intolerant of PAP therapy were screened for HNS therapy. 32 underwent HNS implantation. Presented in this abstract are the data pertaining to the first 11 patients who have currently undergone an in-lab post implantation HNS titration study. At baseline, mean AHI was 41.9 ± 15.8 (range: 15.0-76.4). From pre-to-post implantation, AHI decreased by 31.4 ± 15.7; post-implant, AHI was <15 in 8 of 11 patients (72%). Baseline AHI was significantly related to post implant AHI ($r^2=0.7200$, p 0.0287), Additionally, there was a significant negative relationship between baseline AHI and the pre-to-post implant change in AHI ($r^2 = 0.8304$, $P < 0.0001$). No other significant correlation was found.

Discussion: HNS therapy patients can follow a green or yellow pathway. Those with post HNS therapy AHI of <15 are on the green pathway whereas others with post AHI >15 are on the yellow pathway. We undertook a quality analysis to determine if additional factors could be identified to predict the likelihood of a good outcome. Based on the correlation analyses the only factor that correlated with the post-AHI results was the baseline AHI. The higher the baseline AHI, the higher the post implant AHI and the higher the baseline AHI, the greater the reduction in AHI. Age, BMI or baseline and nadir oxygen saturation or required voltage did not correlate to a better post-implantation AHI. This is very limited based on only 11 patients; however, we anticipate an N of 50 for full presentation.

Conclusion: Pre-implantation AHI has been found to correlate best with delta AHI suggesting that the higher the pre implant AHI the greater the delta AHI. Our results are limited due to small sample size. Further data analyses are in progress and will be available for full presentation.

Predictors of non-adherence to positive airway pressure therapy in patients with obstructive sleep apnea and heart failure

F. Sert Kuniyoshi[1,2], A. Benjafield[3], P. Cistulli[4], K. Cole[1], A. Malhotra[5], A. Malik[1], J.-L. Pépin[6], V. Somers[2]
[1]ResMed Science Center, San Diego, United States, [2]Mayo Clinic, Rochester, United States, [3]ResMed Science Center, Bella Vista, Australia, [4]University of Sydney, Sydney, Australia, [5]University of California San Diego, La Jolla, United States, [6]Grenoble Alpes University, Grenoble, France

Introduction: Adherence to positive airway pressure (PAP) therapy has previously been shown to be associated with reduced healthcare resource utilization and costs in patients with newly diagnosed obstructive sleep apnea (OSA) and comorbid heart failure. This study aims to identify predictors of non-adherence to PAP therapy in OSA patients with comorbid heart failure with preserved (HFpEF) and reduced ejection fraction (HFrEF).

Materials and methods: US administrative claims data linked to objective PAP therapy usage were analyzed. Eligible patients either had two healthcare encounters or one hospitalization with heart failure ICD-10 diagnosis code the year prior to OSA diagnosis and PAP therapy initiation. US Medicare defines PAP compliance as use for at least 4 hours/night for 70% of nights in a consecutive 30-day period over 90 days. In this study, 1-year of PAP data was split into four 90-day timeframes (quarters). PAP adherent patients met this criterion in 4/4 quarters and non-adherent in 0/4 quarters. Multivariable logistic regression models were used to identify predictors of non-adherence.

Results: A total of 4,237 patients with OSA and HFpEF were identified and 3,182 with OSA and HFrEF. In patients with OSA and HFpEF, factors strongly associated with non-adherence included Medicaid and Medicare Advantage insurance coverage (OR = 2.74, p < 0.001 and OR= 1.38, p=0.005, respectively), presence of hypertension (OR=1.71, p=0.009), and at least 1 visit to the emergency room (ER) in the year prior to PAP therapy initiation (OR=1.53, p < 0.001). Similar findings were observed in the HFrEF cohort, with Medicaid and Medicare Advantage insurance coverage (OR = 2.76, p < 0.001 and OR= 1.39, p=0.017 respectively), presence of hypertension (OR=1.45, p=0.033) and prior ER visits (OR=1.25, p < 0.018) being associated with non-adherence. Furthermore, the presence of coronary artery disease and pneumonia also increased the likelihood of non-adherence to PAP therapy in the HFrEF cohort (OR = 1.33, p < 0.009 and OR= 1.31, p=0.032, respectively).

Conclusions: Predictors of non-adherence to PAP therapy in patients with OSA and comorbid HF included type of insurance, hypertension, prior ER visits, coronary artery disease, and pneumonia. These findings highlight the importance of considering socioeconomic factors, such as insurance type, as well as comorbidities and healthcare utilization patterns to identify patients at risk for non-adherence to PAP therapy.

Prevalence of obesity in patients with obstructive sleep apnea

J. Roa-Mora[1], S.J. Rueda-Velásquez[2], A. Pinto[3], A. Cote[2], M. Fernández[2], Y. Madrid[2], F. Valderrama[4], L. Vargas-Ramirez[4]
[1]Universidad Santo Tomás/Instituto Neumológico del Oriente, Sleep Medicine, Bucaramanga, Colombia, [2]Universidad Santo Tomás, Oral Pathology, Bucaramanga, Colombia, [3]Case Western Reserve University, Oral Medicine, Cleveland, United States, [4]Instituto Neumológico del Oriente, Sleep Medicine, Bucaramanga, Colombia

Introduction: Obstructive Sleep Apnea (OSA) is a common disorder characterized by repeated episodes of partial or complete upper airway obstruction during sleep. Significant clinical outcomes of the disorder include excessive daytime sleepiness, cognitive disorders, cardiovascular disease, and metabolic dysfunction, among others. OSA is highly prevalent in obese patients and closely associated to the Body Mass Index (BMI). The higher the BMI, the higher the prevalence of OSA. The objective of this study was to determine the period prevalence of obesity in patients diagnosed with OSA at the Instituto Neumológico Del Oriente in Bucaramanga, Colombia.

Materials and methods: An observational, cross-sectional study was conducted and approved by the Ethics and Research Committee of the Universidad Santo Tomás and the Instituto Neumológico Del Oriente, where a population of patients with OSA diagnosis was studied by extracting information from medical records related to OSA and classified by severity. Obesity was sub-divided into four subgroups, including overweight, Class I, Class II, and Class III obesity, based on body mass index. Sociodemographic variables (gender, age, socioeconomic condition, education attainment and marital status) and anthropometric exposures (neck and abdominal circumferences) were considered. The sample consisted of 670 subjects who attended the institution in one year and met the selection criteria. Frequencies and proportions were calculated for qualitative variables, as well as measures of central tendency and dispersion for quantitative variables. Bivariate analysis was conducted using a Chi 2 test or Fisher's Exact test for categorical variables and Mann-Whitney U-test for continuous variables. A value of $p < 0.05$ was considered statistically significant.

Results: Severe OSA was the most prevalent with 62.84%. Most patients were overweight (51.34%) and 48.66% were obese in any of its three categories (Class I, Class II, and Class III). The association between BMI and severity of OSA is evident where statistically significant differences are found for all variables and where a higher percentage of severe OSA is identified in cases of obesity.

Conclusions: The prevalence of obesity in the population with severe OSA was higher, and a trend of increasing AHI with increasing BMI is shown.

Prevalence of polysomnographic Low Respiratory Arousal Threshold Obstructive Sleep Apnea phenotype in the general population of São Paulo, Brazil

C.J.S. Faria[1], P.R. Genta[2], S. Tufik[1], M.L. Andersen[1], D.L.R. Poyares[1]
[1]Universidade Federal de São Paulo, Psychobiology Department, Sleep Medicine and Biology Division, São Paulo, Brazil, [2]Universidade de São Paulo, Heart Institute, São Paulo, Brazil

Introduction: Obstructive Sleep Apnea (OSA) results from a complex interaction between anatomical and non-anatomical phenotypes. Among the non-anatomical factors, the Low Respiratory Arousal Threshold (LAT) refers to the premature occurrence of a cortical arousal, consequent to the collapse of the upper airway during an obstructive respiratory event. This phenotype is estimated to occur between 30% to 50% of OSA patients. An alternative method to identify the PSG LAT OSA phenotype has been proposed by Edwards et al, 2014. The objective of this study is to report the prevalence of LAT OSA phenotype in the general population of Sao Paulo, as assessed by full in-lab polysomnography (PSG).

Materials and Methods: The frequency of the LAT OSA phenotype was obtained from the database of the 4th edition of the Sao Paulo Epidemiologic Sleep Study (EPISONO), carried out between 2018 and 2019.

Edwards et al. (2014) defined the LAT OSA pnehotype by the presence of 2 or more of the following parameters: AHI<30 events/hour, SpO_2 nadir>82.5% and percentage of hypopneas>58.3%. Participants with mild, moderate or severe AHI and also had SpO_2 nadir values and percentage of hypopneas below the defined parameters, were categorized as "non-BLD".

Seven hundred and sixty nine (769) participants, who underwent full in-lab overnight PSG were categorized into: "non-OSA", "non-LAT" and "LTA". Then, "non-LAT" and "LAT" categories were subdivided, considering OSA classification, into "non-LAT (mild OSA)", "non-LAT (moderate OSA)" non-LAT (severe OSA)", "LAT (mild OSA)"," LAT (moderate OSA)" and "LAT (severe OSA)".

Results: The observed frequency of the PSG OSA LAT phenotype was 33.4%, being 15.5% females and 17.9% males. 55.1% of participants had normal AHI ("non-OSA"), whilst "non-LAT" category comprised 11.4%. Males had a higher frequency of OSA in all categories, except for those classified as non-LAT (moderate OSA) and LAT (severe OSA), in which females slightly predominated (0.9% vs. 0.7% and 0.4% vs. 0.3%, respectively).

Conclusions: LAT OSA phenotype is prevalent in the general population, as it has been reported in clinical populations. Recognizing this phenotype can help in planning the treatment of patients with OSA.

Quantifying dynamics of sleep in subjects with sleep-disordered breathing: towards new biomarkers

M. Bechny[1,2], L. Fiorillo[2], G. Monachino[1,2], J. van der Meer[3], M.H. Schmidt[3,4], C. L. A. Bassetti[3], A. Tzovara[1,3], F.D. Faraci[2]
[1]Institute of Computer Science, University of Bern, Bern, Switzerland, [2]Institute of Digital Technologies for Personalized Healthcare, University of Applied Sciences and Arts of Southern Switzerland, Viganello, Switzerland, [3]Inselspital, Bern University Hospital and University of Bern, Department of Neurology, Bern, Switzerland, [4]Ohio Sleep Medicine Institute, Dublin, United States

Introduction: Sleep is a complex process consisting of several stages and evolving throughout the night. As the night progresses, the proportion of time spent in each sleep-stage (W, N1, N2, N3, REM) changes. In the first half of the night, when homeostatic sleep pressure is high, a higher amount of deep NREM (N3) can be expected. In the second half, REM sleep becomes more prominent. Although sleep dynamics - simplistically defined as a sequence of sleep-stages over the night - has great potential to reveal disease (like REM sleep onset in narcoleptic patients), clinical sleep-study results present only a few dynamics-related parameters (e.g., the number of sleep-stage transitions or awakenings). In this study, we propose to quantify the dynamics of sleep-stages by exploiting an appropriate statistical model, while investigating the impact of demographic and clinical factors. Our focus is particularly on enhancing the understanding of breath-related sleep-disorders, representing the most prevalent sleep-disorder class.
Materials and methods: We analyzed 660 hypnograms from healthy subjects and obstructive or central sleep apnea (OSA/CSA) patients from the BSDB* database. The recordings were scored according to AASM standards. The data also included information on gender, age, and other sleep disorders. Multi-state modelling[1] is a class of regression approaches accounting for the effects of covariates on the (sleep-stage) transition matrix. We modelled the impact of the conclusive diagnosis (healthy/OSA/CSA), age, gender, time since the sleep onset, and sleep-related comorbidities on each of the 25 (5x5) sleep-stage transition probabilities. The inclusion of time as one of the predictors treats sleep as a non-stationary process. Hence, all the estimated effects and inferences were adjusted for the influence of time already spent in sleep.
Results: We list the main significant (p-val<0.05) findings that quantify effects in comparison to the baseline of healthy females. Both OSA/CSA decrease chances of reaching REM sleep and increase transitions between all not-REM (NREM) stages and wake (W), causing a more fragmented sleep along with more frequent awakenings and less compact deep sleep (N3). The age increases transitions into W and out of N3/REM, and reduces transitions from W (thus decreasing sleep-efficiency). Being a male increases transitions into N1, REM→W, and decreases N1/REM→N2 and N2→N3. Further, with time-since-onset, increased transitions are expected for NREM/W→REM and REM→W, and a decrease for W→NREM as well as N1/N2→N3, both confirming the expected dynamics of sleep in the course of a night.
Conclusions: The sleep study report typically contains whole-night summaries (%, duration, latency) of sleep-stages and neglects sleep dynamics. Our study presents a novel tool for quantifying sleep dynamics, which has the potential to characterise sleep-wake disorders and also captures the effect of demographic information. Based on this, it is possible to (a) calculate normative values of various characteristics in the course of sleep for different ages, demographic, and clinical statuses of individuals and (b) identify possible biomarkers.
References: [1] https://doi.org/10.18637/jss.v038.i08

Quantitative analysis of facial contact pressure using oronasal interface during noninvasive ventilation and nocturnal ventilatory support

L. Barros[1], R. Correia[2], J. Gabriel[3], M. Drummond[4], R. Natal Jorge[2]
[1]AAME, São Paulo, Brazil, [2]Universidade do Porto, Faculdade de Engenharia, Porto, Portugal, [3]Universidade Porto, Porto, Portugal, [4]Universidade do Porto, Faculdade de Medicina, Porto, Portugal

Introduction: Non-invasive ventilation (NIV) and continuous positive airway pressure (CPAP) are actually considered the standard treatment for ventilatory insufficiency and obstructive sleep apnea syndrome, respectively. However, adverse effects are not uncommon. Objective: Evaluation of the contact pressure (CP) exerted by 6 types [Mirage Quattro™(MQ), QuattroTMFX(FX), and QuattroTM Air (Air) (Resmed); FlexiFit™431(431)(Fisher&Paykel); ComfortFull 2 (CF) and Amara (AM) (Philips Respironics)] of oronasal interfaces (OI), on the experimental model face (MF), with different levels of positive airway pressure ventilation.

Methodology: The CP by an OI was measured at four locations simultaneously with four pressure sensors positioned between the MF and the interface cushion. The locations pressure point (PP) evaluated were: nasal bridge (S1), right paranasal region (S2), right region of the labial commissural (S3), and sublabial region (S4). For the acquisition, reading, and analysis of acquired data of FlexiForce sensors LabVIEW software was used. The parameters used were: CPAP=10, CPAP=15, bi-level positive airway pressure (PAP): IPAP=20/EPAP=5, and IPAP=15/EPAP=5.

Results: Comparing the 6 OI, the minimum, and maximum (respectively) pressure (cmH2O) values obtained in each sensor were: IPAP15/EPAP5= S1: 20.2 (Q) and 245.4 (C); S2: 36.71(431) and 329.1(Q); S3: 4.0(431) and 113.1(Q); S4: 3.0(Q) and 271.2(C). IPAP20/EPAP5= S1: 15.7(QA) and 125.6(431); S2: 9.2(QA) and 120.5(Q); S3: 4.9(431) and 133.6(C); S4: 3.0(Q) and 271.3(C). CPAP10= S1: 21.41(Q) and 178.5(C); S2: 5.1(A) and 335.1(Q); S3: 4.3(431) and 121.4(Q); S4: 3.1(Q) and 431.2(C). CPAP15= S1: 20.19(Q) and 155.8(431); S2: 36.7(431) and 329.2(Q); S3: 4.1(431) and 113.2(Q); S4: 4.1(431) and 113.2(Q). All differences were significant ($p < 0.05$).

Conclusions: The interfaces used for CPAP or NIV available on the market can show different CP in the face, which implies greater care of the specialist. The interfaces manufacturers show technological evolution in the recent products, revealing a concern to decrease skin lesions.

Radioscopic method for dynamic anatomical assessment of the upper airways during sleep in obstructive sleep apnea: a case study

D.F. de Araujo[1], M.L.P. de Souza[2], C.F. Leite[3], M.H. de Andrade[4], C.M. Chaves Junior[5], M.A. Sobreira Neto[6]
[1]Universidade Federal do Ceará, Núcleo de Pesquisa e Desenvolvimento de Medicamentos, Fortaleza, Brazil, [2]Hospital Universitário Walter Cantídio, Neurosurgery Department, Fortaleza, Brazil, [3]Universidade Federal do Ceará, Physiotherapy Department, Fortaleza, Brazil, [4]Hospital Universitário Walter Cantídio, Sleep Medicine Program, Fortaleza, Brazil, [5]Universidade Federal do Ceará, Odontology Department, Fortaleza, Brazil, [6]Universidade Federal do Ceará, Sleep Medicine Program, Fortaleza, Brazil

Introduction: Detailed evaluation of the upper airway is critical to manage cases of obstructive sleep apnea (OSA), notably in cases of maladaptation to continue positive airway pressure (CPAP) therapy. Sleep endoscopy is currently considered the method of choice for studying patient anatomy during sleep. Hereby, we describe an alternative method to evaluate the anatomic dynamics in OSA using a radioscopic procedure and illustrate its findings in a case study.

Materials and Methods: Following ethics board approval and informed consent acceptance, a patient with moderate OSA and maladaptation to pressure therapy was submitted to the radiographic imaging technique described herein. She had a history of night suffocation, excessive mouth dryness, and air leakage when using CPAP, refractory to optimal comfort approaches. Images were obtained using a floor-mounted magnetic navigator with C-arm in a hemodynamic room during the morning period – due to logistical aspects. Sleep was induced by 10 mg of zolpidem, taken by the participant just before the lights were turned off. The research team – composed by hemodynamic technicians, a sleep medical doctor, an otolaryngologist and a hemodynamicist – carried out the exam in the control room, while lateral dynamic images of the upper airways were taken every eight minutes, initially with the patient in room air and after in use of CPAP (with fixed pressure of 9 cmH_2O), while lying supine. The arch was settled in the transversal position while images were accepted as plausible when the upper airway air column and the epiglottis and soft palate silhouettes could be individualized, as well as the cranial base and hard palate lines were parallel to each other. Definitions of wake and sleep periods were based on behavioral aspects of the subjects, as learned by examiners while hearing and watching the patients. The length of the exam was 160 minutes, with 20 tapes taken.

Results: Narrowing of retropalatal and retroglossal spaces was noted while the patient was snoring in room air, representing a possible mechanism of airway obstruction during sleep; while using CPAP, observers could learn that the retropalatal area was open as soft palate was stable, whereas the epiglottis performed a valvar movement into the hypopharynx. These findings could characterize a mechanism of epiglottic collapse secondary to pressure therapy, leading to patient complaints and difficulty to CPAP adaptation. Some limitations were learned during the study. As the patient changed her positioning, there was a repetitive need to reposition the arch. Lightning and noises evoked by the navigator were difficult to mask, waking up the patient. Scoring sleep and wake was difficult when using only behavioral aspects. The daylight setting of the exam made it imperative to induce sleep. The total radiation exposure was 90.4mGy.

Conclusions: While presenting its own limitations, the radioscopic method delivers important information regarding upper airway anatomy dynamics during sleep. Its less invasiveness diminishes the need for sedation to induce sleep. Radiation levels were plausible, compared to the same two cranial computed tomography scans. Eventually, the technique may be complementary to sleep endoscopy.

Real world assessment of reduction of obstructive sleep apnea events by continuous positive airway pressure using a continuous large U.S. sample by home under-mattress devices

C. Kushida[1], A. Cotton-Clay[2], S. Baron[2], L. Fava[2], V. Easwar[2], A. Kinsolving[2], J. Zitser[3], P. Kahn[2]
[1]Stanford University, Stanford, United States, [2]Fullpower Technologies, Santa Cruz, United States, [3]Tel Aviv Sourasky Medical Center, Tel Aviv-Yafo, Israel

Introduction: Continuous positive airway pressure (CPAP) adherence and treatment effectiveness for OSA on a per-patient basis can be assessed by providers using cloud-based software, but these typically only provide information during CPAP usage, and additionally large-scale population-based assessments have been limited. This study is one of the largest to date for the real-world assessment of OSA by CPAP usage and non-usage in a continuous sample.

Materials and Methods: We used a commercially available home monitoring device (Sleeptracker-AI Monitor, Fullpower Technologies Inc., California, USA) that passively monitors sleep using piezo-electric sensors to analyze sleep-disordered breathing. Validated sleep/respiratory parameters were derived from device data. De-identified data were analyzed, following review and exemption of the study (#57681) from Stanford University IRB. Data from 2021-03-01 to 2023-05-31 were reviewed. Recordings were included if they included at least 4 hours of sleep, and individuals were included in the analytic dataset if they enabled the question (Did you use your CPAP machine?) and answered with at least 1 affirmative and at least 1 negative response to the question on a questionnaire in an included recording. A linear mixed-effects model was conducted using the statsmodels package (Seabold & Perktold, version 0.14.0) in python (Python Software Foundation, version 3.10.11).

Results: A total of 720 individuals (53.7 ± 12.3 years; 448 men, 237 women, 35 no gender provided) with 58,481 recorded nights met the inclusion criteria. Reported CPAP usage was associated with an AHI reduction by 53.4% (51.9, 54.7) over reported CPAP non-usage, and a NREM AHI and REM AHI reduction of 52.6% (51.0,54.1) and 56.9% (55.1,58.6), respectively. Further, the reduction by OSA severity classes based on each individual's mean AHI when reporting no CPAP usage is as follows: none (AHI ≤ 5)=32.8% (29.8,35.7), mild (5 ≤ AHI < 15)=62.3% (60.6,64.0), moderate (15 ≤ AHI ≤ 30)=71.8% (68.8,74.6); severe (AHI > 30)=78.7% (75.4,81.5). Additionally, by analyzing these data by the density of OSA events vs. fraction of the recording (to standardize the samples across individuals), we found that the density of OSA events were significantly increased in the last third of the night compared to the first two-thirds of the night. Reported CPAP usage was associated with a greater AHI reduction during the first (54.1% (52.6,55.6)) and second (56.0% (54.5,57.4)) thirds than in the last third (48.5% (46.7,50.1)).

Conclusions: A noninvasive in-home monitoring device enabling collection/analysis of a large sample of sleep/respiratory data on a continuous nightly basis showed that on average, patients who use CPAP have a little more than a 50% reduction in their AHI overall, with greater reduction for more severe OSA severity classes. Furthermore, when these data are analyzed across nights of use, there is a sharp increase in AHI in the last third of the night, and a smaller reduction with reported CPAP usage. Further analysis is underway to explore the relative contributions for this AHI increase and smaller reduction, whether it is due to taking the device off and/or an increase in severity of OSA events due to increased REM in the last third of the night.

Relationship between OSA pathophysiological phenotypes and treatment response to mandibular advancement devices

I.P. Manetta[1], B.B. Duarte[1], L.B. Nucci[2], C.C. Enes[2]
[1]Pontifical Catholic University of Campinas, Campinas, SP, Brazil., Department of Otolaryngology Head and Neck Surgery, Campinas, Brazil, [2]Pontifical Catholic University of Campinas, Campinas, SP, Brazil., Postgraduate Program in Health Sciences, Campinas, Brazil

Introduction: To assess whether critical pathophysiological phenotypes may predict treatment response in patients with obstructive sleep apnea (OSA) using mandibular advancement device (MAD).

Materials and Methods: Thirty-one OSA patients were treated with MAD. Individuals were categorized and graded into four pathophysiological phenotypes inferred by polysomnographic features (anatomical, ventilatory control, arousal threshold and muscle responsiveness). Morpho-anthropometric data was additionally assessed. Patients were classified as responders or non-responders. Associations between polysomnographic phenotypes and treatment response were documented, as well as morpho-anthropometric data and its impact on therapeutic success.

Results: There was a male predominance (64.5%), with a median age of 49 years (25p:40; 75p:55); BMI=27.4kg/m^2(26; 28.8) and apnea-hypopnea index (AHI) 18.2 (25p:11.7; 75p: 27.6). The greater amount of patients treated with MAD (58%) were good responders (68.0% mild and moderate versus 16.7% severe). Treatment response was associated with shorter intermolar and interpremolar distances in the lower arch ($p = 0.092$ and 0.0129). REM sleep AHI and MAD related treatment response were inversely correlated ($p = 0.0013$). Favorable anatomical ($p = 0.0339$) and low muscle response ($p = 0.0447$) phenotypes were correlated with outcomes.

Conclusions: There is only few research focusing on the phenotypic aspects of MAD related therapeutic success. Apart from the AHI related response showed in previous works, results from this study further suggest that other predictors should be considered, like the REM sleep AHI <16, shorter distance between lower molars and premolars, lower anatomical and higher muscle response polysomnographic based phenotypic scores.

Relationship between temporomandibular dysfunction (TMD) and sleep disorders: an overview of systematic reviews

M. Rigon[1], J. Cardoso[2], K. Obara[3], A.J. Machado Junior[4]
[1]Universidade Estadual de Campinas, FCM/UNICAMP - Universidade Estadual de Campinas, Campinas, Brazil, [2]Universidade Estadual de Londrina, Laboratory of Biomechanics and Clinical Epidemiology, PAIFIT Research Group, Londrina - PR, Brazil, [3]Universidade Estadual de Londrina, Laboratory of Biomechanics and Clinical Epidemiology, PAIFIT Research Group, Londrina, Brazil, [4]Universidade Estadual de Campinas, Ophthalmology and Otorhinolaryngology Dep. at FCM/UNICAMP - Universidade Estadual de Campinas, Campinas, Brazil

Introduction: This review compiles systematic reviews that have dealt with the relationship between sleep disorders and temporomandibular dysfunction (TMD) in adults, focusing on outcomes as sleep quality, obstructive sleep apnea, sleep bruxism, temporomandibular pain, and temporomandibular osteoarthritis. Overall, this overview aims to provide a comprehensive summary of the relationship between sleep disorders and TMD in adults, offering insights for research, ensuring a reliable and objective analysis of existing literature data.

Materials and methods: The review was registered in PROSPERO (CRD42022346383). The research question used the PECOT acronym to define participants, exposure, comparison, outcome, and study type. Searches conducted in multiple databases from inception to March 2023 along with specific relevant keywords. Seven systematic reviews of observational studies in adults investigating the sleep disorders-TMD association were included, while irrelevant or non-systematic studies were excluded. Data extraction used various instruments: Research Diagnostic Criteria (RDC) and Diagnostic Criteria (DC) for TMD, computed tomography, and radiological examinations for temporomandibular osteoarthritis. Sleep quality and daytime sleepiness were assessed through PSQI (Pittsburgh Sleep Quality Index) ESS (Epworth Sleepiness Scale) and SAQ (Sleep Assessment Questionnaire). PSG (Polysomnography) monitored sleep-related variables, while the STOP-BANG questionnaire and ICSD (International Classification of Sleep Disorders) assessed OSAS (Obstructive Sleep Apnea Syndrome) and sleep bruxism. The included studies were assessed by the Risk of Bias in Systematic Reviews (ROBIS) tool, specific for observational studies. Rigorous peer review by independent reviewers.

Results: ROBIS tool in three phases for seven studies. During Phase 1, all questions were aligned with the target question. In Phase 2, bias risk varied across different domains. Domain 1, 3 out of 7 studies had a low risk due to clear eligibility criteria, 3 had an unclear risk due to vague criteria, and 1 had a high risk. Domain 2, 3 out of 7 studies had a low risk due to well-executed search strategies, while 4 had an uncertain risk due to insufficient information. Most studies demonstrated low or no bias risk in assessing methodological quality in Domain 3, except for 1 study that had a high risk. Domain 4, 3 out of 7 studies had a low risk due to pre-defined analyses and robust results, 3 had an uncertain risk due to flaws in result synthesis, and 1 had a high risk. Phase 3, 5 out of 7 studies were classified with a low risk overall, 1 had a high risk, and 1 was classified as unclear. The majority of studies exhibited an appropriate approach to minimizing bias risk.

Conclusions: There is a general preference suggesting an association between sleep disorders and temporomandibular dysfunction (TMD). Systematic reviews such as those by Al-Jewair, Dreweck, Roithmann, and Romero, which showed a low risk of bias assessment due to clarity in specifying eligibility criteria and comprehensive search strategies, support this association. However, it is important to note that studies like Kang, Mendes, and Veiga, lacking sufficient information to assess bias risk, generate uncertainty regarding this relationship.

REM-predominant obstructive sleep apnea: prevalence and clinical associations in a high-altitude population

M.A. Bazurto-Zapata[1], D. Severiche-Bueno[1], A.M. Gonzalez[1], J. Mateus[1], L. Enciso[1], F. Fernandez[1], J. Agudelo[1], M.T. Vargas-Cuervo[2], N.J. Proaños[1], D. Casas[1], D. Rivera[1], E. Dueñas-Meza[1]
[1]Fundacion Neumologica Colombiana, Sleep Center, Bogota, Colombia, [2]Universidad El Rosario, Epidemiologia, Bogota, Colombia

Introduction: REM obstructive sleep apnea (OSA) is a subgroup of the disease, where episodes of apnea or hypopnea occur mainly or exclusively in REM sleep. OSA in REM has an estimated prevalence of 14-36% of all OSA cases.
The clinical impact of REM OSA is not well established, and it is not clear whether it has the same correlation with the neurocognitive and cardiometabolic morbidity widely documented in OSA in NREM sleep There are no data regarding REM OSA and its relationship with daytime sleepiness, and comorbidities at high altitude.
The aim of this study was to determine the prevalence and the differences in clinical and polysomnographic characteristics between Non REM and REM OAS in a population living at 2640 masl.
Materials and Methods: Retrospective cross-sectional study conducted on adults referred to a polysomnography to the Fundación Neumológica Colombiana in Bogotá, Colombia between January and December 2022. Patients with AHI < 5/h and/or total sleep time < 180 min were excluded. Demographic data (age, sex), self-reported questionnaire on past medical history, Epworth sleepiness scale, and anthropometric measurements were routinely recorded prior to PSG. Standard polysomnography (PSG) was performed according to American Academy of Sleep Medicine (AASM) recommendations. Data were scored manually by a sleep specialist according to the AASM scoring rules
Patients were considered to have REM-related OSA if they have a REM sleep duration of at least 30 minutes and the ratio of REM-AHI to NREM-AHI was > 2, and NREM-AHI < 15. Patients who did not fulfill the definition of REM-related OSA were considered to have non-REM OSA.
For the comparison between the OSA and OSA REM groups, the x2 or Fisher's exact test was used for the qualitative variables and Student's t test or its non-parametric counterpart for the quantitative variables, a p value less than 0.05 was considered statistically significant. assumption evaluated by the Shapiro-Wilk test.
Results: 1785 patients were included. Age 55.9± 15.3 years. 53.9% were women. 282 patients (15.8%) had REM OSA. REM OSA was more prevalent in women and in young patients. They had a milder OSA. Patients with REM related OSA had higher sleep efficiency, lower arousal index. Patients with non REM OSA had more severe nocturnal desaturation indexes (T90, T85, ODI) and had more systemic hypertension. There were no differences in ischemic heart disease, cerebrovascular disease or daytime sleepiness.
Conclusions: REM OSA prevalence in a population living at high altitude was 15.8%. The patients with REM OSA were mainly women, younger, and had milder OSA with less desaturation and less systemic hypertension than non REM OSA. This milder expression of the disease could suggest that this apnea should have a different therapeutic approach.

Repeated dosing (5 nights) of 50 mg daridorexant in patients with severe obstructive sleep apnea: effect on sleep-disordered breathing and sleep

M.-L. Boof[1], K. Lederer[2], J.-L. Pépin[3], I. Fietze[2], J. Dingemanse[1]
[1]Idorsia Pharmaceuticals Ltd, Department of Clinical Pharmacology, Allschwil, Switzerland, [2]Advanced Sleep Research, Berlin, Germany, [3]HP2 Laboratory, INSERM U1300, Grenoble Alpes University Hospital and EFCR Laboratory, Thorax and Vessels Division, Grenoble, France

Introduction: Daridorexant (QUVIVIQ™) is a dual orexin receptor antagonist approved in the US and EU, among other countries, for the treatment of adult patients with insomnia disorder. In a previous phase 1 study, daridorexant was shown to have no negative effect on sleep-disordered breathing in patients with mild to moderate obstructive sleep apnea (OSA).[1]

Materials and methods: The present randomized, double-blind, placebo-controlled, crossover phase 1 study evaluated, in one sleep center, whether repeated dosing (5 nights) of the therapeutic dose of 50 mg daridorexant is also safe in patients with severe OSA without insomnia, based on apnea/hypopnea index (AHI, primary endpoint) and/or mean nocturnal oxygen saturation (SpO_2, secondary endpoint), i.e., whether the treatment difference (daridorexant–placebo) was not ≥ 10 events/h (upper one-sided 95% confidence interval [CI]) for AHI and/or ≤ -2% (lower one-sided 95% CI) for mean nocturnal SpO_2. Other respiratory variables, including indices of disease severity, were explored using treatment difference (daridorexant–placebo) and its two-sided 90% CI. The effect of daridorexant on sleep was explored based on total sleep time (TST), rapid eye movement (REM), and non-REM sleep.

Results: All sixteen enrolled participants were included in the intent-to-treat analysis. Baseline AHI and mean nocturnal SpO_2 were 51.2 events/h (standard deviation [SD]: 17.0) and 92.1% (SD: 1.7), respectively. No clinically meaningful effect of 50 mg daridorexant on AHI and mean nocturnal SpO_2 were detected. Treatment differences were -3.74 events/h (upper 95% CI: ≤ 4.23 events/h) and -0.12 % (lower 95% CI: ≥ -0.62 %), respectively. AHI and mean SpO_2 during non-REM were comparable after daridorexant and placebo administration. Interestingly, AHI showed improvement during REM sleep after daridorexant administration as treatment difference (daridorexant–placebo) was -8.2 events/h (90% CI: -13.7, -2.7). No treatment difference was observed for the evaluated indices of disease severity, e.g., the total number of apneas and hypopneas (1.3 [90% CI: -46.7, 49.2.] and -5.4 [90% CI: -43.9, 33.2], respectively) and their longest duration (-6.5 sec [90% CI: -19.2, 6.1] and 9.0 sec [90% CI: -5.5, 23.6], respectively), lowest SpO_2 during respiratory events (0.6% [90% CI: -2.8, 3.9]), or %TST with SpO_2 < 90% (0.33% [90% CI: -4.3, 5.0]). Compared with placebo, daridorexant increased the duration of TST by 32.5 min (90% CI: 6.9, 58.2) mainly via the increased duration of REM sleep (28.8 [90% CI: 16.3, 41.2]).

Among the 6 adverse events reported during the study, 3 were under daridorexant (all mild), none were related to respiratory function.

Conclusions: Our results show that daridorexant does not impair sleep-disordered breathing and suggest improvement of sleep in patients with severe OSA.

Daridorexant does not impair sleep-disordered breathing, independent of OSA severity.

Reference: 1. Boof et al. SLEEP 2021;44:zsaa275

Reports from the Oknawa Nakamura Sleep (ONSLEEP）Registry

H. Nakamura[1], K. Nakamura[1], K. Tohyama[1], C. Takara[1], C. Iseki[1], K. Iseki[1]
[1]Nakamura Clinic, Urasoe, Japan

Introduction: ONSLEEP is a community-based registry of sleep disorder patients with polysomnography (PSG) in Okinawa, Japan. Nakamura Clinic is a free-standing clinic and have 8 beds for PSG. We reviewed two original papers from our clinic and considered the future research project.

Methods: We examined all PSG patients who showed AHI 5 and over during September 1990 to December 2003 (N=4,056) and compared the presence of chronic kidney disease (CKD) with the general screening population in Okinawa. Prevalence of CKD, eGFR<60, was high as 30.5% compare to that of the general population of 9.1%. Even those without obesity, BMI<25kg/m^2, the prevalence of CKD was high as 35.7% (8.1% in general population) (**Iseki K, et al. Hypertens Res 2008).**

Results: We extended the PSG patients who diagnosed sleep apnea syndrome by from September 1990 to December 2010 and examined the outcomes such as death and causes of death by the end of 2013. We compared the death rate by using propensity-score matching method. Number of CPAP users was 1,247 from 4,549and non-CPAP users was 1,247 from 2,128. The median duration of observation was 79 months. The death rate in CPAP users was 4.2%, whereas non-CPAP users was 7.4%: adjusted hazard ratio 0.56 (95% confidence interval; 0.41-0.78) (**Nakamura K, et al. J Clin Sleep Med 2021)**.

Discussion: KDIGO is the International NPO creating Clinical Practice Guideline for CKD patients. In the recent Controversies Conference Report **(Mehrotra R, et al. Kidney Int. June 7, 2023),** sleep disorders are cited as a crucial symptom for dialysis patients.

Currently, a total number of PSG is over 32,000 by the end of 2020. We are planning to examine the outcomes and compare with other registries.

Conclusions: ONSLEEP is a sleep registry which provide valuable clinical information for patients suffering from sleep disorders.

Resolution of central sleep apnea after percutaneous coronary intervention (PCI) with DES implantation- a case study

M. Michalek-Zrabkowska[1], R. Poreba[1], A. Wojakowska[1], M. Wieckiewicz[2], G. Mazur[1], H. Martynowicz[1]
[1]Wroclaw Medical University, Department of Internal Medicine, Occupational Diseases, Hypertension and Clinical Oncology, Wroclaw, Poland, [2]Wroclaw Medical University, Department of Experimental Dentistry, Wroclaw, Poland

Introduction: Central sleep apnea (CSA) is described as a cessation of the airflow occurring without respiratory effort. In opposite, in obstructive sleep apnea (OSA) increasing respiratory effort is linked with lack of airflow caused by cessation of upper airway tract. Etiology of central apnea was previously linked with heart failure and stroke. After diagnosing central apnea in polysomnography, it is highly recommended to manage cardiological examination to assess cardiovascular system.
Materials and Methods: For this study, we have reported a 54-year-old man with a confirmed multivessel coronary artery disease (CAD) and heart failure (HF) who was referred to our Sleep Laboratory for evaluation of sleep disordered breathing.
Results: Case report:
The patient with negligible medical history underwent respiratory polygraphy at home due to suspicion of OSA with complaints of dyspnea from 4 months. Results revealed OSA with concomitant CSA, the apnea to hypopnea index (AHI) estimated 63.0 events/ hour, with central apneas 45.9/ hour. After CSA diagnosis he was directed to cardiology unit to assess cardiovascular system. Surprisingly, although patient was almost asymptomatic, he was diagnosed with HF with reduced ejection fraction to 20-25%. After percutaneous coronary intervention (PCI), multivessel CAD was diagnosed. Based on the PCI results, patient was qualified to two- stage angioplasty of left anterior descending coronary artery with implantation of 3 sirolimus eluting stents (DES) and angioplasty of right coronary artery with implantation of 2 DES eluting everolimus. In several weeks after PCI + DES and improvement of patient's general condition he was admitted to the Sleep Laboratory due to polysomnographic examination. Based on the findings in polysomnography, the patient was diagnosed with OSA with AHI of 25.2/hour. Central sleep apneas decreased and estimated 1.2/ hour. Patient was qualified to positive airway pressure (PAP) titration and started PAP therapy under physician's supervision.
Conclusions: Individuals with newly diagnosed central sleep apnea are suspected of having cardiovascular disease especially heart failure or stroke. Although recent studies revealed evidence for relationship between OSA and increased cardiac risk after PCI, the cause-and-effect relationship between CSA and PCI is still not discussed in the literature. It is important to screen high-risk patients for possible cardiovascular disorder during evaluation of central sleep apnea causes and risk factors.

Respiration-triggered olfactory stimulation reduces obstructive sleep apnea severity – a prospective pilot study

O. Perel[1], L. Kemer[2], A. Green[2,3], N. Arish[4,5], Y. Corcos[6], A. Arzi[7,8], Y. Dagan[2,3]
[1]Weizmann Institute of Science, Neurobiology, Rehovot, Israel, [2]The Sleep and Fatigue Institute, Assuta Medical Center, Tel Aviv, [3]The Research Institute of Applied Chronobiology, The Academic College of Tel-Hai, Tel-Hai, Israel, [4]Pulmonary Institute, Sha'are Zedek Medical Center, Jerusalem, Israel, [5]The Faculty of Medicine, The Hebrew University of Jerusalem, Jerusalem, Israel, [6]Appscent Medical, Ra'anana, Israel, [7]Hebrew University Medical School, Faculty of Medicine, Institute for Medical Research Israel Canada, the Hebrew University, Medical Neurobiology, Jerusalem, Israel, [8]Hebrew University of Jerusalem, Mt. Scopus, Cognitive and Brain Sciences, Jerusalem, Israel

Study Objectives: Obstructive sleep apnea (OSA) is a prevalent sleep-disordered breathing condition characterized by repetitive reduction in breathing during sleep. The current standard of care for OSA management is continuous positive air pressure (CPAP) devices, which often suffer from low tolerance due to limited adherence. Capitalizing on the unique neurocircuitry of the olfactory system and its retained function during sleep, we set out to test whether presenting transient, respiration-based olfactory stimulation can be used as a treatment for OSA markers.

Methods: Thirty-two OSA patients (Apnea-Hypopnea Index (AHI) $\geq$ 15 events/hour) were recruited and underwent two polysomnography sessions, 'Odor' and 'Control,' counterbalanced for order. In 'Odor' nights, patients were presented with transient respiratory-based olfactory stimulation delivered via a computer-controlled olfactometer. The olfactometer, equipped with a wireless monitoring unit, analyzed respiratory patterns and presented odor stimulation upon detecting respiratory events. No odors were shown on 'Control' nights. Following exclusions, 17 patients entered the analyses (n = 17, 49.2 ± 10.2 years, range: 30 – 66).

Results: Olfactory stimulation during sleep reduced AHI (AHI 'Odor': 22.16 ± 16.2, AHI 'Control': 31.65 ± 17.4, z = 3.34, p = 0.000846, BF10 = 57.9), reflecting an average decrease of 31.3% in the number of events. Relatedly, stimulation reduced the oxygen desaturation index (ODI) by 26.9 % (ODI 'Odor': 20.63 ± 18.9, ODI 'Control': 28.81 ± 22.2, z = 3.3373, p = 0.0008458, BF10 = 9.522). Post hoc planned comparisons revealed reductions in both Hypopnea Index (HI 'Odor': 12.85 ± 8.33, HI 'Control': 17.64 ± 6.56, z = 2.1065, p = 0.03515, BF10 = 1.24) and Apnea Index (AI 'Odor': 9.31 ± 10.1, AI 'Control': 14.01 ± 17.6, z = 2.5329, p = 0.01131, BF10 = 1.586). This effect was not linked to baseline OSA markers severity (ρ = -0.042, p = 0.87). Notably, olfactory stimulation did not arouse from sleep or affect sleep structure ($F(1,16)$ = 0.088, p = 0.77).

Conclusions: Olfactory stimulation during sleep effectively reduced OSA marker's severity without inducing arousal and may provide a novel treatment modality for OSA, prompting continued research on this front.

Keywords: Sleep, obstructive sleep apnea, olfaction, odor, breathing disorders, personalized medicine, apnea prediction

A. Arzi and Y. Dagan contributed equally.

Respiratory-related leg movement index as a predictor of all-cause mortality: the MrOS sleep study

N. Esmaeili[1], S. Aritake[2], S. Redline[1], J.W. Winkelman[3], A. Azarbarzin[1]
[1]Brigham and Women Hospital/Harvard Medical School, Division of Sleep and Circadian Disorders, Boston, United States, [2]Japan Society for the Promotion of Science (JSPS), Tokyo, Japan, [3]Massachusetts General Hospital/Harvard Medical School, Psychiatry and Neurology, Boston, United States

Introduction: Obstructive sleep apnea (OSA) is associated with various health risks, including hypertension, cardiovascular diseases, sudden cardiac death, and all-cause mortality. Respiratory event-related leg movements (RRLMs) have been suggested as a possible marker or contributor to some of these risks. Prior research indicates that respiratory events ending with a leg movement lead to greater sympathetic activation and larger increases in heart rate, even when adjusting for event duration and oxygen desaturation. This suggests that RRLMs may independently contribute to acute rises in blood pressure surges and cardiovascular morbidity and mortality in OSA patients. Here, we sought to examine the prospective association of the number of RRLMs per hour of sleep (RRLMI) with all-cause mortality.

Materials and Methods: We used a sample of 542 men [baseline age (mean ± standard deviation): 76.8± 5.3 years; body mass index (BMI): 28.0 ± 3.9 kg/m^2] from the Osteoporotic Fractures in Men (MrOS) cohort in whom an in-home polysomnography study performed from 2003-2005 and manually scored RRLMs were available. Inclusion criteria were an apnea-hypopnea index (AHI) ≥ 10 and good quality data from piezoelectric leg movement sensors. An RRLM was scored if it started within 5 seconds before or after termination of the respiratory event and its duration was 0.5-10 seconds. Five different Cox regression models with different levels of adjustment were built to estimate the adjusted hazard ratios (aHR) for all-cause mortality. Age, race, BMI, alcohol consumption, and smoking status were considered covariates in Model 1. In Model 2, hypertension, prevalent diabetes mellitus, physical activity, antidepressant use, and benzodiazepine use were added to Model 1, while in Model 3 AHI, coronary heart disease, cerebrovascular disease, peripheral arterial disease, and restless leg syndrome were included as additional covariates. In Model 4, AHI was replaced with the sleep apnea-specific "hypoxic burden, defined as the total area under desaturation curve." Finally, in Model 5, the heart rate response to respiratory events was added to Model 4.

Results: Over a median [inter-quartile range] of 11 [7.0-12.5] years, 286 deaths were recorded. On average the baseline AHI, HB, ΔHR, and RRLMI were 40.3 [30.0;53.7] events/h, 68.5 [47.3;104.0] %min/h, 6.64 [4.78;9.54] beats/min and 6.0 [3.4;9.3] events/h, respectively. RRLMI was significantly associated with all-cause mortality in all adjusted models (aHR of 1.18 [95% CI:1.03 – 1.36] for Model 5).

Conclusions: In a sample of older men with OSA, the number of respiratory-related leg movements per hour of sleep was associated with all-cause mortality independent of AHI, and OSA-related desaturation and change in heart rate and many co-morbidities. These findings highlight the importance of further research on different populations and investigations to better understand the underlying mechanisms and other potential risks of RRLMs.

Risk of obstructive sleep apnea in stroke patients in tertiary-level hospitals in the province of Luanda, 2021

C.A. Dias Pedro[1], F. Samianza[2], M. Luemba[2]
[1]Sagrada Esperança Hospital of Luanda, Luanda, Angola, [2]Agostinho Neto University of Angola, Neurociense and Mental Health, Luanda, Angola

Introduction: Obstructive sleep apnea (OSA) is a disease characterized by pauses in breathing during sleep due to repetitive upper airway obstruction. Its prevalence in stroke patients varies between 50% and 70%. OSA is an independent risk factor for stroke. It has been a challenge to make the diagnoses in African countries special in our country, The burden of stroke remains very high in developing countries and OSA can interfere with the recovery, prognosis, and recurrence of stroke in these patients.

Objective: Our main goal was to assess the risk of obstructive sleep apnea in stroke patients in tertiary-level hospitals in the province of Luanda, 2021.

Materials and methods: An observational, cross-sectional analytical study was carried out. The sample consisted of 151 patients, selected by the probabilistic method by clusters of multiple stages. The instruments used for data collection were the STOP-Bang questionnaire and the modified Rankin scale. Data were analyzed based on descriptive and analytical statistics using Cramer's V and Spearman's rho tests to assess the association between the degree of functional dependence and the risk of obstructive sleep apnea and an association between the risk of obstructive sleep apnea and brainstem injury.

Results: The representative sex was male (53.0%), and the predominant age group was 48-57 years (30.5%), with a mean age of 53.1±13.3 years, among the patients interviewed, 8 .6% had a stroke in the brainstem region. Almost half of the interviewed patients (49.0%) had mild to moderate deficiency on the modified Rankin scale, and 38% were at high risk for obstructive sleep apnea. There was a positive association between the degree of functional dependence and the risk of obstructive sleep apnea ($rs = 0.377$; $p = 0.000$), there was no association between the risk of obstructive sleep apnea and brainstem injury ($X2 = 3.703$ / $V = 0.157$; $p = 0.157$).

Conclusions: We observed that stroke patients with a high degree of functional dependence tend to be at high risk for obstructive sleep apnea, There was no association between stroke located in the brainstem region and high risk for obstructive sleep apnea. Keywords: obstructive sleep apnea, stroke, functional dependence, and brainstem stroke.

Risk of traffic accidents in patients with sleep disorders

N. Pereira[1], V. Ossola[1]
[1]Noctis, La Plata, Argentina

Introduction: Traffic accidents (TA) are one of the major causes of morbidity and mortality among patients with sleep disorders. Identifying the key risk factors in our population can guide treatment and prevent future accidents. Objectives: To evaluate predictors of experiencing TA or being on the verge of one due to falling asleep in a cohort of patients seeking treatment for sleep disorders.

Materials and Methods: A retrospective study was conducted involving 547 patients seen at the Noctis Sleep Center between March 2022 and January 2023. Risk factors were assessed through a self-administered questionnaire, including age, gender, body mass index, sleep duration, history of anxiety disorder, hypertension (HTA), dyslipidemia, depression, alcohol and benzodiazepine consumption. Daytime sleepiness was assessed using the Epworth Sleepiness Scale (ESS), defining daytime sleepiness as a score > 10. Obstructive sleep apnea (OSA) was defined as an Apnea-Hypopnea Index (AHI) > 5 events/hour using polysomnography. Statistical analysis included Chi-square and logistic regression.

Results: A total of 547 patients were evaluated, with an average age of 45.7 years and 48.3% being female. Among them, 9.71% (53/547) reported having experienced or nearly experienced an accident due to falling asleep. In univariate analysis, associated risk factors included male gender (77.36% vs 22.64%, p: <0.001), alcohol consumption (67.92% vs 32.08%, p: 0.009), OSA diagnosis (79.25% vs 20.75%, p: 0.017), and presence of daytime sleepiness (67.92% vs 32.08%, p: <0.001). In multivariate analysis, male gender (OR 2.94, CI 0.37-1.84, p 0.003) and presence of daytime sleepiness (OR 6.22, CI 3.97-14.16) were associated with a higher risk of experiencing or being on the verge of a TA due to falling asleep.

Conclusions: Patients with sleep disorders are at a heightened risk of traffic accidents, especially among male patients reporting daytime sleepiness, having an OSA diagnosis, or consuming alcohol. Hence, sleep treatment should be emphasized in this population.

RUSleeping® device associated with StopBang Questionnaire shows high sensitivity and accuracy as a screening tool for Obstructive Sleep Apnea in preoperative evaluation of patients undergoing bariatric surgery

E.B.G. Pillon[1], R.C. Portela[1], M.E.d.C. Silva[1], P.H.R. Feitosa[1], H. Glass[1]
[1]Escola Superior de Ciências da Saúde, Brasília, Brazil

Introduction: Patients referred for bariatric surgery present a high prevalence of Obstructive Sleep Apnea (OSA), which leads to a higher risk of complications in the perioperative period, and must be screened through polysomnography (PSG), which is the gold standard, but expensive test. In the present prospective study, we evaluated suggested screening tools for OSA (Chung F et al., 2016; Tan A et al., 2017) as potential alternatives for PSG: StopBang Questionnaire (SBQ), Berlin Questionnaire (BQ), neck circumference (NC), body mass index (BMI) and waist-to-hip ratio (WHR). We also evaluated RUSleeping® (RUS), a portable device from Phillips-Respironics that estimates the apneas and hypopneas through nasal airflow analysis.Materials and

Methods: We recruited 71 (12 men and 59 women) consecutive patients referred for preoperative bariatric surgery evaluation without previous OSA diagnosis. We registered SBQ and BQ responses and performed PSG (Apnea-Link) and RUS tests. Using the Apnea-Hypopnea Index (AHI) from the PSG with diagnostic score (≥15) as the gold standard, we calculated the other variables' accuracy, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV). We used diagnostic cut points for NC (♀≥41cm/♂≥43cm) and BMI (≥35), and the ROC curve highest accuracy cut points for SBQ (≥4), WHR (≥0.95), and RUS (≥10).

Results: (presented as mean±SD-accuracy-sensitivity-specificity-PPV-NPV): SBQ 4.05±1.83-82.69%-81.25%-85.00%-89.66%-26.09%; BQ 50.00±8.00-71.70%-96.97%-30.00%-69.57%-14.29%; NC(cm) 41.44±4.85-74.63%-60.98%-96.15%-96.15%-39.02%; BMI 43.05±8.48-62.07%-91.67%-13.64%-63.46%-50.00%; WHR 0.94±0.12-61.11%-50.00%-77.27%-76.19%-48.48%; RUS 16.05±15.19-80.60%-79.07%-83.33%-89.47%-31.03%. The AHI had mean±SD 25.32±20.90. An empiric regression curve between SBQ and RUS obtained the equation [SBQ+(RUS/2.5)] at which a cut-point ≥7 provided 92.16% accuracy, 96.88% sensitivity, 84.21% specificity, 91.18% PPV, and 5.88% NPV.

Conclusions: Our study was similar to other Brazilian studies on the prevalence of OSA (Hora AF et al., 2022; Fernandes, VM et al., 2021). It also showed that no single variable was helpful in OSA screening, with SBQ having the highest isolated accuracy. However, the association of the two single highest accuracy tools, SBQ (≥4) and RUS (≥10), on the other hand, showed higher sensitivity (96.88%) and accuracy (92.16%). Since patients perform the RUSleeping® test at home, the association seems to be a promising screening tool for preoperative bariatric surgery evaluation.

Screening and treatment of obstructive sleep apnea pre and post bariatric surgery reduces the need for post-operative intensive care monitoring and length of hospital stay

I.H. Ahmed[1], S.L. Irvine[2], P.N. Draper[3], D. Harris[4], J. Sutherland[5], S. Makky[3], N. Nguyen[6], J.A. Russell[7], S. Sampath[6]
[1]University of British Columbia, Medicine, Vancouver, Canada, [2]University of British Columbia, Faculty of Medicine, Vancouver, Canada, [3]The Richmond Hospital, Anesthesiology, Richmond, Canada, [4]Richmond Metabolic and Bariatric Surgery Program, Endocrinology, Richmond, Canada, [5]University of British Columbia, Centre for Health Evaluation and Outcome Sciences, Vancouver, Canada, [6]Richmond Metabolic and Bariatric Surgery Program, Surgery, Richmond, Canada, [7]University of British Columbia, Centre for Heart Lung Innovation, Vancouver, Canada

Introduction: Obesity is the most prominent risk factor for obstructive sleep apnea (OSA) and weight loss, especially through bariatric surgery for those with BMI > 40, is a well-established treatment option, which can occasionally lead to cure. Bariatric patients, however, are a high-risk group often with multiple co-morbidities including OSA, hypertension, and diabetes mellitus, which can increase the intensity of post-operative monitoring, thereby raising costs. Given the growing number of bariatric surgeries world-wide, there is a need to determine safe and cost-effective processes for postoperative care. The objective of this study was to determine if a novel triage and perioperative management guideline reduces postoperative monitoring and costs following bariatric surgery.

Materials and methods: Using a pre-post design, we performed a retrospective analysis of 501 patients who had bariatric surgery. Half the patients were managed with usual care, and the other half received OSA screening and treatment of moderate/severe OSA with perioperative continuous positive airway pressure. The intervention group was triaged preoperatively to a postoperative nursing location based on risk factors.

Results: There were no significant differences in demographics, co-morbidities, frequency, or severity of OSA between groups. The mean frequencies of OSA, hypertension and diabetes mellitus were 68.7%, 43.0% and 34.5%, respectively. In the intervention group, there were fewer admissions to the intensive care unit (2.0% vs 9.1%; $p < 0.01$) and high acuity unit (9.6% vs 18.3%; $p < 0.01$). The length of stay was shorter in the intervention group (1.3 vs 2.3 days; $p < 0.01$) with a 50% reduction in costs. There were no statistically significant differences in the 30-day incidence of postoperative respiratory and non-respiratory complications between the two groups.

Conclusions: Most postoperative bariatric surgery patients can be safely managed on the surgical ward with monitoring of routine vitals alone if patients with moderate/severe OSA receive perioperative continuous positive airway pressure.

Acknowledgements: We would like to thank the Richmond Hospital Foundation for their generous support of the study and the nurses in the post-operative recovery room

Screening Obstructive Sleep Apnea (OSA) in hospitalized patients admitted for acute ischemic stroke using Belun Ring: an interim analysis

W.-T. Liu[1], Y.-C. Kuan[1], A. Liu[2], D. Wu[1], H.-C. Lee[3], S.-Y. Lin[1], F.-Y. Lee[1], S.-S. Lee[1], J.-H. Chen[4], L.-K. Huang[4], L. Chan[4], W. Gu[5,2], P.-L. Chen[6], L. Leung[2], I-C. Wu[7], A. Chiang[8]
[1]Sleep Center, Shuang Ho Hospital, Taipei Medical University, New Taipei City, Taiwan, [2]Belun Technology Company Limited, Hong Kong, China, [3]Taipei Medical University Hospital, Psychiatry, Taipei, Taiwan, [4]Shuang Ho Hospital, Taipei Medical University, Neurology, New Taipei City, Taiwan, [5]Department of Computer Science, National Yang Ming Chiao Tung University, Hsinchu, Taiwan, [6]FHI 360, Durham, United States, [7]National Yang Ming Chiao Tung University, Computer Science, Hsinchu, Taiwan, [8]Division of Pulmonary, Critical Care, and Sleep Medicine, UH Cleveland Medical Center, Cleveland, United States

Introduction: Obstructive sleep apnea (OSA) is prevalent in stroke patients, with a 30-70% prevalence depending on the apnea-hypopnea index (AHI) cutoff used. OSA may predispose to recurrent strokes, increasing mortality, and worsening functional recovery. Screening for unrecognized OSA followed by appropriate treatment can potentially improve sleep quality and prevent OSA-associated adverse health outcomes. Regrettably, most stroke survivors are not offered sleep assessment, and few undergo proper testing in the 3-month post-stroke period. We hypothesize that Belun Ring, a FDA-cleared home sleep apnea testing system (K222579), can be a reliable tool to screen OSA and estimate total sleep time (TST) and sleep stages in hospitalized patients admitted for acute ischemic stroke.

Materials and Methods: Belun Ring (formally, Belun Sleep System BLS-100, Belun Technology Company Limited) consists of a plethysmography (PPG) and accelerometry-based wearable ring and proprietary deep-learning neural network algorithms, which can derive the Belun total sleep time (bTST), sleep stages (bSTAGE), and AHI (bAHI). Patients admitted to Shuang-Ho Hospital for acute ischemic stroke were prescreened. Those with atrial fibrillation, low ejection fraction (<45%), devastating strokes, on oxygen, ventilator support, neurostimulators, or unstable cardiopulmonary status were excluded. Eligible patients who consented underwent in-lab polysomnography (PSG) and concurrent Belun Ring testing to assess the Belun Ring performance in an acute inpatient setting. The PSG scoring was based on the latest AASM scoring manual, and the scoring technicians were blinded to the BSP results.

Results: As of 6/28/2023, 23 consecutive subjects (20 males; age 58.5 ± 9.2) were recruited. PSG and Belun Ring testing were performed on day 4 (median) after admission (range 2-7). The PSG TST was 250.9 ± 79.9 mins, and the mean PSG-AHI was 25.9 ± 26.0 (range 1.4-101.8) events/hour (5 normal, 7 mild, 4 moderate, and 7 severe OSA). The Pearson correlation coefficients between PSG-AHI and bAHI and PSG-TST and bTST were 0.79 (P<0.001) and 0.84 (P<0.001), respectively. Belun Ring achieved an accuracy of 0.81 in detecting wake, 0.77 in detecting NREM, and 0.92 in detecting REM (Kappa 0.59 for wake; Kappa 0.54 for NREM; Kappa 0.57 for REM.) The accuracy, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and F1 score using bAHI≥15 to predict PSG-AHI≥15 were 0.87, 0.72, 1.00, 1.00, 0.80, and 0.84, respectively. The accuracy, sensitivity, specificity, PPV, NPV, and F1 score using bAHI≥30 to predict PSG-AHI≥30 were 0.91, 0.71, 1.00, 1.00, 0.89, and 0.83, respectively. The performance of Belun Ring in this acute ischemic stroke inpatient population was satisfactory despite an overall less-than-ideal perfusion index which could have resulted from acute illness, colder skin temperature, fluid shift, body position, or a combination of the above.

Conclusions: In this early interim analysis, Belun Ring demonstrated high specificity and PPV in identifying moderate to severe OSA in patients admitted to the hospital for acute ischemic stroke. Belun Ring is easy-to-use and is promising as an early OSA case-finding tool for inpatients with stroke.

Serum Oxidative Stress Biomarkers and their correlation with severity of Obstructive Sleep Apnea - A Cross Sectional Study

U.M. Krishnaswamy[1], K. Venkatnarayan[1], K. Nagaraju[1], C. Veluthat[1], U. Devaraj[1], P. Ramachandran[1]
[1]St. John's National Academy of Health Sciences, Bengaluru, India

Introduction: Obstructive Sleep Apnea (OSA) is a common sleep related breathing disorder characterized by episodic upper airway obstruction resulting in intermittent hypoxia. This results in generation of reactive oxygen species similar to that seen in ischemic reperfusion injury. The resultant oxidative stress has been postulated to be a trigger for cardiovascular and metabolic consequences of OSA. The current study aimed at assessing the correlation between 2 biomarkers indicative respectively of antioxidant reserve (super-oxide dismutase-SOD) and oxidative DNA damage (8-hydroxy deoxy Guanosine-8-OHdG) and severity of OSA.

Materials and Methods: This cross-sectional study was conducted between June 2022 to June 2023. Newly diagnosed, treatment naïve adult patients with OSA were included in the study. Healthy, non-smokers with no history suggestive of OSA or any other sleep disorder were included as controls. Serum SOD and 8-OHdG levels were assessed using ELISA technique (GENLISA™, Krishgen Biosystems).

Results: Sixty patients, comprising 20 patients each with mild, moderate and severe OSA respectively and 20 controls were included in the study. There were 41 (68.3%) males and 19 (31.6%) females among cases; the control group had 10 each of male and female subjects. Mean (SD) age was 46.92 (11.78) years among cases and 36.95 (7.54) years among controls. Comorbid illnesses among cases were hypertension (51.7%), diabetes (26.7%), hypothyroidism (11.7%) and ischemic heart disease (10%). Mean (SE) Apnea-Hypopnea Index (AHI) among cases was 35.2(3.76) per hour.

Median (IQR) serum level of SOD was 31.43 ng/ml (24.82 – 35.53) in patients with OSA and 41.96 ng/ml (29.64 – 58.39) in controls; the levels were significantly lower in patients with OSA compared to controls (p=0.004). In addition, median SOD levels decreased significantly with increasing severity of OSA (p=0.001). There was a negative correlation between SOD levels and total AHI (r = -0.295; p=0.022) as well as supine AHI (r= -0.261; p=0.044).

Median (IQR) for 8-OHdG was 35.48 ng/ml (29.05 – 67.08) and 45.95 ng/ml (36.42 – 58.75) in OSA patients and controls respectively (p=0.237). In addition, there was no difference in serum 8-OHdG levels between mild, moderate and severe OSA (32.62 ng/ml, 36.55 ng/ml and 36.67 ng/ml respectively; p=0.626).

Conclusions: In the present study, serum levels of SOD were lower in OSA patients and showed a negative correlation with severity of OSA which is indicative of reduced antioxidant reserve secondary to oxidative stress. However, 8-OHdG which is a product of DNA oxidation showed no significant difference between healthy controls and OSA patients; this could be due to small sample size or varying duration of hypoxia among included subjects.

Severity of sleep apnea and adhesion to therapy in caregivers

C. Cortesão[1], P. Silva Santos[1], J. Moita[2]
[1]Centro Hospitalar e Universitario de Coimbra, Pneumology, Coimbra, Portugal, [2]Centro Hospitalar e Universitario de Coimbra, Centro de Responsabilidade Integrada de Medicina do Sono, Coimbra, Portugal

Introduction: Caregiving has been associated with adverse health outcomes, including sleep problems. Obstructive sleep apnea (OSA) is the most common respiratory sleep disorder, and risk has been found higher in patients with lower socioeconomic status. We propose to characterize a population of patients with OSA in regards to caregiving status and socioeconomic determinants, and evaluate if these have effect in severity of upper-airway obstruction and adhesion to therapy.

Materials and Methods: We selected 140 consecutive patients with sleep apnea followed in the Sleep Medicine Center in Coimbra, Portugal, diagnosed between november and december of 2021. Through consultation of electronic records we obtained demographic data, data on employment status, economic sufficiency, social/family support and whether they were the primary caregivers of underaged children (<18 y.o.), ill or elderly dependents. Polysomnographic data at time of diagnosis and adherence reports of the following year were evaluated to characterize severity of obstruction and adherence to continuous positive airway pressure (CPAP). Statistical analysis was performed on SPPS 26.0.

Results: Primary caretakers (n=15, 10.7%) of underaged children (n=11, 7.8%) or of ill or elderly people (n=4, 2.8%) were found to be less adherent to CPAP therapy [$X2$ (df = 1, N = 111) = 3,877, p = 0.049], but data regarding CPAP adherence was missing in 29 (20%) patients. Statistically significant differences were found on obstruction severity: non caregivers had more frequent moderate obstruction [$X2$ (df = 1, N = 140) = 0.72, p= 0.0394] and caregivers had more frequent severe obstruction [$X2$ (df = 1, N = 140) = 0.288, p= 0.059]. No difference was found regarding economic insufficiency and social or familial support.

Conclusions: In our sample, caregiving was associated with less adherence to CPAP therapy in the first year of OSA treatment.

Sex difference in the relationship between apnea severity and anxiety symptoms in patients with obstructive sleep apnea

T.Y. Kim[1], M. Lee[1], W. Kim[1], S.-A. Lee[1]
[1]Asan Medical Center, University of Ulsan College of Medicine, Department of Neurology, Seoul, Korea, Republic of

Background & purpose: Anxiety in patients with obstructive sleep apnea (OSA) has not drawn as much attention. Although anxiety is known to be more prevalent in patients with OSA, the relationship between anxiety and OSA is unclear. Substantial sex differences exist in the associations of OSA with various factors, suggesting sex-specific mechanisms in OSA. The aims of the study were twofold in OSA patients: (1) to determine the prevalence of anxiety and (2) to investigate the relationship between OSA severity and anxiety including sex difference in such association.

Methods: This retrospective study was performed using data from adult patients who were evaluated for sleep-disordered breathing between August 2019 and June 2022. OSA was defined as an apnea–hypopnea index (AHI) of ≥5/h on full-night polysomnography. Subjects were excluded if they had periodic limb movements during sleep and restless leg syndrome. Anxiety was defined as the General Anxiety Disorder-7 score of ≥8. We performed multivariate logistic regression analyses with confounding variables including age, sex, the presence of hypertension, the presence of histories of psychiatric disorders, Epworth Sleepiness Scale (ESS) scores, and Insomnia Severity Index (ISI) scores. Sex difference was evaluated using logistic regression with an interaction term.

Results: This study included 1167 adult OSA patients (women, n=209, 17.9%). Anxiety was present in 164 (14.1%) OSA patients. In the multiple logistic regression, comparing to mild OSA (5/ ≤ AHI <15), severe OSA (AHI ≥30) had a statistically non-significant association with anxiety (odds ratio [OR] 0.650; p=0.087). Women (OR 1.669; p=0.004), younger age (OR 0.977; p=0.004), histories of psychiatric disorders (OR, 2.679; p=0.001), higher ESS (OR, 1.072; p<0.001), higher ISI (OR, 1.191; p<0.001), and hypertension (OR, 0.648; p=0.053) were associated with anxiety in OSA patients. Interactions of sex with OSA severity were significant for anxiety in both the unadjusted and adjusted models (interactions p values 0.015 and 0.034, respectively). Specifically, in the adjusted model, the negative relationships of severe OSA with anxiety were significant in men (OR 0.580; p=0.017) but not in women (p=0.265).

Conclusion: Anxiety symptoms are common in adult OSA patients. OSA severity may be negatively associated with anxiety. Sex difference exists in such a negative association, which seems to be significant in men but not in women.

Sex differences in the obstructive sleep apnea patient journey: retrospective analysis of real-world data

A.V. Benjafield[1], E.M. Wickwire[2], X. Zhang[3], S.H. Munson[3], M. Payombar[4], S. Sullivan[5], S. Patil[6,7]
[1]ResMed Science Center, Sydney, Australia, [2]University of Maryland, School of Medicine, Baltimore, United States, [3]Boston Strategic Partners, Boston, United States, [4]Primasun, San Francisco, United States, [5]Verily Life Sciences, South San Francisco, United States, [6]University Hospitals Cleveland Medical Center, Cleveland, United States, [7]Case Western Reserve University, Cleveland, United States

Introduction: OSA has been estimated to affect approximately 936 million adults and up to 90% remain undiagnosed and untreated. The importance of the patient journey from diagnosis to treatment has been increasingly recognised as a vital component of patient-centered healthcare. Understanding care pathways is especially important as people living with OSA frequently experience multiple barriers to diagnosis and treatment. Important differences exist between the sexes in both OSA clinical presentation and clinical care, which might impact access to care. This study aimed to characterise sex differences in the OSA patient journey by identifying the most common care pathways in the U.S by sex. We compared PAP initiation rates, time from diagnosis to treatment initiation, and healthcare resource utilisation (HCRU) in the 12 months following PAP initiation, by sex and care pathway.

Materials and methods: Data was extracted from a U.S. national administrative claims database (01/01/2016–02/28/2020). Inclusion criteria included age ≥18 years and 12 months continuous enrollment before/after the first OSA diagnosis (index date). OSA was defined as ICD-10 diagnosis preceded by diagnostic sleep test (i.e., HSAT, in-lab-PSG, and/or split-night PSG) within the prior 12 months. Exclusion criteria included prior OSA diagnosis/treatment or central sleep apnea. Demographics and baseline comorbidities, and outcomes were assessed using descriptive statistics. Sex differences in OSA care pathways for PAP initiation were assessed using Chi-squared tests.

Results: A total of 86,827 OSA patients (45.1% female) were identified. For females versus males mean age was 49.7±11.9 vs 48.5±11.8 years, Charlson comorbidity index 0.94±1.48 vs 0.78±1.45, commercial payer 93.9% vs 94.8%, respectively. >92% of individuals received care via one of five primary pathways (HSAT 30.8%; PSG 23.6%; PSG-Titration 19.8%; Split-night 14.8%; and HSAT-Titration 3.2%). Overall, PAP initiation rates were significantly lower for females versus males (56.0% vs 64.8%, $P<0.0001$). Based on the identified pathways significantly fewer females initiated PAP in the HSAT (52.6% vs 60.5%; $p<0.0001$), PSG (31.2% vs 38.1%; $p<0.0001$) and Split-night (80.2% vs 82.6%; $p=0.0011$) pathways. No significant sex differences were observed in the PSG-Titration (82.2% vs 83.0%; $p=0.16$) or HSAT-Titration (83.9% vs 85.1%; $p=0.39$) pathways.

Relative to males, females experienced longer time to treatment initiation (OR 1.05, 95%CI 1.04-1.06). Irrespective of the pathway the median timeframe was always longer for females versus males (HSAT 36 vs 35; PSG 37 vs 36; PSG-Titration 61 vs 56; Split-night 29 vs 28; HSAT-Titration 77 vs 74 days, respectively). HCRU 1 year post-PAP was always higher for females versus males (inpatient 0.16±0.48 vs 0.10±0.41; outpatient 29.5±19.8 vs 22.7±17.2; ER 0.43±1.17 vs 0.27±0.73; medication claims 31.2±28.8 vs 22.1±23.7, respectively) irrespective of pathway.

Conclusions: Distinct real-world OSA care pathways exist. Females have significantly lower PAP initiation rates in the majority of pathways, experience longer time to treatment initiation, and consume greater healthcare resources in the OSA journey. This highlights the need to optimise OSA care pathways to reduce disparities and improve access to care and the potential clinical benefits of treating OSA.

Simplified Barbed Reposition Pharyngoplasty (sBRP) as a treatment for OSA patients and Polygraphic findings

M. Arigliani[1], C. Arigliani[2]
[1]"Vito Fazzi" General Hospital, ENT, Lecce, Italy, [2]Campus Bio Medico, University and Teaching Hospital, Unit of Anaesthesia, Intensive Care and Pain Management, Roma, Italy

Introduction: Surgical treatment of OSA utilizes different and specific options for each level of upper airway obstruction. One of the surgical options is Pharyngoplasty with Repositioning by means of Barbed threads (BRP)
Our study aims to compare polygraphic data in patients with OSA treated with Barbed Reposition Pharyngoplasty (BRP) performed with a simplified technique **(s-BRP)** compared to the standard method **(BRP)**. Variations of technique were tested with the purpose of promoting tolerability and diffusion of BRP technique.

Materials and Methods: A sample of 99 patients were involved in the period from April 2015 to December 2019: men 89.69%, women 10.31%. Mean age 49.8 (SD = 13.1), BMI 28.4 (SD = 3.76). In all patients a retro-lingual obstruction was excluded through DISE procedure.
To evaluate the efficacy of the s-BRP, the sample was divided into two groups: Group A was treated with BRP **(BRP group)** and Group B was treated with simplified BRP **(s-BRP group).** We collected the following pre and post-surgery unattended polygraphic data: AHI (hour/sleep), ODI (hour/sleep), Lowest O_2 saturation (%) overnight. Post-surgical polygraphic evaluation was performed after at least six months for both groups of patients of this study.
The surgical procedure, for what concerns Group A (BRP group), was performed respecting the surgical technique published by Vicini (2015). Regarding Group B (s-BRP group), the surgical procedure presents some simplification of technique theoretically of low impact on the results. In the sRBP group, we used a Unidirectional Barbed, dual angle, absorbable Knotless wound closure device (Covidien V-Loc 180TM) instead of a Bidirectional Tissue-Closure Device, double needle, in polydioxanone absorbable monofilament, recommended for suturing both pharyngeal lateral walls in the original description of the BRP procedure.
In addiction, s-BRP procedure stops at step 7 (pp. 351-357, Chapter 33, ISBN 978-3-030-96168-8) and does not continue to step 8, as in the case of the BRP procedure. Using a second suture Covidien V-Loc 180[TM] we performed the sBRP procedure on the opposite side in the same way, taking care to balance and manage the pulling force between the two sides.

Results: The results obtained on the two groups in terms of AHI, ODI Lowest O_2 saturation, overnight, were compared with the two samples Bootstrap t-tests method, showing a substantial overlap when polygraphic results are recorded 6 months after surgery.

Conclusions: In case of OSA deriving from retro-palatal obstruction, the sBRP shows functional results 6 months after surgery, which are superimposable when compared to the BRP technique from which it derives, even if the former is less invasive.

Simulated Obstructive Sleep Apnea impacts lipid levels differently between men and women: a randomized crossover study

V. Bourgon[1], N. Goulet[2], C. Marcoux[2], R. Morin[2], J.-F. Mauger[2], R. Amaratunga[3], P. Imbeault[2,3]
[1]Université du Québec en Outaouais, Psychology and Psychoeducation, Gatineau, Canada,
[2]University of Ottawa, Human Kinetics, Ottawa, Canada, [3]Institut du Savoir Montfort, Ottawa, Canada

Introduction: Obstructive sleep apnea is a common sleep disorder characterized by acute intermittent hypoxia (AIH). AIH impairs lipid metabolism in multiple tissues, resulting in increased blood lipid levels. Despite well-characterized differences in lipid metabolism between biological sexes, research into the relationship between lipid metabolism and AIH has been conducted almost exclusively in men. Therefore, we investigated whether AIH, previously demonstrated to increase postprandial blood lipid levels in men, has similar effects in women.

Materials and Methods: Using a randomized crossover design, 12 men (21.5years[3.6]) and 11 women (21.4years[3.3]) were exposed to 6 hours of normoxia (~98% oxyhemoglobin saturation [SpO2]) and AIH (~15 hypoxic cycles per hour with 100% nitrogen; ~85%SpO2) following the consumption of a high-fat meal (59% of calories from fat; 33% daily energy expenditure, measured using indirect calorimetry). Female participants conducted their experimental sessions during the early follicular phase of the menstrual cycle. Plasma levels of total triglycerides (TG), denser TG (comprising mostly VLDL), buoyant TG (comprising mostly chylomicrons), and non-esterified fatty acids (NEFA) were analyzed using colorimetric assays at 0-30-60-90-120-180-240-300-360 minutes after meal ingestion. SpO2 was monitored continuously with pulse oximetry. Data were analyzed using an analysis of variance with Tukey's post hoc comparisons and an alpha set at 0.050.

Results: Mean SpO2 was lower during AIH compared to normoxia (condition:p=0.029) with no between-group differences (group:p=0.607). Total and denser TG levels increased over time after the meal (time:p<0.001,ηp2≥0.411) and this increase was greater in men than in women in both normoxia and AIH (group x time; p≤0.044, ηp2≥0.116). The increase in total and denser TG levels after the meal did not differ between AIH and normoxia in both men and women (condition x time: p≤0.503, ηp2≤0.049). After the meal, buoyant TG levels were elevated across time and this elevation was higher in men than in women (group x time: p=0.012, ηp2=186). AIH tended to increase buoyant TG levels (condition: p=0.064, ηp2=161); post hoc comparisons revealed that buoyant TG levels were indeed higher during AIH compared to normoxia in men (PTukey=0.045), but not in women (PTukey=1.000). Regardless of condition, NEFA levels were similar between men and women across time (group x time: p=0.359, ηp2=0.064). AIH induced greater elevations in NEFA relative to the normoxic condition (condition: p=0.008, ηp2=0.363) and these elevations were similar between men and women (group x condition: p=0.827, ηp2=0.003).

Conclusions: During both normoxia and AIH, women experienced different postprandial TG responses following the consumption of a high-fat meal, as evidenced by lower total, denser, and buoyant TG levels relative to men. Further, postprandial buoyant TG levels were higher during AIH compared to normoxia in men only. These findings provide experimental support that AIH impacts men and women differently, highlighting the need for equitable research that benefits both biological sexes. More precisely, our findings may help explain why women with obstructive sleep apnea experience lower rates of comorbidities associated with impaired lipid metabolism.

Sleep apnea and 12-year follow-up for all-cause mortality, sleep disordered breathing in the Karamay health study cohort

Q. Zhang[1], X.-l. Jiang[1], J. Shi[1], M. Li[1], M.-R. Han[1], D.-m. Chen[1], X.-s. Dong[2], Z.-m. He[1], F. Han[2], S.-l. Ma[1]

[1]Xinjiang Second Medical College, Department of Respiratory and Critical Care Medicine, Karamay, China, [2]Peking University People's Hospital, Sleep Medicine Center, Peking, China

Objective: To compare the severityof sleep disordered breathing and incidence of mortality in patients with obstructive sleep apnea (OSA) and healthy people in Karamay Community during 12 years.
Methods: from Jan. 2008 to Aug. 2008, 1005 snoring patients over 40 years old were included in this study, Home Sleep Apnea Testing(HSAT) was performed using the ApneaLink PlusTM(Resmed, Australia), including 639 patients with OSA and 366 people with No-OSA. Most ofthese patients were followed up by telephone every year. From June 2020 to May 2021, HSAT were performed in 766 cases of 1005 people after 12 years. The record parametersincluded respiratory disorder index (RDI), hypopnea index (HI), the number of desaturations ≥ 4% per hour (ODI4), mean SaO2 (MSaO2%), the lowest SaO2 (LSaO2%), percentage of time when oxygen saturation was lower than 90% in total recorded time (SIT90), neck circumference, abdominal circumference and body mass index (BMI).
Results: Among the 1005 cases, including 428 males, average age were (62±12.8) years.577 females, average age were (58.0 ± 11.5) years. 639 patients with OSA, average age were (61.9 ± 11.5) years, including 309 males, average age were (63.6 ± 11.9) years, 330 females, average age were (59.7 ± 10.5) years, In 366 No-OSA patients, average age were (56.0 ± 12.4) years, including 120 males, average age were (57.3 ± 13.0) years, 246 females, average age were (55.4 ± 12.1) years, During 12 years, 161 patients deaths in OSA groups and 78 people deaths in No-OSA groups. There was no significant difference in mortality [25.2% (161 / 639) vs 21.3% (78 / 366)] between OSA group and non OSA group (P > 0.05). Compared with 478 OSA patients before and after 12 years, there were no significant difference in neck circumference [(35.8 ± 6.1) cm vs. (36.4 ± 6.9) cm], BMI [(27.6 ± 16.8 kg / m2 vs. 26.7 ± 5.4 kg / m2)], but there were significant difference on RDI [(25.8 ± 18.5) evens / h vs. (15.0 ± 12.7) evens / h], HI [(15.3 ± 12.3) evens / h vs. (6.8 ± 6.5) evens / h], MSaO2[(92.2±2.2)% vs. (90.8±6.3)%] and SIT90 [(16.2 ± 2.2)% vs. (19.1 ± 2.2)%]. Compared with 288 people with No-OSA before and after 12 years, there was no significant difference in neck circumference [(35.5 ± 3.7) cm vs. (35.1 ± 7.8) cm], LSaO2 [(80.6 ± 21.6)% vs. (80.5 ± 10.0)%] and SIT90 [(13.4 ± 2.4)% vs. (13.0 ± 2.2)%]. There were significant differences in BMI [(26.4 ± 4.4 kg / m2) vs. (27.5 ± 4.6 kg / m2)], RDI [(4.0 ± 2.5) evens / h vs. (9.9 ± 8.7) evens / h], HI [(1.6 ± 1.4) evens / h vs. (4.8 ± 4.6) evens / h], MSaO2 [(92.1 ± 18.9)% vs. (90.0 ± 6.9)%] and ODI4 [(4.7 ± 0.5) evens / h vs. (8.2 ± 0.5) evens / h] (P < 0.05).
Conclusion: In the past 12 years, there was no significant difference in mortality between patients with OSA and non-OSA groups, the degree of sleep disordered breathing in have decreased, but the RDI and ODI4have increased in normal population

Sleep apnea screening through a news portal using the STOP-Bang questionnaire. A proof of concept

D. Perez-Chada[1], S. Arias[2], D. Schönfeld[3], D. Vigo[4], M. Azpiazu[5]
[1]Universidad Austral Hospital Universitario Austral, Medicine, Pilar, Argentina, [2]Instituto Nacional de Enfermedades Respiratorias "Dr. Emilio Coni", Epidemiology, Santa Fe, Argentina, [3]Centro de Diagnóstico San Jorge, Pulmonary Medicine, Puerto Madryn, Argentina, [4]Universidad Católica Argentina, Chronophysiology Lab, Institute for Biomedical Research (UCA-CONICET), Buenos Aires, Argentina, [5]Osakidetza Basque Health Service, Araba University Hospital, Sleep Unit, Vitoria-Gasteiz, Spain

Introduction: Obstructive Sleep Apnea (OSA) is a prevalent, chronic, and underdiagnosed disease which impairs quality of life, impacts on the cardiovascular health, facilitates traffic accidents and interferes with the neurocognitive function.
The aims of the present study were:

1. amplify the visibility of OSA in the community by publishing in a news portal media (INFOBAE) a general description of the disease and inviting the readers to respond the Spanish version of the STOP-Bang (SB) questionnaire.
2. evaluate the risk of OSA according to the SB score, among the readers who answered this questionnaire.
3. evaluate the characteristics of the responders according to their risk for OSA.

Materials and methods: The study was run between March 17th and April 28th, 2023.
Adults 18 yr or older were invited to respond a validated questionnaire to assess the risk of OSA. An e-Form of the SB was published in a large circulation news portal media. Data were instantly available, and the information was exported to a database for further analysis. The participants received an instant response indicating their risk for OSA and a recommendation to seek for medical advice when the OSA risk was moderate or severe.
Results: By April 28th, 2023, 7093 subjects responded the questionnaire, 5966 (90.6%) were Argentinians, the remaining 9.4% responders were distributed in 19 LATAM countries and a few Spanish speaking subjects from North America, Europe, and Israel. The highest response rate from countries different form Argentina was 1.3% (Uruguay). The reported results are from Argentina (90.6% of the sample). Fifty-four-point six percent (54.6%) were males. Mean age was 44.9 years old (CI: 44.58-45.21). Mean BMI was 27.42 kg/m² (CI: 27.28-27.56). Overweight was present in 35.8%, 24.6% were obese, 2.7% reported morbid obesity. BMI was normal 35.3% of the sample.
BMI was reported normal by 35.3% of the sample, 35.8% reported overweight, 24.6% obesity, and 2.7% reported morbid obesity. The SB questionnaire classified 32.8 % of subjects at high risk of having OSA, 11.9% as middle risk and 55.4% at low risk of having OSA.
When comparing subjects with low vs. middle-high OSA risk, the reference of tiredness (OR 2.7, CI: 2.4-3.1), male gender (OR 6.3, CI: 5.6-7.1), BMI>35 kg/m² (OR: 8, CI: 6.4-10.1) or being older than 50 years (OR 5.8, CI: 5.1-6.6), had a modest contribution as compared to snoring (OR 16.4, CI: 14.4-18.8), witnessed apneas (OR 14.1, CI: 11.9-16.8), hypertension (OR 15.1, CI: 12.7-18.2), and a neck circumference > 43 cm (OR 12.0, CI: 10.2-14.2).
Conclusions: 1-To our knowledge this is the first survey to assess the OSA risk after publishing the STOP-Bang questionnaire in a news portal
2-In this sample males were not overrepresented (males: 54.6% vs females:45.4%)
3-More than 40% of the responders are at moderate to high risk for OSA
4-Tiredness was highly prevalent even in subjects with a low OSA risk, suggesting that there are other mechanisms responsible for non-restorative sleep.
Acknowledgements: We are indebted to UHN for waiving the SB use and to INFOBAE for publising the SB questionnaire on their news portal.

Sleep Breathing Disorders in patients with Neuromuscular Disease, an integrative review

G. Nobre Nogueira[1], F. Duque de Paiva Giudice Junior[1], J. Pedro Barreto Rocha[1], R. Fagundes da Rosa[1]
[1]Federal University of Ceará, Medicine University, Fortaleza, Brazil

Introduction: Sleep disorders are among the most common non-motor manifestations in Parkinson's disease (PD) and have a significant negative impact on quality of life. While sleep disorders in PD share most characteristics with those that occur in the general population, there are several considerations specific to this patient population regarding diagnosis, management, and implications. The available research on these disorders is expanding rapidly, but many questions remain unanswered.

Materials and Methods: The established inclusion criteria were articles researched from 2018 to 2023 and the use of the DeCS/MeSH descriptors "Sleep Breathing Disorders" and "Neuromuscular Disease" crossed with the Boolean operator "AND" for searching on the PubMed platform. Based on this information, seven articles were selected from which the present review was compiled.

Results: Although there are a myriad of neuromuscular diseases (NMD), a common characteristic among them is their impact on breathing function as a result of motor dysfunction. This impact mostly results from either compromised airway patency and protective reflexes, or reduced efficiency of the respiratory muscles. As a result, individuals with NMD may experience sleep-disordered breathing, and as the disease progresses, they could develop diurnal hypoventilation. Early on, patients can present dyspnea while lying flat, obstructive sleep apnea, or central sleep apnea as the first signs of NMD. Considering this, sleep-disordered breathing may be seen before the development of non-respiratory muscle weakness in patients with NMD. Therefore, it is important to do a proper analysis of their sleep to make an early diagnosis of the disease. It is also known that poor sleep quality can hurt neuromuscular function, indicating a reciprocal relationship that exacerbates the progression of NMD. This emphasizes the significance of early diagnosis to mitigate disease advancement and reduce the risk of respiratory complications like infections, atelectasis, and aspiration syndromes, which the patient may be susceptible to.

Conclusions: It is critical to perform a sleep review, including questions regarding daytime hypersomnolence, frequent nocturnal awakenings for nocturia or other reasons, morning headaches, and decreases in concentration or mental function. Respiratory abnormalities during sleep are poorly identified using sleep history, sleep diaries and assessing sleep hygiene.

Sleep disordered breathing in Iranian children with underlying congenital disorders referred to pediatrics sleep lab, 2015-2023

S. Jalilolghadr[1], H. Nozari[2], S. Sadr[2]
[1]Children Growth Research Center, Research Institute for Prevention of Non-Communicable Diseases, Qazvin University of Medical Sciences, Pediatrics sleep Medicine, Qazvin, Iran, Islamic Republic of, [2]Shahid Behshti University of Medical Sciences, Tehran, Iran, Pediatrics Pulmonology, Tehran, Iran, Islamic Republic of

Introduction: More than 50% of children suffer from various type of sleep disorders like long-time night awakenings, frequent night awakenings until very serious events such as obstructive sleep apnea syndrome (OSAS). The chance of various type of sleep disorders is high in children with chronic disease particularly in neuromuscular patients. Polysomnography is the standard method used to evaluate sleep structure and breathing patterns during sleep.

Materials and Methods: This retrospective, cross-sectional, descriptive study was conducted on all children aged from birth to 18 years who were referred from Mofid Hospital in Tehran to the sleep ward of Qazvin Children's Hospital between 2015 and 2023 due to sleep problems. Data collection involved the completion of the Iranian children and adolescence sleep habits questionnaire (CSHQ), and with manual scoring of polysomnography (PSG) sleep test data according to the American Academy of Sleep Medicine (AASM). Data analysis was performed using SPSS version 24 statistical software, with a significance level of 0.05.

Results: The study included 43 children, with 62.8% being boys. The average age of the participants was 7.06 ± 3.45 years. All referred children had an underlying medical condition, which the highest prevalence was neuromuscular diseases (48.5%) and the lowest was chest deformities (9.1%). The most common clinical symptoms in children were restless sleep (63.9%), nighttime pain and moaning (56.6%). The PSG results revealed low sleep efficiency, with 59.5% of children having an abnormal arousal index (AI). There was a higher proportion of lighter sleep stages (N1, N2), reduced deep sleep stage (N3), delayed onset of rapid eye movement (REM) sleep, and an extremely low percentage of REM sleep. Additionally, 77.5% of children exhibited OSAS, with 55% experiencing severe apnea. Children with higher apnea-hypopnea index (AHI) values showed a greater drop in oxygen saturation index (SpO2), particularly during REM sleep (<0.001).

Conclusions: Sleep structure disruption and OSAS are prevalent among children with underlying medical conditions, especially those with neuromuscular disorders. Failure to address these symptoms seriously threatens the child's growth and development. Initial symptoms manifest during sleep, particularly in REM sleep, and without appropriate diagnosis and intervention, they can extend into waking hours, ultimately impacting the child's quality of life. Therefore, timely interventions can lead to improved morbidity and mortality outcomes in children with chronic illnesses.

Sleep disordered breathing in patients with chronic heart failure: analysis depending on the etiology of the heart failure

K. Krupichka[1], M. Agaltsov[1], R. Myasnikov[1], S. Beregovskaya[1], O. Drapkina[1]
[1]National Medical Research Center for Therapy and Preventive Medicine, Moscow, Russian Federation

Aim of the study: To study the correlation between sleep disordered breathing (SBD) in patients with chronic heart failure with reduced (HFrEF) and heart failure with mildly reduced ejection fraction (HFmrEF) on the etiology of reduced cardiac function.

Materials and Methods: The study included 123 patients with HFrEF and HFmrEF. All patients underwent cardiorespiratory sleep monitoring, general clinical examination, laboratory and instrumental methods of investigation. A

The study included 123 patients with HFrEF and HFmrEF. All patients had sleep polygraphy, general clinical examination, laboratory and instrumental diagnostic methods.

Three groups were identified according to the results of the sleep CRM:

Group 1-patients with prevalence of central sleep apnea (CSA),

Group 2-patients with prevalence of obstructive sleep apnea (OSA),

Group 3-patients without OSA or CSA.

Results: Only 5 patients (4.1%) had no sleep apnea, 47 (38.2%) were diagnosed with central sleep apnea, and 71 (57.7%) with obstructive sleep apnea. The proportions of patients with moderate and severe and OSA differed slightly and were 35.9% (42 patients) and 44.4% (52 patients), respectively. More than half of the patients (52.4%) had LV EF<35%. The proportions of patients with moderate and severe forms of central sleep apnea and obstructive sleep apnea differed slightly and were 35.9% (42 patients) and 44.4% (52 patients), respectively.

Ischemic heart disease (CHD) (43.1% of the total) was the most common cause of chronic heart failure in all three groups. Other causes of heart failure were non-ischemic cardiomyopathy (26%), cardiac arrhythmias (14.6%) and other causes (16.3%), which included arterial hypertension, myocarditis and heart defects. It was established that the only cause of CHF, which showed a trend towards difference between groups, was arrhythmogenic cardiomyopathy (mainly atrial fibrillation), which is widely represented in the group of patients with obstructive sleep apnea compared with patients with central sleep apnea (p = 0.058).

Summary: Thus, our data indicate a high incidence of sleep apnea both OSA and CSA in patients with systolic CHF of ischemic etiology. There is an unreliable relationship between the etiology of CHF and obstructive sleep apnea.

Sleep-disordered breathing in patients with pulmonary hypertension

C.M. Guimarães[1], N.C.N. Araujo[2], M.F. Dourado[2], C.A. Ribeiro[1], R. Galtieri[3], C.N.D. Nogueira[2], C. Salles[1,2,4]

[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]Federal University of Bahia, University Hospital Professor Edgard Santos, Salvador, Brazil, [3]Federal University of Bahia, Post Graduate Program in Interactive Processes of Organs and Systems, Institute of Health Sciences, Salvador, Brazil, [4]Jorge Amado University Center, Salvador, Brazil

Introduction: Pulmonary hypertension (PH) is a clinical and hemodynamic syndrome defined as a mean pulmonary artery pressure greater than or equal to 20 mmHg, measured by right heart catheterization. The relationship between sleep-disordered breathing and PH is still poorly studied; however, studies have shown that nocturnal hypoxemia associated with repetitive variations in intrathoracic negative pressure due to partial or complete upper airway obstruction may adversely contribute to pulmonary hemodynamics in these patients. The objective of this study was to evaluate the frequency of sleep-disordered breathing in patients with pulmonary hypertension.

Materials and methods: Forty patients were enrolled in a PH outpatient clinic in Salvador, Bahia, Brazil, diagnosed with PH through invasive measurement of mPAP by right-chamber catheterization (mPAP >20 mmHg). Sleep quality questionnaires were applied (Berlin Questionnaire, Epworth Sleepiness Scale, Pittsburgh Questionnaire). The severity of dyspnea was measured according to the NYHA functional classification, divided into four groups: I, II, III, and IV. The authors grouped classes I and II into a group with PH and mild dyspnea and classes III and IV into a group with PH and severe dyspnea. The European Society of Cardiology (ESC) classifies PH into 5 groups: Group 1 (pulmonary arterial hypertension); Group 2 (PH associated with left heart disease); Group 3 (PH associated with lung diseases and/or hypoxia); Group 4 (PH associated with pulmonary artery obstructions) and Group 5 (PH with unclear and/or multifactorial mechanisms).

Results: The total sample comprised 40 patients with PH aged 55 (44 – 69.5) years. Self-declared blacks were 82.5% (n = 33); female sex = 70% (n = 28) of the individuals. The mean cervical circumference was 37.9 ± 4.9 cm. Patients on drug treatment = 82.5% (n = 33), on oxygen therapy = 20% (n = 8). The dyspnea severity in patients with PH was considered severe according to NYHA classification in 36.1% (n = 13) of patients despite drug treatment. According to the ESC classification, 37.5% (n = 15) were classified in group I; and 27.5% (n = 11) were classified in group IV. It was possible to observe that 75% (n = 30) of patients with PH complained of snoring, whereas 82.5% (n = 33) were at high risk for obstructive sleep apnea, and 67.5% (n = 27) presented excessive daytime sleepiness according to the Epworth Sleepiness Scale. Among those at high risk for obstructive sleep apnea, 37.9% (n = 11) had severe dyspnea despite drug treatment, and 15.2% (n = 5) were on oxygen therapy.

Conclusions: Patients with PH, especially those with severe dyspnea, presented a high frequency of sleep-disordered breathing. Data from this study points out the need for investigation of obstructive sleep apnea in patients with PH since hypoxemia and airway obstruction during sleep may contribute to the non-control of the disease.

Sleep lab at home: evaluation of oximetry to provide at-home sleep screening of children

D. Wensley[1], N. Memarin[2], J.M. Ansermino[3]
[1]University of British Columbia, Pediatrics, Vancouver, Canada, [2]Child and Family Research Centre, Vancouver, Canada, [3]University of British Columbia, Anaesthesia, Vancouver, Canada

Introduction: The BC Children's Hospital (BCCH) sleep lab is the only Pediatric sleep assessment clinic in the province of British Columbia, Canada. 400 tests\year can be performed, and the wait time is >1 year. 30% of families live outside of Vancouver, with most over 2 hours away. The objective of this study was to identify and validate a sleep screening methodology using pulse oximetry for Obstructed Sleep Apnea (OSA) in the child's home to improve access to care in BC.

Materials and Methods: Children 3-12 years old with features suggestive of OSA were recruited when referred for polysomnography (PSG) at BCCH. Following consent, each subject was assessed by full night PSG in the lab and concurrently with the Masimo Rad-97 oximeter. The oximeter and instructions were then given to the participant's family and a subsequent home study was performed within a week. Estimated specific oxygenation and heart rate were extracted from the oximeter for analysis at 0.5 Hz. The intended data analysis required a larger sample. Therefore, iPhone Oximeter™ data, acquired for previous studies of our research group (Garde et al., 2014; Garde et al., 2019) was used to augment the Masimo Rad-97 data. Validation steps comprised the development of a machine learning model using Linear Discriminant Analysis (LDA) to predict apnea and hypopnea events summarized as the apnea hypopnea index >5 during periods of participant sleep. Model features were extracted from the SpO2 data in the time and frequency domains, using a 2-minute sliding window, with 1-minute overlap. A model was trained using leave-one-out-cross validation where all minus one data points were used to train the model to predict the outcome (healthy or SDB) and the final data point was used for testing. This procedure was repeated until every data point was used for testing. Primary outcomes assessed for model validity were diagnostic sensitivity and specificity. Secondary outcomes included usability and acceptability of the device at home.

Results: This study recruited 18 participants (10 males; 8 females; mean age 6.7 +/-2.7) using the Massimo Rad-97 oximeter and PSG. An LDA model trained on these data had a sensitivity = 57% and specificity = 82% (optimal number of features = 30). To increase performance, the training dataset was augmented with a cohort of 67 participants (41 males; 26 females; median age 9.2 +/-4.5) who had PSG and similar SpO2 measures at a sampling rate of 0.5 Hz. The LDA model with augmented data included 30 features and had a sensitivity = 62% and specificity 76%. All participants using the Massimo Rad-97 rated the device highly for device usability at home based on ease of set-up and removal and perceived sleep quality.

Conclusions: Our study leverages the BCCH's sleep lab infrastructure to improve the accessibility of pediatric sleep assessment. The Massimo Rad-97 pulse oximeter could be used for screening at home for OSA but further validation of these pilot results is required in a larger sample.

Systematic review of miRNA expression changes in Obstructive Sleep Apnea: insights into associated pathways and contribution to disease

L. S. Gaspar[1,2,3], A. Capitão[1,2], B. Santos[1,2,4], A. Ferreira Mendes[1,2,4], C. Cavadas[1,2,4], I. S. Moreira[1,2,5], A.R. Álvaro[1,2,3]

[1]CNC - Centre for Neuroscience and Cell Biology, University of Coimbra, Coimbra, Portugal, [2]CIBB - Centre for Innovation in Biomedicine and Biotechnology, University of Coimbra, Coimbra, Portugal, [3]IIIUC - Institute for Interdisciplinary Research, University of Coimbra, Coimbra, Portugal, [4]FFUC - Faculty of Pharmacy, University of Coimbra, Coimbra, Portugal, [5]DCV: Department of Life Sciences, University of Coimbra, Coimbra, Portugal

Introduction: Obstructive Sleep Apnea (OSA) has been associated with the development of multiple comorbidities, yet, how cellular responses to OSA initiate and cause disease progression in multiple organs is still not clear. Several studies have reported changes in the expression of several microRNAs (miRNAs) in patients with OSA. MiRNAs are key regulators of multiple cellular and physiological processes in health and disease. A better understanding of OSA impact on miRNA expression may provide relevant insights into the pathophysiology of OSA and its pleiotropic effects, with applications in OSA clinical management. We thus proposed to mine the existing biomedical literature regarding dysregulated miRNAs in patients with OSA to create a unified database and explore associated biological processes and contribution to disease.

Materials and Methods: The current study was registered at the International Prospective Register of Systematic Reviews database (ID: CRD42023386720). We retrieved all human observational studies that reported Differentially Expressed (DE) miRNAs, validated by quantitative PCR, in peripheral samples of patients with OSA, in comparison with a control group (no OSA), from PubMed/Medline and Web of Science. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines were followed. Eligible studies were characterized using the Quality Assessment Tool for Diagnostic Accuracy Studies 2 (QUADAS-2). DE miRNAs and target genes were explored using the MultiMiR package in R. We further retrieved information regarding the disease spectrum width (DSW) of DE miRNAs from the Human microRNA Disease Database (HMDD) and miR2disease. Enrichment analyses were performed in R using clusterProfiler and DOSE packages to discriminate associated molecular functions (MF), cellular compartments (CC), biological processes (BP), and pathways from the Kyoto Encyclopedia of Genes and Genomes (KEGG).

Results: Ten studies met the inclusion criteria. We gathered 15 DE miRNAs in patients with OSA, among which 13 downregulated and 2 upregulated miRNAs ($p < 0.05$). DE miRNAs in OSA have been associated with 528 different diseases, mostly neoplasms, and diseases of the circulatory and nervous systems. We found 11792 associated target genes, most specifically affected by down-regulated miRNAs (7764 genes). Pathway analysis of target genes revealed 576 significant associated biological processes, 142 molecular functions and 111 cellular compartments (p-adjust < 0.05). KEGG analysis showed that target genes were mostly associated with signalling pathways, protein processing, cell cycle regulation, cellular senescence, several types of cancer, and bacterial and viral infections (p-adjust < 0.05).

Conclusions: Our results suggest an evident effect of OSA on miRNA and gene expression, which not only provides further insights into the contribution of OSA to disease mechanisms and common comorbidities but also sheds light into potential biomarkers and targets for OSA treatment.

Systematic review on the cardiorespiratory impact and prevalence of Obstructive Sleep Apnea in patients with mucopolysaccharidosis

F. Góis de Deus[1], L. Rebouças[1], D. Santana Miguel[1], M. Meira e Cruz[2,3,4], C. Salles[5,6,1]
[1]Bahiana School of Medicine and Public Health, International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]Faculty of Medicine of Lisbon, Lisboa, Portugal, [3]University of Lisbon, Sleep Unit, Cardiovascular Center, Faculty of Medicine in Lisbon, Lisboa, Portugal, [4]European Sleep Center, Lisboa, Portugal, [5]Federal University of Bahia, University Hospital Professor Edgar Santos, Salvador, Brazil, [6]Jorge Amado University Center, Salvador, Brazil

Introduction: Mucopolysaccharidoses(MPS) represent a group of rare hereditary diseases with eleven subtypes caused by the deficiency of a lysosomal enzyme, leading to the intralysosomal accumulation of glycosaminoglycans (GAGs) due to a reduction in their metabolization. Cardiorespiratory involvement is frequent, especially in some types of MPS (I, II, and VI). The coexistence of MPS and Obstructive Sleep Apnea(OSA) can generate synergism in pulmonary and cardiovascular complications, increasing the risk and making managing both conditions more difficult. The main objective of this study was to evaluate the prevalence of OSA and its comorbidities in MPS.
Materials and Methods: A database search was undertaken using the following descriptors: "mucopolysaccharidosis", "obstructive sleep apnea". Inclusion criteria covered studies investigating polysomnographic assessment in patients with MPS, whereas reviews, letters, symposia, conference proceedings, animal studies, abstracts, and posters were excluded.
Results: There were 417 articles identified, besides 11 more through manual search, of which only 07 met the inclusion criteria. Moreira et al. observed a prevalence of 68.9% of OSA in MPS I, II, and IV, 61.3% of which was considered severe, 22.6% mild, and 16.1% moderate. When analyzed individually, MPS I (85.8%) presented a predominantly severe condition, MPS II (44.5%) was more moderate, and MPS IV (50% mild, 50% severe) had a balanced distribution. The nadir oxygen saturation (SpO2) analysis revealed a more significant reduction in MPS I (p=0.02). Lin et al. showed that of 24 patients, 22 were children, and all had OSA, consisting of 2 mild, 7 moderate, and 13 severe. Nashed et al. identified OSA in 64% of patients, of which 86% had the mild to moderate form. Interestingly, among patients undergoing enzyme replacement therapy, 66.6% demonstrated severe OSA, indicating a possible relationship. Santamaria et al. found OSA in 54% of patients, with 100% of children affected and 17% of adults (p=0.01). The study also showed that children had higher apnea rates than adults (10.4 and 14.7, respectively) (p=0.04). Santamaria et al. observed mental retardation(36%), corneal opacity(27%), enlargement of internal organs, especially liver and/or spleen (82%), joint limitation (91%), multiple dysostosis (82%) and cardiac involvement (82%, involving isolated valvular disease or associated with myocardial thickening in the absence of significant hemodynamic abnormalities). Leighton et al. found OSA in 92.3% of patients, with a range in mean oxygen saturation from 98.6% to 78.6%. John et al. identified OSA in 85.1% of MPS type VI cases, distributed between mild, moderate, and severe.
Conclusions: Based on the results of the present systematic review, the prevalence of OSA in MPS ranged from 44.5% to 100%, depending on the subtype analyzed. The association between pulmonary and cardiovascular impairment with OSA in MPS was also observed. Therefore, early detection of OSA in these patients may represent an important strategy for minimizing future complications and optimizing the management of both conditions.

The association between gut microbiota dysbiosis and nocturnal hypoxia in young adults with obstructive sleep apnea

R. Zhao[1], M. Peng[2], B. Zhou[2], X. Zhang[2], F. Han[2], Z. Gao[1], X. Dong[2]
[1]Peking University People's Hospital, Department of Pulmonary and Critical Care Medicine, Beijing, China, [2]Peking University People's Hospital, Department of Respiratory and Sleep Medicine, Beijing, China

Introduction: OSA is a chronic sleep-disordered breathing characterized by recurrent collapse of the upper airway during sleep and frequent oxygen desaturation. It is evidenced that the adverse health outcomes of OSA were associated with nocturnal hypoxia. The composition of gut microbiota in OSA with intermittent hypoxia need to be evaluated. This study aims to identify gut microbiome phenotype of OSA based on high-throughput sequencing and establish the association between microbiome and nocturnal hypoxia.

Materials and methods: Young adult subjects (Age<45 years) who referred to the sleep center of Peking University People's Hospital for snoring or daytime sleepiness were enrolled, healthy volunteers without snoring were also recruited. All participants completed overnight PSG and fecal sample collection. Bacterial DNA of fecal samples were extracted. 16s rRNA sequencing technology was used to analyze the microbiota structure and functional characteristics of OSA and healthy controls. After further correction of confounding factors using MaAslin2, redundancy analysis(RDA) and Spearman correlation test were used to find different features related to OSA phenotype, and then evaluate the diagnostic efficacy of microbiome features.

Results: A total of 46 qualified fecal samples were collected, including 17 healthy controls, 12 subjects with mild OSA and 17 with moderate-to-severe OSA (MSevOSA). The alpha diversity of the gut microbiota in the OSA groups were changed, the abundance of mild and MSevOSA group was greater than that of healthy control, but the species uniformity and microbiota diversity (Shannon index and Simpson index) were lower than those of healthy control. LEfSe analysis found that Ruminococcus_torques_group and Escherichia-Shigella were significantly enriched in the gut of the MSevOSA group. The abundance was positively correlated with cumulative time at $SpO_2<90\%$(CT90), and significantly negatively correlated with lowest oxygen saturation($LSpO_2$). RDA analysis and Envfit test found the environmental factors with the greatest impact on the gut microbiome were mean oxygen saturation($MSpO_2$), CT90, $LSpO_2$, BMI and oxygen desaturation index(ODI) respectively, (r^2 was 0.804, 0.539, 0.525, 0.307 and 0.202, respectively, both p <0.001). While apnea-hypopnea index(AHI) had the lowest contribution to the difference in microbiota abundance (r^2=0.216, p=0.006), suggesting that hypoxic factors dominated the changes of gut microbiota with OSA. BugBase annotation showed that the aerobic phenotype of gut microbiota in MSevOSA group decreased significantly compared with the healthy control group (p=0.019). The random forest model was used to identify the characteristics of 10 gut differential genus related to the clinical phenotype of OSA, which could effectively diagnose OSA. Among them, the ROC-AUC diagnosed by the random forest model of gut features reached 0.829 and 0.938 in the training and test set, respectively.

Conclusions: The diversity and composition of microbial communities with MSevOSA were different from those of healthy controls. Hypoxic factors ($MSpO_2$, CT90) dominated changes in gut microbiome structure. A random forest model confirmed that the microbial characteristics had good diagnostic performance. However, further large sample and validation studies are still needed.

The association between sleep apneas and catathrenia phenomena: a multi-center analysis

M. Yu[1], Y. Wen[2], F. Han[2]
[1]Peking University School and Hospital of Stomatology, Orthodontics, Beijing, China, [2]Peking University People's Hospital, Sleep Division, Beijing, China

Introduction: Catathrenia is a rare sleep-related breathing disorder. There is a close association between sleep apnea and groaning episodes. This study aims to summarize the incidence of catathrenia, both primary groaning and respiratory events-related groaning (RERG), at two independent sleep centers and to explore the association between groaning and respiratory events.
Materials and methods: This study was conducted at two independent sleep centers, Peking University People's Hospital and Peking University International Hospital. All the participants (n=1123) who underwent full-night polysomnography (PSG) within the study period were included, of which 329 were enrolled prospectively. Catathrenia was classified into primary groaning and respiratory events-related groaning (RERG), characterized by groaning events occurring right after respiratory events within 30s. OSA patients combined with catathrenia enrolled prospectively (n=27) were treated with automatic positive airway pressure (APAP) and monitored by PSG.
Results: There were 741 males and 382 females, with an average age of 46.3±14.0 y, and the average body mass index (BMI) was 26.3±4.3 kg/m^2. Primary groaning was found in 10 patients (5 males and 5 females), resulting in an incidence of 0.89% in total. The RERG was found in 78 patients, with an incidence of 6.95%. The incidence of RERG was significantly higher in the age 41 to 50 group and severe OSA males. The RERG index and apnea-hypopnea index were positively correlated. RERG tent to follow obstructive apneas and hypopneas. With the treatment of CPAP, patients' groaning index decreased from 32.1±28.1 to 0.1±0.5 events/h (p<0.001), with all the groaning events eliminated in 24 patients.
Conclusions: Catathrenia phenomena are common in patients with OSA, especially in severe male patients. Groaning events are closely related to obstructive respiratory events. Groaning events could be almost completely eliminated under APAP treatment.

The benefits of 4-month CPAP therapy for management of moderate-to-severe sleep-related breathing disorders on the sleep quality, daytime alertness, quality of life, fatigue, and mental health and participation in the community among people with chronic spinal cord injury

J. Furlan[1], S. Hitzig[2], M. Boulos[3]
[1]KITE Research Institute and Lyndhurst Centre, Toronto Rehabilitation Institute, University Health Network; and University of Toronto, Toronto, Canada, [2]St. John's Rehab Research Program, Sunnybrook Research Institute; and University of Toronto, Toronto, Canada, [3]Sunnybrook Health Sciences Centre; and University of Toronto, Toronto, Canada

Introduction: Sleep-related breathing disorders (SRBDs) are common, but under-recognized after spinal cord injury (SCI). Notably, SRBDs can occur in up to 50% of the individuals living with paraplegia, in up to 90% of the individuals living with tetraplegia. Herein, we report preliminary data from an ongoing original study examining the potential benefits of continuous positive airway pressure (CPAP) therapy for 4 months on cognitive function, psychological status, quality of life and participation in the community in people with chronic SCI and moderate-to-severe SRBD.

Participants and methods: This study included adults with chronic SCI who underwent a 4-month trial of CPAP therapy for management of recently diagnosed moderate-to-severe SRBD to date. This research project includes a single-arm clinical trial (NCT04007380) and a qualitative study. Outcome measures for the clinical trial included the Epworth Sleepiness Scale (ESS), Medical Outcomes Study Sleep Scale (MOS-SS), Fatigue Severity Scale (FSS), Depression, Anxiety & Stress Scale-21 (DASS-21), Montreal Cognitive Assessment (MoCA), SF-36, and Craig Handicap Assessment & Reporting Technique (CHART). The participants were also invited for a 1-hour semi-structured interview to share their living experience before and after the trial of CPAP therapy (qualitative analysis). Adherence was defined as the use of CPAP for >4 hours per night on >4 nights of the week.

Results: By June 2023, we screened 33 individuals (10 females and 23 males) with ages between 37 and 79 years (mean age of 58.3 years) who sustained a motor complete (n=15) or incomplete SCI at cervical (n=22) or thoracic levels. Time since SCI varied from 4 to 793 months. The apnea-hypopnea index (AHI) varied from 2.6 to 83.7 events per hour. Of the 33 individuals, 25 participants were diagnosed with moderate-to-severe SRBD and initiated CPAP therapy, and 19 individuals have completed the CPAP trial. Daytime sleepiness and sleep quality, fatigue and quality of life significantly improved with CPAP therapy. There was a trend for improvement of cognitive, mental health and participation scores, but they have not reached significance yet (p=0.079, p=0.207, p=0.221, respectively). All participants confirmed that CPAP therapy had a major beneficial impact on their mental health and cognition in the qualitative study.

Conclusions: Our preliminary results suggest that 4 months of CPAP therapy significantly improves sleep quality, and quality of life, and mitigates daytime sleepiness, fatigue, and anxiety in people with chronic SCI. We anticipate that, by completion of this research project with a larger sample size, the CPAP therapy will be also found to significantly improve cognition, mental health and/or participation of individuals living with SCI.

The difference between hypoxic ventilatory response in highlanders and lowlanders with obstructive sleep apnea

M. Salanitro[1], Z.-M. He[2], X.-S. Dong[3], X.-L. Jiang[2], Q.-L. Zhang[2], P. Da[2], J.-P. Li[2], J. Shi[2], F. Han[3], T. Penzel[1]
[1]Charité-Universitätsmedizin Berlin, Interdisciplinary Sleep Medicine Center, Berlin, Germany,
[2]Karamay Central Hospital, Department of Pulmonary and Critical Care Medicine, Karamay, China,
[3]Peking University People's Hospital, Department of Pulmonary and Critical Care Medicine, Beijing, China

Introduction: Hypoxic ventilatory response (HVR) is when a person experiences heightened ventilation triggered by low oxygen levels, which enables the body to absorb and deliver lower oxygen concentrations at faster rates. This response is initially heightened in lowlanders who venture to high altitudes and then diminishes considerably over time as they acclimatize (Teppema & Dahan A. 2010). Knowing this, could HVR mediate the lung function in patients with obstructive sleep apnea (OSA) who originate from either high or low altitude towns? It is important to note that not only altitude but other factors such as age, gender, severity of OSA, and ethnicity can influence HVR. This study aimed to compare the HVR and lung function of people with and without OSA, who originate from either high-altitude or low-altitude towns. Additionally, this study considered other possible moderating factors of HVR.

Materials and methods: A total of 226 subjects, including those with snoring, were recruited from the Karamay community (altitude 500m). Despite recruitment being in the same area, the total sample immigrated from either sea level (Han) or high altitude (Uygur - 2500m) to Karamay at least 10 years before investigation (71 Han OSA patients, 75 Uygur OSA patients, 28 Han control subjects without OSA, and 52 Uygur control subjects without OSA). Furthermore, patients were matched for age and gender in order to make the groups more comparable. Following this, all patients underwent polysomnography (PSG) and HVR lung function assessment. Parameters including apnea-hypopnea index (AHI), mean arterial oxygen saturation (MSaO2), lowest arterial oxygen saturation (LSaO2), the number of desaturations ≥4% per hour (ODI4), and HVR were calculated. Multiple logistic regression analysis was conducted using a binary outcome for HVR.

Results: Patients with mild OSA from Uygur exhibited weaker HVR compared to Han patients. However, the difference in HVR between individuals from Uygur and Han was not significant in moderate and severe OSA cases. OSA patients from Uygur had higher neck circumference, higher abdominal circumference, higher LSaO2, lower AHI, and lower ODI4 compared to OSA patients from Han. Control subjects without OSA from Uygur exhibited a lower HVR compared to control subjects from Han. HVR was found to be associated with AHI values, sex, and neck circumference while remaining independent of age and BMI.

Conclusions: According to the results of this study, the difference in HVR between this sample only exists in individuals with mild OSA. Additionally, the severity of OSA in the Han people is greater than in the Uygur people, yet the HVR is weaker in the Uygur people. This phenomenon could be explained by environmental and genetic factors between Uygur and Han people such as the differences in growing up in different altitudes, maxillofacial structures (Han people have a small jaw and mandibular retraction compared with Uygur people), and /or different lifestyles (Uygur people prefer meat-based diets including beef and mutton whilst eating a few vegetables) (Rebuck & Campbell. 1974).

The effect of combined hypoglossal nerve stimulation with palatine tonsillectomy on treatment response in obstructive sleep apnea patients with oropharyngeal lateral wall collapse

D. Vena[1], H. Yang[1], J. Sumner[1], A. Aishah[1], T.-Y. Wang[1], N. Calianese[1], L. Gell[1], A. Azarbarzin[1], L. Messineo[1], G. Labarca[1], W.-H. Hu[1], A. Wellman[1], S. Sands[1], P. Huyett[2]
[1]Brigham and Women's Hospital and Harvard Medical School, Medicine, Boston, United States,
[2]Massachusetts Eye and Ear Institute, Otolaryngology, Boston, United States

Introduction: Hypoglossal nerve stimulation (HGNS) treatment is an increasingly popular treatment option for obstructive sleep apnea (OSA) that works by protruding the tongue anteriorly. Given its mechanism of action, HGNS optimally treats patients with anteroposteriorly-directed pharyngeal collapse (e.g., tongue base obstruction) whereas patients with a lateral component to their pharyngeal collapse, i.e. oropharyngeal lateral walls (OLW) collapse, can respond incompletely to the treatment. Treatment options are available that can reduce the severity of the lateral component of collapse, such as tonsillectomy. Thus, when used in combination with HGNS, tonsillectomy may be effective at eliminating the post-HGNS-treatment residual OSA in patients with OLW collapse. Therefore, the current study investigates the effect of concurrent palatine tonsillectomy with implantation of HGNS therapy in patients with OLW collapse.

Methods: Patients with moderate-severe OSA with at least partial OLW collapse and small tonsils (scores 1-2) on drug-induced sleep endoscopy that underwent tonsillectomy with HGNS were prospectively enrolled. Patients with large tonsils (scores 3-4) were excluded as they were ineligible for HGNS implantation. We evaluated the effect of tonsillectomy on HGNS treatment response by comparing patients undergoing HGNS with tonsillectomy against recent historical controls with HGNS alone (and at least partial OLW collapse) using linear regression adjusting for age, sex, BMI, AHI, and OLW collapse severity. Treatment response was defined as percent change in AHI from baseline sleep study to whole-night, post-treatment titration polysomnogram (PSG).

Results: Twenty-four patients have undergone HGNS with tonsillectomy, 13 of whom have completed post-operative titration PSG and are included in the current analysis (AHI: 29.2[21,45.3] /h, age: 59[52.5,65] years, BMI: 31[28,32] kg/m^2, 12 men, %reduction AHI: 87[54,91]). Ten patients had complete OLW collapse and three had partial OLW collapse. The control group consisted of 115 patients (AHI: 30.9[21.5,45.4] /h, age: 59[53,65] years, BMI: 30[27,32] kg/m^2, 89 men, %reduction AHI: 61[28,80]), 90 with partial and 25 with complete OLW collapse. Overall, adjusted regression analysis showed that tonsillectomy was associated with a marked additional reduction in AHI (21[7-33]%reduction, N_{cases}=13/128, p=0.007). The effect of tonsillectomy was strengthened further (28[11-41]%reduction, N_{cases}=10/35, p=0.006) when isolating analysis to the subgroup of patients with complete OLW collapse.

Conclusions: Combining tonsillectomy with HGNS in patients with OLW collapse substantially improves treatment response compared to previous controls with HGNS alone, providing a novel approach to overcoming the poor HGNS efficacy typical in this population. Effects were particularly strong in patients with complete OLW collapse. Our study provides the initial evidence required to justify a randomized trial to confirm these findings.

The effect of orofacial myofunctional therapy with autofeedback in patients with mild or moderate obstructive sleep apnea

A. Köster[1], H. Vaher[1], D. Dobran Hansen[2], U. Tinbod[2], H. Mäkinen[1], H. Hrubos-Strøm,[2], T. Jagomägi[1]
[1]University of Tartu, Faculty of Medicine, Institute of Dentistry, Tartu, Estonia, [2]University of Oslo, Institute of Clinical Medicine, Medical Faculty, Oslo, Norway

Introduction: Airway collapse, which is the most common cause of Obstructive sleep apnea (OSA) is mostly caused by a decrease in tone of weakened oropharyngeal muscles during sleep. Orofacial myofunctional therapy (OMT) is a promising method to decrease the severity of mild to moderate OSA. OMT is based on isotonic and isometric exercises that target oral and oropharyngeal structures with the aim of increasing muscle tone, endurance and coordinated movements of the pharyngeal and peripharyngeal muscles during sleep. Standard OMT treatment requires regular visits to a therapist, which is expensive and inconvenient for the patient. Our Study involves digitalized sleep diaries and web-based therapy, which the patient can fill out/do at home. The aim of this study is to evaluate the effect of the OMT digital exercise program based on the 2009 protocol of Guimaraes et al. Moreover, we aim to identify anatomical and behavioural predictors of OMTa adherence

Materials and methods: The study is a single RCT with blinded outcome evaluation with the intention to analyze the effect of OMT treatment. The groups are randomized to either immediate start with OMT exercises or be allocated to a 3 month waiting list. A pilot study was conducted in Norway (n: 12) to supplement the main RCT intervention study (n: 100, 80 patients in Norway and 20 patients in Estonia).

Results: The pilot study showed that a regular weekly web based therapy session was unnecessary and did not help in motivating some patients. The patients mastered the exercises fast. One exercise of our OMT program was not acceptable for social reasons.

Conclusions: The exercises still need small adjustments done between consultations. The therapist needs to see full sets of exercises because patients can do it differently when tired or unmotivated. The exercise which was deemed unfit was removed from the main RCT study.

The effects of Daridorexant 50 mg on Patients with Comorbid Insomnia Disorder and Untreated Mild Obstructive Sleep Apnea: A Subgroup Post-hoc Analysis of a Phase 3 Clinical Trial

C.J. Lettieri[1,2], D. Léger[3], P.P. Luyet[4], A. Malhotra[5], J.-L. Pépin[6], S.F. Quan[7], P. Saskin[1], O. Briasoulis[4]
[1]Idorsia Pharmaceuticals US Ltd, Radnor, United States, [2]Pulmonary, Critical Care and Sleep Medicine, Department of Medicine, Uniformed Services University, Bethesda, United States, [3]Université Paris Cité- HOTEL-DIEU de Paris APHP-Centre Université Paris Cité, Paris, France, [4]Idorsia Pharmaceuticals Ltd, Allschwil, Switzerland, [5]Division of Pulmonary and Critical Care Medicine, Department of Medicine, University of California, San Diego, United States, [6]Institut National de la Sante et de la Recherche Medicale (INSERM) U 1300, HP2 Laboratory (Hypoxia: Pathophysiology), Grenoble Alpes University, Grenoble, France, [7]Division of Sleep and Circadian Disorders, Department of Medicine, Brigham and Women's Hospital and Division of Sleep Medicine, Harvard Medical School, Boston, United States

Introduction: The prevalence of obstructive sleep apnea (OSA) in patients with insomnia disorder (ID) is ~30%-40%. Whether sleep medications remain effective for ID with comorbid OSA is unclear. Daridorexant 50 mg improved both sleep and daytime functioning in patients with ID.[1] Furthermore, daridorexant did not impair nighttime respiratory function in patients with OSA.[2] This post-hoc analysis investigates the effects of daridorexant in patients with comorbid ID and untreated mild OSA.

Materials and methods: Methods and results from the placebo-controlled Phase 3 trial investigating 3-month daridorexant treatment (25 mg and 50 mg) in adults with ID (DSM-5® criteria) have been published (NCT03545191).[1] Participants with AHI ≥15 events per hour at screening polysomnography (PSG) and those receiving positive airway pressure therapy were excluded from the trial. This analysis evaluates efficacy and safety of daridorexant 50 mg versus placebo, in a subgroup of participants with "mild OSA" (AHI: 5–<15 events per hour) at screening. Endpoints assessed at Month (M) 1 and M3 include PSG measured wake after sleep onset (WASO) and latency to persistent sleep (LPS), as well as Epworth Sleepiness Scale© (ESS©), visual analog scale (VAS) morning sleepiness and treatment-emergent adverse events (TEAEs). Results are reported as mean (SD). P values not adjusted for multiplicity are based on a linear mixed effects model for repeated measures versus placebo. Results for daridorexant 25 mg are not reported.

Results: Of 930 randomized participants with ID, 153(17%) had mild OSA (daridorexant: 50 mg: n=53, 25 mg: n=53; placebo: n=47), 772(83%) had AHI <5 events per hour 'no OSA' (daridorexant: 50 mg: n=256, 25 mg: n=255; placebo: n=261) and 5 had missing AHI. Participants with mild OSA versus no OSA were older (63.8 [11.4] versus 53.7 [15.5] years), had a higher male proportion (39.9% versus 31.6%), a higher BMI (28.4 [4.3] versus 26.1 [4.1] kg/m^2), and longer baseline WASO (114.2 [40.8] versus 95.5 [38.1] min). In participants with ID with mild OSA at baseline, LPS was 64.9 (36.8) min, ESS© was 6.4 (5.2) and VAS morning sleepiness was 42.8 (20.0).

In ID with mild OSA, daridorexant 50 mg versus placebo improved WASO (change from baseline to: M1: -33.3 (39.8) versus -17.3 (40.7) min, p<0.001; M3: -30.6 (48.3) versus -20.4 (48.1) min, p=0.020) and LPS (change from baseline to: M1: -32 (29.1) versus -19 (35.2) min, p=0.067; M3: -37.9 (31.7) versus -16.4 (38) min, p=0.004). ESS© scores remained unchanged from baseline to M1 and M3 for daridorexant 50 mg and placebo. Daridorexant 50 mg reduced morning sleepiness to a greater extent than placebo (change in VAS morning sleepiness from baseline to: M1: 9.7 [16.9] versus 4.9 [17.1]; M3: 15.1 [22.1] versus 12.1 [18.8]). TEAE incidence was 45.3% (daridorexant 50 mg) and 38.3% (placebo). Two participants discontinued study treatment due to AEs (both in placebo). One participant reported somnolence (daridorexant 50 mg).

Conclusions: Daridorexant 50 mg improved sleep among patients with comorbid insomnia and untreated mild OSA with an acceptable safety profile.

The effects of low-dose morphine on sleep and breathlessness in chronic obstructive pulmonary disease: a randomised controlled trial

T. Altree[1,2], A. Pinczel[1], B. Toson[1], K. Loffler[1], A. Hudson[1], D. Currow[3], S. Mukherjee[1,4], P. Catcheside[1], D. Eckert[1]
[1]Flinders University, Adelaide Institute for Sleep Health (FHMRI Sleep Health), Adelaide, Australia, [2]Central Adelaide Local Healthcare Network, The Queen Elizabeth Hospital, Adelaide, Australia, [3]University of Wollongong, Faculty of Science, Medicine and Health, Wollongong, Australia, [4]Southern Adelaide Local Health Network, Flinders Medical Centre, Adelaide, Australia

Introduction: Low-dose, sustained-release morphine is frequently prescribed for chronic breathlessness in chronic obstructive pulmonary disease (COPD). However, efficacy varies between patients and is difficult to predict. Preliminary findings suggest that beneficial effects of low-dose morphine on breathlessness may be mediated, at least in part, by improved sleep. However, the effects of morphine on sleep in COPD have not been objectively investigated. Accordingly, the goal of the current study was to quantify the effects of low-dose morphine on sleep and breathlessness in people with COPD. We hypothesised that low-dose morphine would improve
1) sleep and
2) breathlessness, and the extent of these changes would be related.
Materials and Methods: People with COPD and breathlessness (modified Medical Research Council score ≥2) were enrolled in a double-blind, randomised controlled cross-over trial (ACTRN12621000752864). Those with severe obstructive sleep apnea were excluded. In random order, participants received either 20mg sustained-release morphine each evening for 3 days, or placebo, with a one-week washout period. During each arm, in-laboratory overnight polysomnography with transcutaneous carbon dioxide monitoring ($TcCO_2$) was conducted on night 3 when morphine was expected to have reached steady pharmacokinetic state. "Breathlessness Now" questionnaire scores were assessed before and after sleep at both night 3 visits. Sleep-disordered breathing endotypes were assessed using a validated polysomnogram signal processing methodology. Next morning driving performance using the AusEd driving simulator assessed morphine-related driving risks.
Results: Twenty-two participants were recruited and nineteen (mean±SD age 71±7 years, 46% women) completed the study protocol. Baseline forced expiratory volume in 1 second was 65±2% predicted. Sleep efficiency was not different between placebo and morphine conditions (66±17 vs. 67±19%, p=0.89). Morphine significantly reduced the proportion of REM sleep compared to placebo (12±7 vs. 19±10%, p<0.01) and increased the proportion of N2 sleep (49±17 vs. 42±12%, p=0.02). Morphine did not improve current breathlessness or worst breathlessness in the past 24 hours. Asleep mean and nadir oxygen saturations were significantly lower on morphine compared to placebo (89±4% vs. 92±4%, p<0.01 and 79±11 vs. 84±7%, p<0.01 respectively). Oxygen desaturation index and apnea hypopnea index were unchanged. Asleep mean and peak $TcCO_2$ levels were higher on morphine compared to placebo (50±7mmHg vs. 47±5mmHg, p<0.01 and 55±9mmHg vs 50±6mmHg, p<0.01 respectively). Endotypes and driving simulator performance were similar between arms.
Conclusions: Low-dose sustained-release morphine did not improve sleep efficiency or breathlessness. Sleep architecture was altered, with reduced REM and increased N2 sleep. Morphine did not worsen sleep-disordered breathing, but oxygen saturation and ventilation were reduced during sleep, which could be harmful. These effects need to be considered by clinicians prescribing regular, low-dose, sustained-release morphine for chronic breathlessness.

The effects of orofacial myofunctional therapy in the treatment of OSA in older adults: a Colombian clinical experience

F. Arboleda[1], V. Ieto[2], A. Granados[3], B.P. Pareja[4]
[1]Fenix Centro Medico de Especialistas, Medellin, Colombia, [2]Vanessa Ieto Fonoaudiologia do Sono, São Paulo, Brazil, [3]Hospital Alma Mater de Antioquia, Medellin, Colombia, [4]Clínica Vanguardia, Medellin, Colombia

Introduction: Obstructive sleep apnea (OSA) affects a quarter of older adults, strongly impairing their quality of life and general health, and its comorbidity has been demonstrated with many metabolic disorders and age-associated risk factors, developing upper airways obstruction. Orofacial Myofunctional Therapy (OMT) emerges as a complementary treatment in the approach to OSA, facilitating better airway patency in the patient and improving quality of life.

Materials and Methods: The objective of this research is to verify the effects of OMT in older adults in anthropometric variables, sleep, and orofacial myofunctional evaluation. Methodology: 25 diagnosed patients were evaluated, some with type I PSG and others with type III PSG, referred from sleep centers in the city of Medellín, with orofacial myofunctional evaluation protocols from the speech-language therapists (SLT) from Brazil group. The Epworth Sleepiness Scales (ESS) and the Berlin Scale (BS) were applied before and after treatment.

Results: The age range was from 60 to 78 years, of which 68% (17) were women and 32% (8) men, with a mild degree of OSA: 56% (14), moderate 36% (9), and severe 8% (2). Regarding the oropharyngeal variables, which were the object of attention for the orofacial myofunctional evaluation, an improvement in the strengthening of the lips was found, initially 25% presented a lack of strength and at the end of the treatment 25% presented an adequate strength of said lip muscles, with improvement in suction and fluid leakage during swallowing. An adequate relationship was also found between the tongue and the soft palate, expanding the airway space, and in terms of chewing characteristics, it was found in the pre-treatment evaluation that 95% had unilateral chronic chewing and 4% bilateral. Post- treatment changed the majority to bilateral alternate chewing, as a result of strengthening these muscle groups. The SES scores obtained significant differences from 10.9 to 5.5, the neck circumference also decreased, going from a mean measurement of 37.6 cm to 36.8 cm. Snoring intensity also decreased as the annoyance to others.

Conclusions: OMT was effective for the management of OSA in older adults, improving aspects of orofacial myofunctional evaluation, decreasing excessive daytime sleepiness and snoring.

Acknowledgements: We thank the patients participating in the study.

The effects of rapid maxillary expansion on persistent pediatric snoring post-tonsillectomy

R. Bariani[1], R. Bigliazzi[2], T. Moura Guimarães[1], S. Tufik[1], M. Andersen[1], G. Moreira[1], R. Raimundo Fujita[3]
[1]Universidade Federal de São Paulo, Psicobiologia, São Paulo, Brazil, [2]Orthodontics, São Paulo, Brazil, [3]Universidade Federal de São Paulo, Otorrinolaringologia e Cirurgia da Cabeça e Pescoço, São Paulo, Brazil

Introduction: Studies to evaluate treatment alternatives in children with refractory sleep-disordered breathing (SDB) to adenotonsillectomy are scarce. Rapid maxillary expansion (RME) may represent a treatment option for children with SDB and craniofacial anomalies or for whom adenotonsillectomy or other treatment modalities have failed or when surgery is contraindicated. **Objective:** To evaluate the short-term influence of rapid maxillary expansion on the quality of life in children with persistent snoring after late adenotonsillectomy 2 years or more.

Materials and Methods: Prospective clinical trial study using rapid maxillary expansion therapy. Participant inclusion criteria were children aged 5 to 12 years who had adenotonsillectomy but whose parents/guardians reported that they still snore ≥4 nights per week, have maxillary atresia and Obstructive Apnea- Hypopnea Index (OAHI)> 1. Twenty four children with sleep-disordered breathing, including 13 patients with primary snoring only and 11 patients with snoring and obstructive sleep apnea before and after 6 months of RME participated in this study. All patients underwent nasopharyngoscopy and complete polysomnography, and the Quality of Life Questionnaire (OSA-18), Pediatric Sleep Questionnaire (PSQ). Brazilian Registry of Clinical Trials (ReBEC): number RBR-463byn.

Results: OSA-18 domain total scores significantly reduced in both groups (intragroup difference). In the evaluation of snoring, there was a reduction due to the treatment effect in both groups but more significant in the OSA group.

Conclusions: Our study demonstrates the potential benefit of evaluating and treating children with residual snoring. ERM may be an alternative treatment that improves children's snoring and quality of life with refractory SDB after adenotonsillectomy, suggesting a multidisciplinary approach for treating sleep disorders in children.

The evaluation of a revolutionary custom-made oral appliance design on effectiveness, efficacy and compliance

J. Ojile[1], M. Uhles[1], K. Postol[2], J. Lillenberg[3], S. Alisic[1], A. Gonzalez[1]
[1]Clayton Sleep Institute, St. Louis, United States, [2]Sleep Disorder Dentistry, St. Louis, United States, [3]Sleep Well St. Louis, St. Louis, United States

Introduction: Evaluate the clinical effectiveness of the SomnoDent Avant with Bflex technology, a custom-made oral appliance therapy (OAT) device in the treatment of mild/moderate Obstructive Sleep Apnea (OSA) for naïve and PAP non-compliant patients. The hypothesis for the study was that the unique strap mechanism design of the appliance encouraged mouth closure and nasal breathing, and would have high levels of effectiveness, particularly for supine sleepers. The evaluation of the initial fit of the device as well as the patient's and bed partner's acceptance was also investigated.

Materials and methods: Prospective 90 day trial, participants age ≥ 18 with AHI of ≥10 to ≤30 events/hr. confirmed by using a WatchPAT, Home Sleep Apnea Testing (HSAT) device at baseline. The initial advancement of the lower jaw was 60%. Treatment effectiveness is derived from two endpoints: efficacy and compliance. The efficacy of the OAT is defined as the change from baseline in AHI, based on one and three-month HSAT. Efficacy was measured in supine, lateral and prone positions. Compliance data was obtained from the Dentitrac (BRAEBON Medical Corporation) chip embedded in the SomnoDent Avant device looking at usage for at least 4 hours per night for at least 5 out of 7 nights a week.

Results: Preliminary data from 50 participants (66% male, 35% female), age: 52.3 ± 11.8 yrs., BMI: 31.1. A statistically significant 3-month trend change from baseline AHI -11.0 ± 7 (37/37), Average usage:7.0hrs/night, ESS: 3-month change from baseline -3.3 ± 4.0 (80.0% improvement), FOSQ 10: 1.7 ± 2.2 (76.7% improvement). The adequate (first-time) fit of the device upon initial insertion was 89.3%, bed partner sleep improvement was 83.3%, and 88.9% would recommend the use of the Avant OAT device.

Conclusions:
• SomnoDent Avant demonstrated high effectiveness in the treatment of OSA, particularly with supine dependent OSA participants. The unique design of the Avant strap likely acts to close the patient's mouth, encouraging nasal breathing
• Statistical improvement in the quality of life
• Optimum first-time fit
• Improvement in bed partner quality of sleep

The Functional Jaw Orthopedics effect in preventing Sleep-Related Breathing Disorders: case series

D. Barbosa[1], A. Machado-Júnior[1]
[1]State University of Campinas (UNICAMP), Medical School of Science, Campinas, Brazil

Introduction: The mouth is a peripheral projection of the central nervous system that provides somatosensory sensitivity and motor activity, according to the functional importance of the biology of each species. Vicious habits produce proprioceptive and exteroceptive stimuli in the orofacial area, leading to neuromuscular compensation and the development of inadequate functional patterns, resulting in anatomical and functional alterations and imbalances. Functional Jaw Orthopedics (FJO) acts on mandibular dynamics, muscles, face, and bones, restoring adequate functional patterns. The therapeutic stimuli provided by functional orthopedic appliances aim to guide the growth and development of oral structures, seeking to restore the balance of stomatognathic functions. Sleep-related breathing disorders (SRBD), such as snoring and obstructive sleep apnea (OSA), are changes in the functions performed by the mouth, directly interfering with breathing and leading to cardiovascular and neuropsychological changes with profound socioeconomic implications. The disease diagnosis must be made as early as possible, as a child who breathes through the mouth can become a future apneic adult if not diagnosed and treated preventively. The study aims to present the effect of FJO on the stimuli used in genetic and epigenetic factors for preventing and treating snoring and OSA.

Materials and Methods: A case series study was carried out using three medical records from the DFB & Associados Ltda clinic of three patients. Two male brothers, aged 5 and 9, complained of bruxism, snoring, respiratory allergies, and mouth breathing problems. In clinical examination, dental class II, overbite and overjet. The patients were treated with FJO and Planas direct tracks based on Neuro Occlusal Rehabilitation for approximately eight years. The third patient, a 47-year-old children's father, complained of snoring and severe OSA. After the refusal of CPAP treatment, the use of a mandibular advancement device (MAD) was recommended. This patient was treated for three years.

Results: In children, after eight years of FJO treatment and after more than ten years of follow-up without treatment, improvements were observed in dental occlusion, increased posterior air space, normalization of nasal breathing, remission of snoring and bruxism, in addition to morpho-functional stability provided by the treatment. The father, who used MAD for three years, experienced restorative sleep and improved energy levels, reducing alcohol and anxiolytic consumption. However, during follow-up, the patient discontinued the OSA treatment and opted for orthodontic treatment with another professional. Subsequently, the patient underwent septal surgery, suffered a hemorrhagic stroke, and died at 52 in 2013.

Conclusions: This case study highlights the efficacy of FJO in restoring oral functions, treating SRBD, and promoting development and balance from childhood to adulthood. It emphasizes the need for continuous OSA treatment in adults, as it can have severe consequences, including death. The study also reports the effectiveness of FJO in preventing SRBD in children who may develop apneic conditions as adults, underscoring the importance of ongoing OSA treatment.

Acknowledgments: To the Family for allowing us the presentation of case reports.

The impact of sleep disruption in patients with chronic rhinosinusitis with nasal polyps using immunological therapy: a systemic review

D.P. Migueis[1], M.C. Lopes[2], A.L.d.S. Pinto[1], R. Pezato[3]
[1]Fluminense Federal University, Niteroi, Rio de Janeiro, Brazil, [2]University of São Paulo, Child and Adolescent Affective Disorder Program (PRATA), Department and Institute of Psychiatry at University of Sao Paulo Medical School, São Paulo, Brazil, [3]Federal University of São Paulo, ENT Research Lab, Department of Otorhinolaryngology-Head and Neck Surgery, Sao Paulo, Brazil

Introduction: Chronic rhinosinusitis with nasal polyps (CRSwNP) is an inflammatory disease that leads to nasal obstruction, mouth breathing, and increased airway resistance, contributing to flow limitation, and upper airway resistance syndrome. Sleep disordered breathing has been associated with stress oxidative and inflammation due to intermittent hypoxia and proinflammatory cytokines release.

CRSwNP has multiple endophenotypes and the interleukins 4, 5, 13, as well as IgE, have a crucial role in the T helper (Th) cells that provide helper functions to other cells of the immune system, particularly Th2 inflammation process in these patients. Dupilumab is a human monoclonal antibody that blocks the shared receptor for IL-4 and IL-13, promoting a downregulation of the molecular pathways in inflammatory diseases. Our aim is to raise a concern about the impact of CRSwNP and immunological therapy on sleep using Dupilumab treatment.

Materials and Methods: A literature search was performed in PubMed, Cochrane Trials, and SciELO databases, according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement guidelines by two independent authors. Dupilumab was the first immunobiological approved for CRSwNP in the United States, Europe, and Brazil.

Results: Eighteen longitudinal trials using Dupilumab were selected. They found a significant improvement in the mucous, anosmia, and other nasal symptoms according to validated tools. The tomographic and endoscopic evaluation registered a decrease in the volume of the nasal polyp, preventing recurrence during therapy, which seems to be safe with few adverse effects.

Only two studies reported sleep aspects of participants with CRSwNP. Both presented baseline 22-item sino-nasal outcome test (SNOT-22) scores whose the nasal symptoms domain had the highest mean score followed by the sleep dysfunction domain. A randomized clinical trial accessed participants with severe CRSwNP after 24 and 52 weeks of Dupilumab use. It revealed significant improvement in a disease-specific health-related quality of life, SNOT-22 total, domain (Nasal, Sleep, Function, Emotion, and Ear/facial), and 22-item scores at week 24 than the placebo group (all $p<0.0001$), with continued improvements to week 52. Besides, there was a clinical improvement after Dupilumab therapy on SNOT-22 scores in a retrospective cohort in a real-world setting.

Conclusions: CRSwNP impacts the quality of life, but the sleep evaluation was limited to the sleep or fatigue domains of SNOT-22. Mucosal inflammation of CRSwNP may cause sleep fragmentation due to nasal symptoms, such as nasal congestion, postnasal drainage, and nocturnal cough, but it is relevant to access aspects of neuroimmune signaling by CRS inflammatory cytokines. Endoscopic sinus surgery promotes sleep quality and decreases corticosteroid use, but many cases with recurrence of eosinophilic polyps may benefit from immunobiological therapy anti-IL-4 and anti-IL-13 with Dupilumab. Further studies should perform sleep questionnaires or polysomnography comparing baseline and post-immunobiological therapy in CRSwNP individuals, considering endophenotype measures.

The impact of Takayasu arteritis on diagnosis and treatment of sleep apnea

M. Medrado[1], C. Daltro[2], T. Iglesias[3], E. Iglesias[4]
[1]Centro Especializado em Pneumologia e Medicina do Sono, Salvador, Brazil, [2]Universidade Federal da Bahia, Programa de Pós Graduação em Medicina E Saúde, Salvador, Brazil, [3]Universidade Federal de Sao Paulo, Programa de Psicobiologia, Sao Paulo, Brazil, [4]Hospital Universitario Professor Edgard Santos, Salvador, Brazil

Introduction: Takayasu arteritis is a large-vessel vasculitis that affects aorta and its primary branches. It is characterized by an inflammatory process in the vascular wall leading to variety of symptoms by the narrowing, occlusion, or dilation of the arteries. One of the consequences of vascular stenosis is the reduction of blood supply with reduction of pulses and consequent limb ischemia. This disease is more predominant in women starting between 10-40 years. The most common vessel affected is the left subclavian artery, but can also affect the aorta, right subclavian, brachiocephalic, carotids and vertebral arteries. This study assessed the impact of the stenosis of subclavian artery, secondary to TA, on peripheral oximetry.

Case report: Female, 66 years old, complaining of difficulty maintaining sleep for 8 years, associated with sleep fragmentation due to nocturia, non-restorative sleep, daytime sleepiness, and daily snoring. The patient has diagnosis of Obesity, Systemic Arterial Hypertension, Fibromyalgia, Cronh's Disease and Takayasu Arteritis. Doppler ultrasonography showed diffuse thickening of the intima-media complex suggestive of arteritis, significant stenosis of the right common carotid artery and critical stenosis of the right axillary subclavian artery, diffuse and intense thickening of the arterial walls involving the brachiocephalic, right common carotid and right axillary-subclavian arteries. On physical examination, she had blood pressure of 120 x 70 mmHg, BMI: 34 kg/m^2. SpO$_2$ on the right arm: 96% and SpO$_2$ in the left arm: 99%. Faced with the asymmetric vascular condition between the upper limbs, a type 1 polysomnography with an oximeter on the right index finger was performed and, simultaneously, a type 4 polygraphy on the left index finger.

Results: Baseline polysomnography: AHI: 30 ev/h, minimum SpO$_2$: 78%, remaining 52% of the total sleep time with SpO$_2$ below 90%. Polygraphy: ODI: 49.6 ev/h, minimum SpO$_2$: 79%, with 28% of the total recording time remaining with saturation below 90%. In view of the confirmed diagnosis of Obstructive Sleep Apnea, CPAP terapy with therapeutic pressure of 13 cmH$_2$O was initiated and a new test during treatment was performed, once again keeping the polysomnography with an oximeter on the right index finger and type 4 polygraphy on the left index finger. Polysomnography with CPAP: AHI: 0.3 ev/h, SpO$_2$ min: 68%, remaining 26% of the total sleep time with SpO$_2$ below of 90%; polygraphy with CPAP: ODI: 9 ev/h, minimum SpO$_2$: 72%, remaining 1% of the total recording time with saturation below 90%.

Conclusion: This case showed the variability of oxyhemoglobin saturation indices in a patient with Takayasu's arteritis using different methods for detection of Obstructive Sleep Apnea and the importance of personalized monitoring for an accurate diagnosis and, consequently, a proper treatment plan for individuals with this condition.

Key words: Takayasu arteritis, Obstructive sleep apnea, Oxyhemoglobin saturation.

The importance of Systemic Immune Inflammation Index (SII) in patients with Obstructive Sleep Apnea syndrome

A. Mammadova[1], Z. Yalçinkaya[2], O. Köktürk[1]
[1]Gazi University School of Medicine, Department of Pulmonary Disease, Ankara, Turkey,
[2]Afyonkarahisar Center Community Health Center, Afyon, Turkey

Introduction: Systemic immune inflammation index (SII); It is a new generation inflammation marker created with whole blood parameters, reflecting the body's comprehensive immune status. Obstructive sleep apnea syndrome (OSAS) is a disease with both local and systemic inflammation. To detect changes in inflammation markers in these cases; may help us predict the severity of sleep-disordered breathing, associated systemic inflammation, and the presence of comorbidities. In this study, we aimed to investigate the importance of SII in cases diagnosed with OSAS.

Materials and Methods: He applied to our sleep center between January 2017 and July 2022 with complaints of snoring, witnessed apnea, and excessive daytime sleepiness; The cases who underwent polysomnography (PSG) and complete blood count were scanned retrospectively. Platelet x neutrophil / lymphocyte ratio in complete blood count values was defined as SII. PSG findings (age, gender, body mass index (BMI), apnea-hypopnea index (AHI), mean oxygen saturation) were compared with SII in 126 subjects who met the eligibility criteria for the study. The cases were divided into 4 groups according to the AHI value; AHI <5, 5-14, 15-29 and ≥30 were grouped as simple snoring, mild, moderate and severe OSAS, respectively. ROC analysis was used to determine whether the SII value has a diagnostic value for OSAS and whether it can be used for this purpose. Statistical significance level was accepted as $p<0.05$.

Results: A total of 126 cases, 78 (61.9%) male and 48 (38.1%) female, were included in the study. A total of 92 cases were found to have additional disease. The most common diseases were hypertension in 57 cases, diabetes mellitus in 35 cases, and coronary artery disease in 13 cases. The mean AHI value of all cases was 30.48±2.51 and the mean arterial O_2 saturation (SpO_2) was 89.99±0.74%. In the correlation analysis, it was observed that as the percentage of SpO_2 below 90% in total sleep duration increased, SII increased statistically ($p<0.05$, $r=0.185$). When the mean SII values of the OSAS groups were examined, a statistically significant relationship was found between the AHI value and the mean SII value. In the correlation analysis, it was determined that the SII value increased as the AHI value increased ($p<0.001$, $r=0.347$). SII in cases with OSAS; When the cut-off value was taken as 492.34, it was found to be 74.5% sensitive and 64.0% specific in predicting severe OSAS cases with AHI≥30 ($p<0.001$, AUC=0.722).

Conclusions: A statistically significant correlation was found between SII and OSAS severity. Since SII can be easily calculated from the parameters found in routine blood analysis, it was concluded that it can be used as a simple and inexpensive biomarker to reveal the chronic systemic inflammation observed in OSAS cases.

Keywords: Systemic immune inflammation index, Obstructive sleep apnea syndrome, Apnea-hypopnea index, Systemic inflammation, Polysomnography

Acknowledgements: There is no acknowledgement

The influence of ethnic background on altitude-induced central sleep apnea

G. Heiniger[1], T. Imler[1], A. Waeber[1], K. Lambercy[2], B. Bradley[1], G. Lecciso[1], F. Degache[3], R. Heinzer[1]
[1]Center for Investigation and Research in Sleep. University Hospital of Lausanne, Lausanne, Switzerland, [2]Head and Neck Surgery Department, Centre Hospitalier Universitaire Vaudois, Lausanne, Switzerland, [3]Institute of Sport Sciences University of Lausanne (ISSUL), University of Lausanne, Lausanne, Switzerland

Introduction: High-altitude-induced hypoxia leads to the occurrence of central sleep apnea (CSA) in otherwise healthy individuals without respiratory disorders at lower altitudes. However, the onset of altitude-induced CSA vary among individuals and may be attributed to genetic differences in respiratory control during sleep.

The remarkable hypoxia tolerance observed in Tibetans has been associated with specific genes and could potentially be protective against CSA. This study aims to investigate whether there are disparities in the propensity to develop high-altitude-induced CSA between Caucasian and Tibetan subjects residing in Switzerland.

Materials and Methods: Twenty nine healthy subjects living at low altitude were included in the study: 20 Caucasians subjects were compared to 9 Tibetans subjects living in Switzerland (all males, median-{IQR} age: 25 (23.5-26) vs 28 (27-32), median-(IQR) BMI: 22.1 (21.2-23.1) vs 23.8 (23.1-28) respectively). Each participant underwent 2 complete polysomnographic recordings, one at home at low altitude and one in a hypoxic chamber simulating an altitude of 3,500 meters (FiO_2: 13%). This enabled us to calculate mean blood oxygen saturation (SpO_2) during the sleep period, the oxygen desaturation index (ODI), the apnea-hypopnea index (AHI) and the percentage of sleep spent in periodic breathing (PB). The difference in AHI between high and low altitudes was then calculated and compared between ethnic groups using non-parametric tests.

Results: Compared with Caucasians, Tibetans had a smaller increase in AHI at simulated high-altitude (median {IQR}: +41.90/h {+8.60; +58.7.20}/h vs +81.1/h {+29.12; +119.92}/h, $p<0.024$) and a lower tendency to develop PB (27.7% {5.2-42.1}% vs 63.4% {10.1-87.2}%, $p=0.045$).

At High-altitude, despite a lower ODI in the Tibetans (mean+-SD 57.3+-27.8/h vs 96.9+-54.6/h, $p<0.016$), mean SpO_2 was not different between the two groups during the night (median{IQR}: 69.7{66.7-71.7}% vs 70.3{66.1-74.1}%, $p=0.76$).

Conclusions: Despite comparable acclimatization with both groups living at low altitude, Tibetan subjects demonstrated a reduced propensity to develop CSA during sleep at high-altitude. Although Tibetan subjects have a lower ODI, their mean SpO_2 was comparable to that of Caucasian subjects. This suggests that a genetic adaptation to hypoxia may confer protection against hypoxia-induced CSA in Tibetans.

Acknowledgements: The authors would like to thank the MotionLab Institute for Sports Therapy and Performance (Le Mont-sur-Lausanne, Switzerland) for their collaboration.

The prevalence of Obstructive Sleep Apnea in Gestational Hypertension: a systematic review

B. Cunha[1], C. Medina[1], C. Salles[2], M. Gusmão[3]
[1]Bahiana School of Medicine and Public Health (EBMSP), International Center of Clinical Sleep Medicine and Research, Salvador, Brazil, [2]Bahiana School of Medicine and Public Health (EBMSP), Federal University of Bahia, Jorge Amado University Center, International Center of Clinical Sleep Medicine and Research, University Hospital Professor Edgar Santos, Salvador, Brazil, [3]Bahiana School of Medicine and Public Health (EBMSP), Salvador, Brazil

Introduction: Gestational hypertension (GH) is the second leading cause of maternal mortality; it is estimated that at least 10% of pregnant women are affected by it. Furthermore, the occurrence of hypertension during pregnancy is associated with prematurity, low birth weight, and infants small for gestational age. Obstructive sleep apnea (OSA) is part of the group of Sleep-Related Breathing Disorders (SRBD). The presence of OSA impairs blood pressure regulation and is more prevalent in individuals with hypertension, acting as a predisposing factor for the development of this condition. Thus, OSA is often an unrecognized factor in hypertension in pregnant women. In this regard, the diagnosis and treatment of OSA in pregnant women can help control blood pressure and reduce the incidence of maternal and fetal complications and risks, necessitating recognition of the prevalence of these two conditions during pregnancy. The objective of this study is to evaluate the prevalence of Obstructive Sleep Apnea in Gestational Hypertension.
Materials and Methods: This study is a systematic review, for which a search was conducted in the PubMed Central database using the descriptors: "pregnant women"; "obstructive sleep apnoea"; "gestational hypertension". Cohort or cross-sectional studies evaluating the prevalence of obstructive sleep apnea in gestational hypertension were included. Review studies, abstracts, conference proceedings, studies involving pregnant women with other sleep disorders, and studies involving pregnant women with a pre-existing diagnosis of hypertension before pregnancy were excluded.
Results: From the studies retrieved through electronic database searches and manual searches, initially, 2,576 studies were found, of which 3 met the inclusion criteria for inclusion in the systematic review. Bin et al. 2016 analyzed a cohort study based on 636,227 hospital records of pregnant women, of whom 55,178 developed GH, and concluded that the incidence of GH was 19.7% in pregnant women with OSA, compared to 8.7% in those without OSA. Reid et al. 2011 conducted a cross-sectional study with 8,651 deliveries, in which 422 of the pregnant women were diagnosed with GH, and concluded that the prevalence of OSA was five times higher in pregnant women with GH compared to normotensive women. Champagne et al. 2009 conducted a case-control study with a group of 135 hypertensive pregnant women and 150 normotensive pregnant women, classifying GH as -systolic blood pressure (SBP) > 90 mmHg measured on two occasions at least 4 hours apart in previously normotensive pregnant women. The authors concluded that the prevalence of OSA in the group of women with GH was 82%, compared to 45% in the normotensive pregnant women group.
Conclusions: Based on the studies analyzed in this systematic review, it can be concluded that there is strong evidence that the prevalence of OSA is higher in pregnant women with GH compared to normotensive pregnant women. In this sense, it is evident that OSA may function as a modulating factor of blood pressure and contribute to its increase in pregnant women.

Therapeutic decision-making in a virtual sleep apnea diagnostic workflow using a peripheral arterial tonometry-based home sleep testing device

M. Azpiazu[1,2], E. Ordax[1,2], A. Alvarez[1,2], S. Delis[1,2], C. Pia[1,2], C.J. Egea[1,2]
[1]Bioaraba, Neurosciences-Sleep Disorders, Vitoria-Gasteiz, Spain, [2]Osakidetza Basque Health Service, Araba University Hospital, Sleep Unit, Vitoria-Gasteiz, Spain

Introduction: Obstructive sleep apnea (OSA) is a chronic, life-threatening, prevalent, and undiagnosed sleep breathing disorder, with a high economic impact. More than 21,000 middle-aged adults from our area (Araba, Spain) are unaware that they suffer from treatable OSA.
To streamline access to therapy, we can simplify diagnosis by using home sleep tests, wearable technologies, and new virtual workflows. Sleep wearables are non-invasive, easy-to-use medical devices, which provide multi-night, and reliable OSA automatic diagnosis. Its inclusion in OSA diagnostic workflows should be a cost-effective measure in terms of time and money.
NightOwl™ by Ectosense is an FDA-cleared, CE-marked, validated, self-contained, disposable device with a capacity for ten sleep night tests. It consists of a small fingertip sensor that collects accelerometer and photoplethysmographic data and a cloud-based analytics software. A probabilistic model determines whether the co-occurrence of oxygen desaturation, digital vasoconstriction (peripheral arterial tonometry) and increased pulse rate events constitutes a respiratory event, to assess for OSA.
Our goal is to evaluate the feasibility of NightOwl™ in real clinical practice for therapeutic decision-making (TDM) in suspected OSA patients.
Materials and methods: Observational, prospective, single-center study in adults (20-70 years) with suspected OSA due to medium-high probability in STOP-Bang questionnaire (scoring at least 3), without any other comorbid sleep disorder and with technological skills. Written instructions were emailed to the patient with the activation code to perform the study. Each device was scheduled for 3–5 sleep tests, and the diagnostic process was considered valid with a minimum of two successful tests (4+ hours per test).
The TDM followed our own Apnea Virtual Lab algorithm (a compendium of current guidelines), based on the highest AHI3% value of the successful tests. A false negative was considered if the AHI3% was below 5 in a symptomatic patient or if the AHI3% was between 5-15 in a patient at risk.
Results: A total of 41 patients completed the study (66% men, 48.2 years old, STOP-Bang score: 4.2, AHI3%: 29.4). Sixty-six percent reported antisocial snoring, 27% daytime sleepiness/fatigue, 2% cardiovascular morbidity, 24% two or more cardiometabolic risk factors and 7% high-risk occupations. OSA prevalence (AHI3% at least 5) was 88%, and moderate-severe OSA (AHI3% at least 15) was 59%.
A total of 169 sleep nights tests were performed but only 65% were successful. Unsuccessful tests were usually due to technical issues (battery, Bluetooth connection, app) or user misuse.
Nevertheless, a total of 32 patients (78%) had a valid diagnostic process for TDM, 6 patients had an invalid one, and only 3 patients were considered false negative (7% of all patients).
We considered positive pressure therapy for 17 patients (53%) and MAD for 5 patients.
Conclusions: Our data suggest that the inclusion of NightOwl™ in our virtual OSA diagnostic workflow could be an attractive measure providing an automatic, remote and rapid diagnosis for TDM in 8 out of 10 suspected OSA patients, without the need for a further next-level home sleep test.
Acknowledgements: We are grateful to ResMed for providing the NightOwl™ devices for this real-life study.

Therapeutic outcome when shifting from long-term fixed-pressure CPAP to auto-adjusting CPAP

L. Rosenthal[1], R. Aguilar Roblero[2]
[1]Sleep Medicine Associates of Texas, Dallas, United States, [2]Universidad Nacional Autónoma de México, Division de Neurociencias, Instituto de Fisiología Celular, Coyoacán, Mexico

Introduction: The available guidelines recommend the use of CPAP or APAP for ongoing treatment of OSA in adults. While Auto-Adjusting CPAP (Auto) provides therapeutic effectiveness at a lower mean pressure, outcome studies have not provided clear therapeutic advantages when compared to fixed-pressure CPAP (FP). The purpose of this study is to evaluate therapeutic adherence and effectiveness of OSA patients shifting from long term use of FP to Auto.

Materials and methods: Consecutive OSA patients treated with FP who were evaluated following the 2021 FDA-mandated recall are included. Eligible patients were those treated with a recall FP-CPAP who had been in therapy for $\geq$ 6 months, were able to receive a replacement (either through the manufacturer or through a prescription for replacement) and were seen in follow-up to assess clinical progress with the new CPAP. At T1, patients with the recall unit were evaluated, informed of the manufacturer's replacement program, and were offered Rx for CPAP replacement. Those patients who elected to get Rx for new equipment, were prescribed Auto at the settings determined by the clinician (LR) based on the clinical evaluation at T1 (or were maintained on FP if patients declined Auto). Once the equipment was replaced, patients were seen in follow-up at T2 at an interval of 12 to 180 days ($\bar{x}$= 73$\pm$49).

Results: A total of 109 patients were evaluated. Thirty patients (6 F, 24 M, age 61$\pm$13, Dx AHI 37$\pm$33, BMI: 33$\pm$9) continued FP at T2 (all through the manufacturer replacement) and 79 (27 F, 52 M, age 62$\pm$11, AHI$\pm$41+27, BMI: 34$\pm$7) shifted to Auto (5 from the replacement program, 74 from the other available lead brand in the USA); the groups were comparable at Dx. Therapeutic adherence and effectiveness were comparable at *T1* (*FP*: pressure 9$\pm$3 cwp, use/nights 436$\pm$75 minutes, period 149$\pm$51 days with 4-hr adherence at 92$\pm$15%; AHI 3$\pm$2, ESS 4$\pm$3. *Auto*: pressure 9$\pm$2 cwp, use/nights 420$\pm$91 minutes, period 146$\pm$56 days with 4-hr adherence at 88$\pm$18%; AHI 3$\pm$2, ESS 4$\pm$3. At *T2*, the period/days follow-up was shorter but not different for the groups (66$\pm$47 and 75$\pm$49 days and 4-hr adherence 90$\pm$13% and 93$\pm$11% respectively) as were their T2 ESS scores (FP-CPAP 5$\pm$4, Auto-CPAP 4$\pm$3). At *T2*, significant differences were noted on the level of adherence (T2-T1: FP: -2$\pm$11, Auto: 18$\pm$51 minutes; p<.05), and AHI at (T2-T1: FP 1$\pm$4, Auto -1$\pm$2: p<.01). The pressure for the FP groups was comparable (9$\pm$3 cwp) while the Auto group showed significant differences for the low, 90-95%, and maximum pressures (8$\pm$2, 11$\pm$2 and 12$\pm$3 cwp; all p<.01).

Conclusions: The study showed continued adherence and effectiveness of PAP therapy among a cohort of patients who experienced the 2021 recall. Shifting to Auto-CPAP provided for some additional therapeutic benefit, which was likely due to the use of pressure settings based on clinical assessment instead of default settings.

The role of AMPK in mitophageal disturbances during the process of chronic intermittent hypoxia inducing genioglossal dysfunction

W. Wang[1], X. Weng[2], X. Zhang[3]
[1]The Second Affiliated Hospital of Nanjing Medical University, Department of Pulmonary and Critical Care Medicine, Nanjing, China, [2]The Second Affiliated Hospital of Nanjing Medical University, Nanjing, China, [3]The First Affiliated Hospital of Nanjing Medical University, Nanjing, China

Introduction: Among the multiple pathogenesis of obstructive sleep apnea (OSA), the essential one is oxidative stress characterized by chronic intermittent hypoxia (CIH), with a pathogenesis akin to ischemia/reperfusion injuries. Mitophagy is an important mechanism to extenuate mitochondrial impairment resulting from hypoxia and avoid cell apoptosis consequently. Dysfunction of the genioglossus muscle is important in the pathogenesis of OSA. Our past study has revealed that disturbances of genioglossal mitophagy could be associated with damaged mitochondrial structure, impaired mitochondrial function and decreased genioglossus contractile properties in rats induced by CIH, which can be attenuated by adiponectin(Ad). However, neither the pathway nor the involved factors were clear. This study was designed to explore the role of AMPK in genioglossal mitophagy affected by CIH.

Materials and methods: The dominant negative AMPK(DN-AMPK) rats were treated with adenovirus transfection. 50 male SD rats were randomly divided into 5 groups: a normal control (NC) group, CIH group, CIH+Ad group, CIH+DN-AMPK group and CIH+Ad+DN-AMPK group, with 10 rats in each group observed for 5 weeks. At the end of 5 weeks, all rats were evaluated for comparison of serum Ad levels, contractile function of the genioglossus, mitochondrial structure and function, mitophagy and cell apoptosis in the genioglossus. Statistical analyses were performed using SPSS; differences among groups were compared using one-way analysis of variance (ANOVA).

Results: 1). Compared with NC group, the serum Ad level was lower in CIH and CIH+DN-AMPK groups and partially improved in CIH+Ad and CIH+Ad+DN-AMPK groups. Dysfunction of genioglossus contractile properties was detected in CIH, CIH+DN-AMPK and CIH+Ad+DN-AMPK groups without significant difference during these 3 groups, and partially mitigated in CIH+Ad group with significance. 2). Damaged mitochondrial structures were growing at the end of week 5 whilst mitochondrial function-associated mRNA, the activity of mitochondrial enzymes and content of ATP in genioglossus were lessening in the CIH group compared with NC group. All changes above were extenuated in CIH+Ad group whereas no modification happened in CIH+DN-AMPK and CIH+Ad+DN-AMPK groups compared with CIH group. 3). Exacerbation of apoptosis was also observed in CIH, CIH+DN-AMPK and CIH+Ad+DN-AMPK groups compared with NC group, but no significant difference was found during these 3 groups. Apoptosis was partially remitted in CIH+Ad group compared with CIH group with significance. 4). Relative protein and mRNA of mitophagy, autophagy biomarker LC3-Ⅱ, and autophagosomes declined in CIH, CIH+DN-AMPK and CIH+Ad+DN-AMPK groups compared with NC group, without significance during these 3 groups. Significant improvements were detected in CIH+Ad group.

Conclusions: Disturbances of genioglossus mitophagy could be related to damaged mitochondrial structure, impaired mitochondrial function and decreased genioglossus contractile properties in rats induced by CIH, which could be alleviated by Ad via increasing mitophagy. AMPK might play an import role in the process of mitophagy while through AMPK Ad could improve mitophagy decreased in CIH.

The screening value of Sleepok application based on snoring analysis in high-risk population of obstructive sleep apnea (OSA)

Y. Chen[1], X. Zhang[2], B. Zhou[2], L. Zhao[2], L. Wu[2], W. Wang[2], R. Zhao[2], M. Peng[2], M. Sun[2], J. Gu[2], X. Dong[2], F. Han[2]
[1]Peking University Health Science Center, Institute of Medical Technology, Beijing, China, [2]Peking University People's Hospital, Department of Respiratory and Sleep Medicine, Beijing, China

Introduction: In the context of high prevalence of OSA but insufficient sleep-related medical resources, consumer-level sleep monitoring devices such as wearable devices and smartphone application are gradually used for self-assessment of OSA, and it provides patients with portable self-screening opportunities and is favored by consumers.
Objective: To evaluate the screening value of Sleepok application in OSA high-risk population.
Materials and methods: This study is an observational study. Eighty-three patients 〔mean age (46.5±15.0) years old, 63.9 % male, mean body mass index (25.5±4.6) kg/m^2〕 with snoring who were referred to the Sleep Center of Peking University People's Hospital from July 2022 to January 2023 were enrolled, and they underwent overnight monitoring with Sleepok app and polysomnography (PSG) simultaneously. Wilcoxon rank sum test was used for comparison between the apnea hypopnea index (AHI) generated by Sleepok automatic analysis (AHI_Sleepok) and AHI obtained by PSG and interpreted by sleep professionals according to the recommended guidelines (AHI_PSG). Spearman correlation analysis was used to determine the relationship between AHI_Sleepok and AHI_PSG while the intraclass correlation coefficient (ICC) was used to test the consistency of the two groups of data. The sensitivity and specificity of the OSA diagnosis were evaluated and receiver operating characteristic (ROC) curve was drawn.
Results:

- (1) The AHI_Sleepok was 16.8 (5.4, 29.6) times/h, and the AHI_PSG was 14.1 (5.9, 27.8) times/h. There was no significant difference between the two groups ($Z = -0.711$, $P = 0.477$).
- (2) The results of spearman correlation analysis showed that there was a positive correlation between AHI_PSG and AHI_Sleepok (rs = 0.74, P < 0.001). ICC consistency test showed that AHI_PSG and AHI_Sleepok was statistically consistent (ICC = 0.808, P < 0.001).
- (3) Taking AHI≥5 times/h as the gold standard for the diagnosis of OSA, Sleepok optimal diagnostic value for OSA was AHI>9.60 times/h, with a corresponding sensitivity of 78.13% and a specificity of 73.68%. The area under the curve (AUC) was 0.81 (0.71, 0.92), the positive predictive value (PPV) was 90.91%, and the negative predictive value (NPV) was 50%. Taking the moderate-to-severe OSA (AHI≥15 times/h) diagnostic threshold of as the gold standard, the best diagnostic value of Sleepok was 20.65 times/h, and the AUC was 0.88 (0.81, 0.95), the sensitivity/specificity/PPV/NPV corresponding to the best diagnostic value were 70.27%/91.30/86.67%/79.25%. Because the purpose of Sleepok app is for OSA screening, we recommend AHI _ Sleepok＞10.30 times/h as a cut-off value to more sensitively recognize the person with high risk of moderate to severe OSA (sensitivity=91.89%, specificity=58.70%).

Conclusions: Sleepok has a good initial screening value for the patients with OSA high-risk, and has good consistency with PSG, especially in patients with moderate to severe OSA.

The use of expiratory pressure relief technology may compromise pharyngeal patency in patients with obstructive sleep apnea under CPAP therapy

G. Freitas Grad[1], G.L.F. Lorenzi Filho[1], P. Rodrigues Genta[1]
[1]University of São Paulo / Heart Institute, Pneumology, São Paulo, Brazil

Introduction: Many patients cannot tolerate continuous positive airway pressure (CPAP) for obstructive sleep apnea (OSA) during sleep. To reduce expiratory discomfort caused by CPAP, a technology has been developed that reduces CPAP during expiration. However, the impact of expiratory pressure reduction (EPR) on pharyngeal patency is unclear. We hypothesized that EPR compromises pharyngeal patency in OSA patients.

Objective: To compare pharyngeal patency, as measured by peak flow (PFlow), in patients using CPAP with and without the use of EPR.

Materials and Methods: Subjects with severe OSA using nasal CPAP were recruited. Subjects underwent polysomnography and were fitted with a nasal mask attached to pneumotachometer and a pressure transducer. Pharyngeal luminal pressure was measured using a pressure catheter inserted through the nose. CPAP was titrated to induce flow limitation. EPR was turned on and off during N2-N3 sleep for 5 breaths, intermittently.

Results: Thirteen subjects (8 women), aged 62 ± 13 years, with a BMI of 39 ± 8 kg/m^2, AHI = 67.1 ± 33.1 events/hour, were recruited. Home therapeutic CPAP was set to 10 (9-12) cmH$_2$O. The values comparing EPR *off* and EPR *on* were statistically significant for all variables: PFlow (L/s) 0.40 (0.34-0.45) vs 0.19 (0.15-0.26) (Z=3.183, p=0.001, r=0.88); PMask (cmH$_2$O) 6.90 (6.75-7.33) vs 3.96 (3.79-4.36) (Z=3.181, p=0.001, r=0.88); DP (cmH$_2$O) 4.33 (3.68-6.48) vs 6.20 (4.71-11.67) (Z=3.110, p=0.002, r=0.86); and UAR (cmH$_2$O/L.s^{-1})14.58 (12.30-25.20) vs 50.98 (27.48-138.37) (Z=3.180, p=0.001, r=0.88).

Conclusions: EPR reduces peak inspiratory flow and narrows the airway, potentially compromising CPAP therapy.

The use of home sleep apnoea test in the diagnosis of OSA - a retrospective analysis

M. Sim[1], J. Chang[1], M.R. Chee[1], Y. Poh[1], H.S. Wong[1], Y. Mok[1]
[1]Changi General Hospital, Department of Sleep Medicine, Surgery and Science, Singapore, Singapore

Introduction: The American Association of Sleep Medicine (AASM) recommends the use of a home sleep apnoea test (HSAT) as an alternative test for the diagnosis of obstructive sleep apnea (OSA) in uncomplicated patients with signs and symptoms of an increased risk of moderate to severe OSA. If a HSAT is negative or technically inadequate, an in-laboratory polysomnography (PSG) is recommended for further evaluation. However, practice guidelines may not always be followed and individual practices vary. Therefore, our objective was to assess whether HSATs were ordered appropriately to reach a diagnosis of OSA in a real world setting.

Materials and methods: Single center retrospective cohort analysis of patients who had HSAT performed between 29 July 2020 and 31 August 2022.

Results: A total of 563 HSATs were performed for the evaluation of suspected OSA. 86.5% (487/563) of patients had a diagnosis of sleep apnoea; 20.2% (114/563) were mild (AHI 5 < 15), 26.8% (151/563) were moderate (AHI 15 < 30) and 39.4% (222/563) were severe (AHI ≥ 30). 5.0% (28/563) of patients had a technically inadequate study and 8.5% (48/563) of patients had a normal Apnea Hypopnea Index (AHI < 5).

Of the patients with a technically inadequate HSAT, 35.7% (10/28) was due to insufficient sleep time, 17.8% (5/28) due to multiple excluded periods by the software and 46.4% (13/28) due to poor signals. 21.4% (6/28) of these patients proceeded with a PSG, 39.3% (11/28) repeated a HSAT and 39.3% (11/28) did not proceed with either a PSG or repeat HSAT. In those who underwent a PSG or repeat HSAT, 17.6% (3/17) had mild sleep apnoea and 70.6% (12/17) had moderate-severe sleep apnoea. 18.1% (2/11) of patients who repeated a HSAT had another technically inadequate study. Patient wishes (11/11) were the primary reason for choosing a repeat HSAT over a PSG.

Of the patients with a normal AHI on HSAT, only 14.6% (7/48) proceeded with a PSG while 85.4% (41/48) did not. For these patients, PSG showed mild sleep apnoea in 57.1% (4/7) and severe sleep apnoea in 14.3% (1/7). Reasons for not performing a PSG were patient refusal (41.5%, 17/41) or the test was not offered by the physician (58.5%, 24/41).

A review of patients with a normal AHI on HSAT revealed that only 43.8% (21/48) had signs and symptoms of an increased risk of moderate-severe OSA (according to AASM definition) while 56.2% (27/48) did not. Patients with a normal AHI on HSAT were also more likely to be younger (age 35.5 ± 25 vs 48.0 ± 24, OR 1.05 95% CI 1.02-1.07, p < 0.01) and have a lower BMI (25.0 ± 4.6 vs 29.4 ± 9.0, OR 1.13 95% CI 1.07-1.20, p < 0.01) compared to patients with AHI ≥ 5.

Conclusions: Patients with a negative or technically inadequate HSAT are at risk of non-completion of diagnostic testing as majority will not proceed with a PSG. Clinicians must be cautious about the use of HSAT in patients without signs and symptoms of an increased risk of moderate-severe OSA, especially in non-obese or younger patients.

The value of excessive daytime sleepiness in predicting outcome after hypoglossal nerve stimulation in obstructive sleep apnea

Y. Wang[1], P. Arens[2], T. Penzel[1]
[1]Charité - Universitätsmedizin Berlin, Interdisciplinary Center of Sleep Medicine, Berlin, Germany,
[2]Charité - Universitätsmedizin Berlin, Department of Otorhinolaryngology, Berlin, Germany

Introduction: Since 2001, hypoglossal nerve stimulators (HNS) have been used worldwide to treat obstructive sleep apnea (OSA) patients. However, few studies focus on the possible contributing factors, including specific polysomnography (PSG) parameters, HNS device configuration and daytime sleepiness symptoms. The aim of this study was to investigate the relationships between these metrics and HNS therapy outcomes.

Materials and methods: Twenty-seven patients who underwent HNS implantation since 2016 were included retrospectively. Demographic data, pre and postoperative sleep study characteristics, and device use recordings were collected. To assess daytime sleepiness, each patient completed the Epworth Sleepiness Scale (ESS). Possible factors influencing the success of HNS therapy were then evaluated and identified.

Results: One year after activation of HNS, the mean baseline apnea-hypopnea index (AHI) was reduced from 34.5 ± 12.0 to 23.5 ± 16.4, $p < 0.05$, the mean oxygen desaturation index (ODI) decreased from 31.3 ± 14.8/h to 22.1 ± 12.1, $P < 0.05$, and the success rate of treating OSA was 52.2%. The mean baseline ESS scores differed significantly between the success (n=13) and failure groups(n=14) (p=0.03), while no significant correlation was found between other baseline demographic characteristics, polysomnography data and HNS device setting parameters.

Conclusions: An elevated preoperative Epworth sleepiness scale score was associated with treatment outcome, demonstrating that excessive daytime sleepiness may help predict the effects of HNS.

Three-year outcomes of Targeted Hypoglossal Nerve Stimulation randomized controlled trial (THN3) for Obstructive Sleep Apnea

O. Jacobowitz[1], J. Maurer[2], S. Mickelson[3], M. Miller[4], A. Oliven[5], V. Certal[6], M. Hopp[7], D. Winslow[8], T. Huntley[9], N. Nachlas[10], D. Eisele[11], M.B. Gillespie[12], B. Weeks[13], E. Lovett[14], A. Malhotra[15], A. Schwartz[16]

[1]ENT and Allergy Associates, New York, United States, [2]University Medical Centre Mannheim, Department of ORL-HNS, Division of Sleep Medicine, Mannheim, Germany, [3]The Atlanta Snoring and Sleep Disorders Institute, Advanced Ear, Nose & Throat Associates, Atlanta, United States, [4]ENT Associates, Clearwater, United States, [5]Bnai-Zion Medical Centre, Department of Medicine, Haifa, Israel, [6]Hospital CUF Porto, Department of Otorhinolaryngology/Sleep Medicine Centre, Porto, Portugal, [7]Cedars-Sinai Medical Center, Department of Otolaryngology-Head and Neck Surgery, Los Angeles, United States, [8]Norton Clinical Research Group, Louisville, United States, [9]Center for Ear, Nose, Throat and Allergy, Carmel, United States, [10]Ear, Nose, Throat, and Allergy Associates of Florida, Boca Raton, United States, [11]Johns Hopkins University, Department of Otolaryngology, Head and Neck Surgery, Baltimore, United States, [12]University of Tennessee Health Science, Department of Otolaryngology-Head and Neck Surgery, Tennessee, United States, [13]SENTA Clinic, Department of Otolaryngology, San Diego, United States, [14]LivaNova PLC, Clinical and Medical Affairs, Minneapolis, United States, [15]University of California San Diego, Pulmonary, Critical Care, and Sleep Medicine, Department of Medicine, San Diego, United States, [16]University of Pennsylvania Perelman School of Medicine, Philadelphia, United States

Introduction: The THN3 randomized, controlled trial primary analysis established that proximal ("targeted") hypoglossal nerve stimulation (HGNS) safely improved measures of sleep-disordered breathing, blood oxygenation and quality of life in moderate to severe obstructive sleep apnea (OSA). Longer-term outcomes have not described in the context of sustaining benefits at 11 months or longer of HGNS treatment. Outcomes up to 3 years post-implant are reported.

Materials and Methods: THN3 subjects (BMI≤35 kg/m^2, apnea-hypopnea index (AHI) 20-65/hr, not preselected with sleep endoscopy), after completing 11 months of HGNS (Months 12 and 15 post-implant for Treatment and Control groups, respectively), presented for follow-up at Months 24 and 36. Subjects with complete data through Month 36 were analyzed to calculate improvement at Month 12/15 as well as changes from Month 12/15 values at Months 24 and 36. To account for non-normality of polysomnographic variables, improvements and long-term changes were measured with medians and 95% confidence intervals (95%CIs) calculated by bootstrapping. Probability of superiority, a non-parametric effect size, was similarly computed to estimate the likelihood that outcomes at Month 12/15 were superior to Baseline.

Results: At Month 12/15, AHI (N=93) changed from Baseline by -14.9/hr (95%CI: -17.8,-11.2) with probability of superiority 0.72 (0.62,0.81) while changes relative to Month 12/15 at Month 24 and 36 were, respectively, -0.3 (-4.0,1.3) and -0.1 (-3.4,5.5). Likewise, oxygen desaturation index (ODI, N=93) changed by -15.4/hr (-20.7,-12.9) versus Baseline with probability of superiority 0.75 (0.67,0.84) while Month 24 and 36 changes versus Month 12/15 were 1.2 (-1.2,3.6) and 0.8 (-2.0,4.2), respectively. The percentage of sleep time with oxygen saturation < 90% (T90, N=93) changed by -3.8 (-6.0,-2.7) relative to Baseline with probability of superiority 0.73 (0.63,0.82), while changes at Month 24 and 36 relative to Month 12/15 were, respectively 0.2 (-1.4,0.8) and 0.2 (-0.4,0.9). The Epworth Sleepiness Scale (ESS, N=97) changed at Month 12/15 by -5.0 (-6.0,-4.0) versus Baseline with probability of superiority 0.86 (0.79,0.92) while changes versus Month 12/15 at Month 24 and 36 were 0.0 (0.0,1.0) and 0.0 (0.0,1.0), respectively. Finally, the Functional Outcomes of Sleep Questionnaire (FOSQ, N=95) changed at Month 12/15 relative to Baseline by 2.8 (2.3,3.7) with probability of superiority 0.88 (0.81,0.94) while Month 24 and 36 changes relative to Month 12/15 were 0.0 (-0.3,0.0) and 0.0 (-0.3,0.0), respectively.

Conclusions: Among THN3 subjects with complete data through Month 36, proximal HGNS was associated with clinically meaningful benefits at Month 12/15 that were nearly identical at Months 24 and 36, implying that clinical improvement driven by proximal HGNS is tightly maintained over the long term. Longitudinal follow-up should be undertaken for subjects in the ongoing OSPREY confirmatory randomized, controlled trial of proximal HGNS to confirm the sustained benefits.

Upper airway stimulation in patients with Obstructive Sleep Apnea and high Body Mass Index (BMI)

P. Bosschieter[1], N. de Vries[2], R. Dhanda Patil[3], R. Soose[4], S. Manchanda[5]
[1]Stanford University, School of Medicine, Palo Alto, United States, [2]Onze Lieve Vrouwe Gasthuis, Department of Otorhinolaryngology, Head and Neck surgery, Amsterdam, Netherlands, [3]Cincinnati Veterans Affairs Medical Center, Cincinnati, United States, [4]University of Pittsburgh, UPMC Department of Otolaryngology, Pittsburgh, United States, [5]Indiana University School of Medicine, Division of Pulmonary, Critical Care, Sleep, and Occupational Medicine, Indianapolis, United States

Introduction: Upper airway stimulation (UAS) has been successfully used to treat patients with moderate to severe OSA and a BMI ≤ 32, however, higher BMI ranges (BMI > 35) have not been well studied.

Materials and Methods: The ADHERE Registry collects real-world data related to the use of Inspire UAS therapy to treat OSA. The registry follows patients to 1 year post-implant. Data from this registry was analyzed to determine the outcomes of patients with a higher baseline BMI.

Results: Three BMI ranges (groups) were examined and compared: BMI ≤ 32 (n=1218); 32< BMI≤ 35 (n=222); 35<BMI≤40 (n=57). Demographics including age and sex, were not different between the groups. Patients with a higher baseline BMI had a significantly higher baseline AHI. There were no statistically significant differences in surgical times between the three groups (133.5±53.3 min vs. 138.4±50.0 min vs. 135.3±39.2 min), and no differences in the safety profiles at implant (each group reporting a 1% serious adverse event rate). Mean AHI at 1 year post-implant was not different between the groups (15.3±14.4/hr vs. 17.4±16.9/hr vs. 17.0±16.8/hr, p=0.24). There was also no difference in the reduction in AHI (20.1±18.1 vs 21.2±20.1 vs 18.4±17.5, p=0.64) or responder rate between these groups (65.1% vs. 60.6% vs. 60.9%, p=0.47). Symptom relief, as reported by the median ESS score, was not different between groups (6.0 vs. 6.0 vs 6.5, p=0.93). Mean therapy usage (reported as hours/night) was significantly different between the groups with patients in the 35<BMI≤40 group having the lowest usage (5.9±2.2 hrs vs 5.2±2.4 hrs vs 5.0±2.0 hrs, p=0.0001). There were no differences in safety at one year, with each group reporting a serious adverse event rate of 2-4%.

Conclusions: No differences in safety and effectiveness were noted between the three BMI ranges treated with Inspire UAS therapy. However, therapy usage was lower in patients with higher BMI. While BMI may play a role in appropriate patient selection, other factors including airway anatomy and airway collapsibility should be considered. Factors that result in a decrease in utilization of UAS therapy in patients with the 35<BMI≤40 should be investigated and addressed.

Utilizing novel sensor to track transient blood pressure changes during sleep

R. Khayat[1], A. Chaudhari[2], E. Lee[2], J. Kim[2]
[1]University of California-Irvine, Sleep Disorders Center, Newport Beach, United States, [2]Vena Vitals, Inc, Irvine, United States

Introduction: Sleep disordered breathing is directly associated with poor cardiovascular outcomes. However, blood pressure (BP) measurements are not commonly utilized in clinical sleep assessments. The current approach to measuring BP during sleep relies on ambulatory BP monitoring devices that can only take intermittent cuff readings (every 30-60 min); this process is –uncomfortable, disturbs the subjects' sleep, and lacks the temporal resolution to identify rapid BP changes that happen between cuff inflations. Recently, a novel wearable capacitive tonometry sensor became available that can capture transient beat-by-beat BP changes validated against the arterial line. We sought to test the feasibility of adapting this device to measuring BP changes continuously during sleep.

Methods: We developed a technique to use the novel sensor as a sole measure of transient BP changes during sleep. The calibration-free technique accounts for two critical concepts: [1] within-breath modulation of BP, which is well established in health and disease & [2] sympathetic and vascular tones are in a steady state during periods of eupneic breathing and can serve as a baseline value to estimate amplitude of change during subsequent respiratory events. Therefore, by normalizing to BP changes that occur during eupnea, we can quantify the magnitude of transient BP changes triggered by events such as apneas, hypopneas, and increased airway resistance.

To quantify the hemodynamic impact during the eupnea segments, empirical mode decomposition (EMD) was implemented on the device's signal. Inhalation and exhalation were confirmed by comparison to the readings of thoracic belt worn by users undergoing polysomnography (PSG). To apply this technique, we needed to detect eupnea segments automatically. A machine learning classifier was built based on data from 25 users undergoing PSG and wearing the novel sensor. The model was trained on features extracted from the intrinsic mode functions (IMF). A nested cross validation was used to ensure the results demonstrated generalizability.

Once we established the baseline and boundaries of within-breath BP changes during eupnea, we validated the device estimated BP values against the arterial line in data sets from three patients in the operating room who were instrumented simultaneously with the reference standard, an arterial line along with the new non-invasive sensor.

Results: As the outer-loop of the nested cross validation was a random subsampling approach, 100 iterations were performed. On average, the accuracy and F_1-score of this setup was respectively 86.04% and 76.53%, demonstrating not only ability to detect eupnea but also generalizability. In the three patients, when comparing the arterial line reading to the estimated BP change, the average R^2 was 0.94 ± 0.01, demonstrating strong positive correlation.

Conclusions: This method leveraging a novel wearable beat-to-beat BP monitoring device shows promise in being able to accurately and non-invasively track transient BP changes during sleep. Applications of this hemodynamic monitoring during sleep include the ability to provide more precise stratification of sleep disordered breathing conditions based on BP fluctuations. Additionally, this approach through a wearable form factor facilitates more personalized evaluations of treatment efficacy for sleep disorders.

Validation of portable monitor compared with polysomnography for screening of obstructive sleep apnea in polio survivors

Q. Ding[1], J. Liu[2], J. Wu[3], J. Du[4], X. Li[2], M. Wang[2], Y. Sun[2], Y. Yu[5], J. Wang[2], T. Sun[2], C. Zhang[1], C. Lv[2], K.P. Strohl[6], F. Han[1], X. Dong[1]
[1]Peking University People's Hospital, Department of Respiratory and Sleep Medicine, Beijing, China, [2]Binzhou Medical University Hospital, Department of Respiratory and Critical Care Medicine, Binzhou, China, [3]Dongyang People's Hospital, Department of Pediatrics, Dongyang, China, [4]Dongyang Seventh People's Hospital, Department of Sleep Medicine, Dongyang, China, [5]Binzhou Medical University, Department of the First School of Clinical Medicine, Binzhou, China, [6]Case Western Reserve University, and Cleveland Louis Stokes VA Medical Center, Division of Pulmonary, Critical Care and Sleep Medicine, Department of Medicine, Cleveland, United States

Introduction: Sleep-disordered breathing (SDB) is highly prevalent in polio survivors. Obstructive sleep apnea (OSA) is the most frequent type. Full polysomnography (PSG) is recommended for OSA diagnosis in patients with cormobidities by current practice guidelines, but it is not always accessible. The purpose of this study was to evaluate whether type 3 portable monitor (PM) or type 4 PM might be a viable alternative to PSG for the diagnosis of OSA in postpolio subjects.

Materials and Methods: A total of 48 community-living polio survivors (39 males and 9 females) with an average age of 54.4±5.3 years referred for evaluation of OSA volunteered to participate were recruited. First, they completed the Epworth Sleepiness Scale (ESS) questionnaire, underwent pulmonary function testing and blood gas tests the day before PSG night. Then, they underwent an overnight in-laboratory PSG with a type 3 PM and type 4 PM recording simultaneously.

Results: The AHI from PSG, respiratory event index (REI) from type 3 PM, ODI_3 from type 4 PM was 30.27±22.51/h vs 25.18±19.11/h vs 18.28±15.13/h, respectively (P< 0.001). For AHI ≥5/h, the sensitivity and specificity of REI were 95.45% and 50%, respectively. For AHI ≥15/h, the sensitivity and specificity of REI was 87.88% and 93.33%. The Bland–Altman analysis of REI on PM versus AHI on PSG showed a mean difference of -5.09 (95% confidence interval [CI]: -7.10,-3.08; P <0.001) with limits of agreement ranging from −18.67 to 8.49 events/h. ROC curve analysis for patients with REI ≥15/h showed an area under the curve (AUC) of 0.97. For AHI ≥5/h, the sensitivity and specificity of ODI_3 from type 4 PM were 86.36% and 75%, respectively. For patients with AHI ≥15/h, the sensitivity was 66.67%, and the specificity was 100%.

Conclusions: Type 3 PM and Type 4 PM could be alternative ways to screen OSA for polio survivors, especially for moderate to severe OSA.

Variation of quality of life in patients with obstructive sleep apnea hipopnea syndrome after treatment with mandibular advance device

C. Chavez[1], J. Rey De Castro[1], E. Rafael[2]
[1]Universidad Peruana Cayetano Heredia, Lima, Peru, [2]Universidad Nacional Mayor de San Marcos, Lima, Peru

Introduction: The Obstructive Sleep Apnea (OSA) progressively deteriorates the quality of life of those affected; our objective was to determine the variation of the quality of life, after treatment with Mandibular Advancement Device (MAD), in patients with mild – moderate OSA.

Material and methods: Prospective, quasi-experimental study. Subjects with respiratory disturbance index (RDI) between 5 and 30 / hour (measured with respiratory polygraphy), without previous treatments, with conditions for the use of MAD were included. The quality of life was assessed with the FOSQ (questionnaire of functional sleep results) before and after 45 days of treatment with MAD.

Results: 26 completed the study (20 males). The mean (SD) of the age was 43 (9.6) years, BMI was 29 (8.6) kg / m2, and the RDI was 19 (7.6) / hour. After 45 day, significant changes were observed, with respect to the baseline values, in the FOSQ score (total calculation, general productivity, social outcome, activity level, vigilance and intimate relationships/sexual activity, p <0.001). The mean RDI decreased from 19 (7.6) to 7 (3.8) (p <0.001), the minimum desaturation of O_2 increased from 77 (5.2) to 83 (3.9) (p <0.001), the T90 decreased from 73 (15.4) to 31 (16.6) (p <0.001) y Epworth's score decreased from 11.2 (4.6) to 6.4 (3.5) (p <0.001).

Conclusions: In patients with mild-moderate OSA, treatment with MAD produces significant improvement in their quality of life, reduces the level of disease expressed in decreased RDI, improves oxygenation level and reduces daytime sleepiness expressed in decreased Epworth score.

Vivicheck ™ (M-IOT platform for telemonitoring) to improve patient adherence with OSA treatment

F. Brescia[1], N. Zanetta[1], R. Bonazzi[1], M. Fumagalli Romario[1]
[1]Vivisol Corporate, Monza, Italy

Introduction: The integration between patient, homecare provider and reference clinicians has recently evolved thanks to the launch of telemedicine services (or more properly of e-health), which today represent a real enabling and essential asset of home care. The most important advantage offered by telemedicine monitoring in OSA patients under CPAP treatment is the possibility of identifying patients with adherence problems in order to be able to intervene immediately and therefore reduce the risks of morbidity/mortality ensuring the effectiveness of the treatment.
A medical Internet of Things (M-IoT) platform, capable of collecting and analysing both vital parameters via multi-parameter devices and therapy data generated by the devices prescribed in the treatment plan, could increase adherence to the treatment. Telemonitoring through a M-IoT platform allows immediate attention to possible side effects and a timely resolution of problems which brings to an improvement of the patients' clinical conditions of patients and to a reduction of the risk factors, especially cardio cerebrovascular related to this pathology. Furthermore, the patient being aware of telemonitoring is more motivated to use the medical device.
The purpose of this project is to highlight the efficacy of the use of a M-IoT platform in healthcare services at home in the field of lung care, ventilation and apnoea care. This platform allows to integrate the data of the devices with the clinical information collected from healthcare professionals and directly from the patients.
Materials and Methods: We analysed a data set of 40k patients with OSA treatment at a specific time (T_0), after 6 months (T_1) and after 1 year (T_2). We considered the three parameters defined from the official statement of the American thoracic society (ATS) approved by the ATS board of directors (March 2013): usage; AHI and leaks. We compared, at T_0, T_1 and T_2, for each parameter, the average score with the defined values of golden standard: usage >4hr/night; AHI<10events/hr and leaks <24L/min.
Results: The processing of the patient data collected in the M-IoT platform highlighted that the average of the three parameters were compliant with the values defined by the golden standard.
Conclusions: OSA is a chronic disease and needs to be managed accordingly (i.e., CPAP adherence should be monitored consistently over time). The use of telemonitoring technologies on patients with OSA, an adequate organizational model and a follow up plan, supported by an effective tool (M-IoT platform), could help professionals in monitoring the evolution of the disease and empower the patient in their adherence. Furthermore, with a deeper analysis that also includes clinical record data (from diagnosis) we would be able to develop a more accurate and complete picture of the OSA patients' compliance.

What are the costs of putting your business in "SLEEP MODE" in aeternum? Understanding the corporate costs and legalities of Obstructive Sleep Apnea

C. Rivas Echeverria[1,2,3,4], L. Ramos[1,5], L. Molina[6,2], Z. Peña[1], C. Rivas[7], A. Leal[8,9], P. Serrano[1,10,11], A.G. Pérez[1,12], F. Rivas[13,12,14,15,16], V. Rivas[1], K. Siddiqui[13,17], C. Marabotti[18], N. Campos[19], E. Venturini[20], A. Zacher[21,22,23,13], M.B. Gallardo Perelló[2], C. Pont Febrer[2], I. Sainz[24], L. Vargas Ramírez[25], H. Prá[2], J. De Otero[2], M.J. Torres[2], A. Bauzá[2]

[1]Sleepcare Clinics, Leicester, United Kingdom, [2]SLEEPCARE Clinics of Sleep and Respiratory Medicine/Hospital Parque Llevant, Porto Cristo, Spain, [3]The Centre Surgery, Hinckley, United Kingdom, [4]The Health Suite, Sleep Clinic, Leicester, United Kingdom, [5]Kauel Inc, Artificial Intelligence, Houston, United States, [6]IBSALUT Conselleria Salut I Consum Illes Balears, Palma de Mallorca, Spain, [7]Universidad de Navarra, Facultad de Medicina, Pamplona, Spain, [8]Fondation Sanitus, Porto, Portugal, [9]Med-Linkare Clinic, Porto, Portugal, [10]Hospital Clínico Universitario "Lozano Blesa", Zaragoza, Spain, [11]Hospital Viamed Montecanal, Zaragoza, Spain, [12]Universidad de Los Andes, Merida, Venezuela, [13]Sleepcare clinics, Leicester, United Kingdom, [14]Kauel USA, Artificial Intelligence, Houston, United States, [15]Pontificia Universidad Católica del Ecuador, Ibarra, Ecuador, [16]Miu City University, Miami, United States, [17]Ruby General Hospital, Kolkata, India, [18]CNR Institute of Clinical Physiology of Pisa, Pisa, Italy, [19]Universidad Técnica de Manabí, Portoviejo, Ecuador, [20]Cecina Civil Hospital, Department of Cardiology, Unit of Cardiac Rehabilitation, Cecina, Italy, [21]British Society of Pharmacy Sleep Services, Lincoln, United Kingdom, [22]CIO European Academy Dental Sleep Medicine, Lincoln, United Kingdom, [23]Taskforce Member on an Independent Advisory Board to the All Party Parlamentary Group for Sleep, Lincoln, United Kingdom, [24]Hospital Virgen del Rocio, Centro de Rehabilitación Cardiaca Fisiocard, Sevilla, Spain, [25]Instituto Neumológico del Oriente, Bucaramanga, Colombia

Introduction: Obstructive sleep apnoea (OSA) is characterised by the recurrent upper respiratory airway collapse during sleep that causes apneas and hypopneas, hypoxia, hypercapnia and arousal from sleep and their pathophysiological consequences. OSA is a highly prevalent but underdiagnosed condition that can cause cardiovascular and metabolic diseases, cognitive dysfunction, impaired mental health, traffic and occupational accidents, hypersomnolence, decrements in daytime functioning, work performance and productivity, impaired quality of life of patients and their family/friends/work, and premature all-cause mortality. Not screening for OSA among workers is the rule rather than the exception. Although sleep tests are expensive, they could dramatically reduce costs and increase the productivity and profitability of businesses. Health systems and laws vary among countries, causing inequities that detriment the access or requirements for sleep tests for screening OSA and, consequently, increase the corporate cost. We reviewed this topic, comparing different laws, health systems, and some plans to tackle the problem and their results in terms of costs and prevalence of underdiagnosed OSA.

Materials and Methods: Systematic review of the literature about costs, productivity, a critical review of the legislations (Health and Safety at Work Act or its equivalent in the UK, the USA, Venezuela, Ecuador, Chile, Spain, Portugal, India, Australia and New Zealand) and extrapolate the results in costs for business.

Results: The equivalent of the "Health and Safety at Work Act (HSWA)" laws and health systems are substantially different in each country; consequently, inequities can be seen in accessing health services related to OSA. Regardless of these variations, most of these laws underscore the employers' responsibility to ensure or even mandate screening for OSA.

OSA may account for up to 60.35% of non-crime-related fatalities. An adequate OSA management strategy can reduce hospitalisations by 91% and medical expenses by 57.4% over two years. More importantly, it could mitigate up to 73% of work-related accidents. Employers' negligence towards OSA can lead to stringent legal consequences, including fines and imprisonment. Employers worldwide may face severe penalties for neglecting worker health. Hence, effective OSA management enhances worker well-being and reduces potential legal consequences for employers. On the other hand, access to screening tests and treatment for OSA seems to be related to the availability of sleep consultants/services rather than the laws themselves. The laws are either permissive or strictly force companies to screen employers for OSA. Notwithstanding, the availability or lack of "OSA services" makes the difference in reducing underdiagnosed OSA with its resulting increase in productivity and profitability. The excess costs of untreated OSA seem to be mitigated by disregarding the laws and their fines or civil and criminal sanctions and penalties.

Conclusions: Laws that reinforce businesses to assess employees and screen them for OSA can help businesses to increase their profitability and reduce costs instead of causing unnecessary waste of resources, nevertheless developing adequate facilities and investing in sleep consultants,

diagnostic tests, and treatment for OSA are the measurements that make the difference reducing the prevalence of undiagnosed OSA and increasing the productivity and profitability of the business.

What measure of CPAP treatment is most closely associated with reduced risk of future major cardiovascular events (MACE)?

A. Reynor[1], B. Singh[1,2,3], K. Maddison[1,2,3], P. Eastwood[4], B. Shenoy[2], J. Walsh[1,2,3], C. Harvey[2], S.S. Dhaliwal[2,5,6,7], N. McArdle[2,1,3]
[1]University of Western Australia, Centre for Sleep Science, Perth, Australia, [2]Sir Charles Gairdner Hospital, Department of Pulmonary Physiology & Sleep Medicine, Perth, Australia, [3]West Australian Sleep Disorders Research Institute, Perth, Australia, [4]Murdoch University, Health Futures Institute, Perth, Australia, [5]Faculty of Health Sciences, Curtin Health Innovation Research Institute, Perth, Australia, [6]National University of Singapore, Duke-NUS Medical School, Singapore, Singapore, [7]Universiti Sains Malaysia, Institute for Research in Molecular Medicine, Pulau Pinang, Malaysia

Introduction: Obstructive sleep apnea (OSA) is associated with future Major Adverse Cardiovascular Events (MACE). Continuous positive airway pressure (CPAP) is the standard treatment for OSA, but it is not known which measure of CPAP treatment is most closely associated with reduction in future MACE. This study compared associations between several measures of CPAP treatment and future MACE.

Materials and methods: Participants: 2717 adults attending a tertiary sleep clinic between January 2006 and May 2010, diagnosed with at least moderate OSA (apnea hypopnea index [AHI] ≥15) by laboratory polysomnography (PSG), completed a health questionnaire and anthropometric measurements.

CPAP treatment: A month-long CPAP trial managed by sleep scientists and sleep physicians. Participants who accepted CPAP were reviewed in the clinic periodically post-trial.

Outcomes: Time to cardiac death or non-fatal hospitalisations due to MACE, or the end of follow up, using Cox proportional hazards models. Hospitalisation and cardiac death data were obtained from Health administrative records.

Predictors: Average nightly CPAP use week 1 (Week 1 download), Average nightly CPAP use all available downloads to occurrence of MACE event or end of follow up (All downloads), and the SARAH index (Sleep-Adjusted Residual AHI) from all available downloads to occurrence of MACE event or end of follow-up.

SARAH index=([AHITreatment × HoursTreatment] + [AHIUntreated × HoursUntreated])/HoursTotalSleepTime

Covariates: Age; sex; body mass index; Socio-Economic Indexes for Areas 2006; post-secondary education; diabetes; hypercholesterolemia; hypertension; depression; prevalent cardiovascular disease and oxygen desaturation index 3%.

Results: MACE occurred in 490 (18%) of participants.

Week 1 downloads: Each additional hour of CPAP use was associated with a 3% decrease in risk of MACE (HR 0.970, 95% CI 0.941-1.000, p=0.049). Compared to those not using CPAP, each tertile of increasing use predicted reduced risk of MACE (tertile 0: ref, tertile I: HR 0.748, 95% CI 0.579-0.966, p=0.026, tertile II: HR 0.763, 95% CI 0.590-0.988, p=0.040, tertile III: HR 0.836, 95% CI 0.656-1.066, p=0.149).

All CPAP downloads: Each additional hour of CPAP use predicted a 4.2% reduction in risk of MACE (HR 0.958, 95% CI 0.929-0.989, p=0.007). Compared to zero use, each tertile of increasing use predicted a reduction in risk of MACE (tertile 0: ref, tertile I: HR 0.632, 95%CI 0.484-0.824, p=<0.001, tertile II: HR 0.772, 95% CI 0.602-0.990, p=0.042, tertile III: HR 0.708, 95% CI 0.553-0.905, p=0.006). Each unit decrease in SARAH index is associated with a 0.04% decrease in risk of MACE. There was a dose-response decreasing risk of MACE with decreasing SARAH index tertiles (tertile I: ref, tertile II: HR 0.827, 95% CI 0.658-1.039, p= 0.102, tertile III: HR 0.772, 95% CI 0.614-0.969, p=0.026).

Conclusions: CPAP treatment was associated with a decreased risk for future MACE. The reduction in risk was evident from average nightly use download data as early as week 1. Average nightly CPAP use from all downloads showed a more robust association with MACE. Only the SARAH index showed a dose-response relationship with MACE; as SARAH is a measure of untreated residual OSA it may be a better measure of the physiological effectiveness of CPAP on MACE risk.

When does insomnia relate to obstructive sleep apnea (OSA)?

N. Pereira[1,1], V. Ossola[1]
[1]Noctis, La Plata, Argentina

Introduction: Insomnia is a frequently encountered issue in neurological clinical practice. There exists a discrepancy in the literature regarding the association between insomnia and obstructive sleep apnea (OSA). Objectives: To evaluate the prevalence of insomnia in patients with OSA and identify risk factors for an OSA diagnosis among patients with insomnia.

Materials and methods: A retrospective study was conducted involving 193 patients seen at the Noctis Sleep Clinic between July 2022 and January 2023. The diagnosis of insomnia and risk factors were determined using a self-administered questionnaire. OSA was defined as the presence of an Apnea-Hypopnea Index (AHI) > 5 events/hour using overnight polysomnography. OSA severity was categorized as mild (AHI 5-15), moderate (AHI 15-30), and severe (AHI > 30). Statistical analysis included Chi-square and logistic regression.

Results: A total of 193 patients were evaluated, with a mean age of 45.01 (standard deviation: 16.23), and 47.7% were female. Among them, 62.21% (122/193) received a diagnosis of OSA. The prevalence of insomnia did not show statistically significant differences between patients with and without OSA (54.92% vs 59.2%, p: 0.673). The diagnosis of severe OSA was negatively associated with the presence of insomnia (65.1% vs 44.1%, p: 0.031). In comparison, patients with mild/moderate OSA showed a similar insomnia rate to those without OSA (65.1% vs 59.2%, p: 0.598). In the multivariate analysis, the presence of snoring (OR 7.45, CI 2.32-26.8, p: 0.001), overweight (OR 8.83, CI 2.23-41.3, p < 0.001), obesity (OR 10.7, CI 2.84-47.5, p < 0.001), and arterial hypertension (OR 9.05, CI 2.02-62.9, p: 0.010) were associated with an OSA diagnosis in the insomnia population.

Conclusions: In our study, the presence of insomnia did not correlate with an OSA diagnosis, even when considering different severity levels. However, patients suffering from insomnia who report snoring, elevated BMI, or a history of hypertension should undergo polysomnography due to the heightened risk of developing OSA.

Technology/Technical

Accuracy evaluation of a portable transmissive oximeter during sleep in comparison with polysomnography

M. Melo[1,2], J. Vallim[1,2], K. Sousa[2], L. Soster[3,2], S. Garbuio[2], G. Pires[1,2], R. Bonaldi[2]
[1]Universidade Federal de São Paulo, Department of Psychobiology, São Paulo, Brazil, [2]SleepUp Tecnologia em Saúde LTDA, São Paulo, Brazil, [3]Universidade de São Paulo, Hospital das Clínicas, São Paulo, Brazil

Introduction: Wearable devices, such as pulse/ring oximeters, detect changes in blood volume in microvascular tissue and allow measurement of heart rate, blood pressure and oxygen saturation (SpO2). The purpose of this study was to evaluate the performance of a commercially available transmissive oximeter in measuring SpO2 during sleep in comparison to polysomnography (PSG). The goal was to evaluate the performance of this device during sleep to allow an accurate monitoring of the oxygen desaturation index and detection of sleep-disordered breathing.

Materials and Methods: Ten subjects (50% female, mean age: 56.6±13.0 years; 50% severe sleep apnea, mean AHI: 34.5±30) underwent overnight type I PSG wearing a Nonin transmissive oximeter, with sample rate of 10Hz) and a transmissive oximeter ring (SleepUp® PO2), with a sample rate of 0.25Hz. To evaluate the accuracy of the portable device, we considered the PSG oximetry system as the reference (SpO2Ref), which was resampled according to the sensor sample rate. The performance of the portable device was evaluated using the root mean squared error (RMSE) of the sensor data and the reference. Bland-Altman density plots were used to show the agreement between each point of the device in relation to the SpO2Ref.

Results: Approximately 54.1 hours were considered valid for the SleepUp® PO2/SpO2Ref comparison. The device achieved an RMSE of less than 3% compared to the reference (SleepUp® PO2 RMSE=2.4%). The RMSE was calculated during the entire validity period and met the requirements of the FDA and ISO 80601-2-61:2011, Part 2-61 standards that indicate the overall error or the root mean square error (RMSE) must be below 3.0% for a transmissive pulse oximetry. The Bland-Altman density plot showed good agreement between the measurements, with a mean bias of -0.37% for SleepUp® PO2/SpO2Ref comparison.

Conclusions: We have shown good agreement between the portable oximeter in relation to a reference transmittance oximeter used in the gold standard PSG, according to the standard measurement rules, being adequate for sleep purposes. Further studies with more subjects comparing the differences between oxygen desaturation index (ODI) and apnea-hypopnea index (AHI) events should be performed.

A novel objective digital mental health platform based on machine learning for screening of current major depressive episode in sleep clinics

M. Grassi[1,2,3], A. Defillo[2], S. Daccò[1,2,3], D. Caldirola[1,3], Z. Wolfy[2], G. Perna[1,2,3], T. Young[2]
[1]Humanitas University, Biomedical Sciences, Pieve Emanuele, Milan, Italy, [2]Medibio Limited, Research and Development, Savage, United States, [3]Villa San Benedetto Menni Hospital, Hermanas Hospitalarias, Clinical Neurosciences, Albese con Cassano, Como, Italy

Introduction: Sleep disturbances and mental health conditions go hand in hand. Two of the most comorbid consistent sleep conditions associated with depression are insomnia and hypersomnia. Problems with sleep regulation are not only secondary to the illness; they often could precede depressive episodes. Improving sleep in depressed patients is found to improve clinical outcomes. The high prevalence of depression in sleep clinics (SCs) advocates for mandatory screening. This could reduce the detrimental consequences of a delayed depression diagnosis and the risk of a worse prognosis for both depression and sleep-wake disorders. Nonetheless, depression screening is not part of routine clinical practice in US SCs.

Screening for a current major depressive episode (cMDE) requires the administration of a psychometric assessment based on DSM-5 criteria. These evaluations are normally performed and interpreted by a licensed mental health provider. This process is time and cost-consuming and demands the experience of a clinician.

We propose introducing a new automated platform-based screening method in SCs.

We aim to describe the performance of a prototype of this novel platform, based on machine learning, for the screening of the likelihood of a cMDE in SCs.

Materials and methods: To develop the prototype of the digital platform, we consecutively and naturalistically enrolled 450 adults (22 to 75 years old) referred to SCs for a polysomnography (PSG) study due to suspected primary or secondary sleep-wake disorders from two multi-center studies (271 subjects from the first study and 179 from the second study). PSG including electroencephalography (EEG) and electrocardiography (ECG) signals, sociodemographic and clinical data reported in medical records have been used to train the platform prototype of the machine learning algorithm that determines the presence of high or low likelihood of a cMDE. The likelihood of a cMDE has been defined as a PHQ-9 total score ≥ 10. We report the performance of the platform in making such a determination based on a 5-fold nested cross-validation protocol.

Results: The analyzed sample was composed of 215 females (47.8%) with, a mean age of 45.6 ± 15.5. According to the PHQ-9 cut-off score ≥10, 153 (34%) had a probable cMDE. In nested cross-validation, the platform was able to make the determination of the likelihood of a cMDE with a sensitivity of 70.6%, a specificity of 71.7%, a positive predicted value of 56.2%, and a negative predictive value of 82.6%**. Conclusion** The interim performance of the presented platform sheds light on the benefit of the development of automated depression screening devices in SCs. Although this technology is not a stand-alone tool, it represents a limited-cost objective diagnostic aid based on physiological signals without the initial need for a mental health provider. This increases the chance of depression detection and reduces the socio-economic burden of a misdiagnosed or undiagnosed depression.

Assistive technologies and their application to sleep problems in adult ADHD: a scoping review

F. Schofield[1], H. Isotalus[1], M. Jones[2], I. Craddock[1], V. Perera[3]
[1]University of Bristol, Digital Health and Care, Faculty of Engineering, Bristol, United Kingdom, [2]University of Bristol, School of Physiology, Pharmacology & Neuroscience, Faculty of Life Sciences, Bristol, United Kingdom, [3]LV=, Innovation, Bristol, United Kingdom

Introduction: Attention Deficit Hyperactivity Disorder (ADHD) is defined medically as a heterogeneous presentation of symptoms of inattention and hyperactivity or impulsivity. Previously considered a neurodevelopmental disorder solely affecting children, longitudinal analysis estimates adulthood ADHD prevalence of 2-6%. Comorbidities are common, with large-scale analysis suggesting 80% of adults with ADHD experience sleep problems. Of particular interest are reports of drug-naïve adults with ADHD presenting with reduced sleep efficiency, alongside increased sleep latency and daytime sleepiness.

Recently, there has been an increase in both commercial and research-led digital technologies that target ADHD core and co-morbid symptoms. Various reviews have highlighted the utility of digital technologies for infant ADHD; in turn raising the possibility of efficacy when applying the same approach to adult ADHD sleep management. This scoping review explores to what extent digital technologies are being employed to support adult ADHD, with emphasis on application to assistive sleep technologies.

Materials and Methods: Owing to the apparent lack of specific research into assistive technologies for adult ADHD sleep management, the scoping review addresses the broader question: "how are technologies currently being employed to support adults with ADHD?". Following the Preferred Reporting Items for Systematic reviews and Meta-analyses extension for Scoping Reviews (PRISMA-ScR), inclusion criteria were set to include any primary peer-reviewed papers that evaluated an assistive technology for any aspect of ADHD in adults. Abstracts, student theses, datasets, or interventions exclusively aimed at or tested in children (0-17YO) were excluded. Using base terms "Adult", "ADHD", and "Assistive Technology", a first-round search identified terminology to be included into a systematic search. The systematic search was then employed in four databases: Web of Science, PubMed, ACM Digital Library, and IEEE Xplore. After a 3-step process of removing duplicates and ensuring adherence to inclusion/exclusion criteria, 42 papers met the review criteria. Study design, sample size, and primary outcomes were extracted, and each paper thematically mapped into different areas of ADHD support.

Results: The most common area (n=17, 40.48%) for technology usage in adult ADHD was the proposal of automated diagnosis using biomarkers detected through neuroimaging, actigraphy, or virtual reality. Other areas included core symptom support (n=12, 28.57%), neurofeedback (n=6, 14.29%), symptom assessment (n=2, 4.76%), or support with education (n=2, 4.76%) and driving (n=2, 4.76%). Most papers were pilot studies (n=18, 42.86%), whilst 6 (14.29%) were randomised controlled trials. No papers that proposed or evaluated an assistive technology to support sleep in adult ADHD were identified.

Conclusions: Despite high levels of reported sleep disruption, this review has identified an absence of literature that addresses assistive technologies for adult ADHD sleep management. The included literature did however indicate a high acceptability for various technologies. Efficacy was observed when psychoeducational and behavioural therapy principles were adapted into digital formats; an approach observed in the development of interventions for a neurotypical population. However, more emphasis should be placed on developing technologies in collaboration with the target population to better understand the appropriate adaptations required.

Can consumer grade finger ring trackers add diagnostic value? A comparison of measurement performance of 3 rings to clinical polysomnography

I. Fietze[1], S. Bauerfeind[1], T. Penzel[1], S. Herberger[1]
[1]Charité University Medicine Berlin, Interdisciplinary Center of Sleep Medicine, Berlin, Germany

Introduction: Finger ring trackers are a growing consumer health sensor product category that provide individual sleep metrics, whose accuracy and measurement performance remains currently unknown. We investigated the accuracy of reported overall total sleep time (TST), and sleep stages of 3 commercial finger ring-trackers in a real-world all-comers university sleep lab population by comparing it to the gold standard polysomnography (PSG).

Materials and methods: The diagnostic performance of 3 consumer-grade finger ring trackers was compared to in-lab PSG. The devices used in the investigation were the Oura Ring (Gen. 3, Oura Health Oy, Finland), SleepOn Go2Sleep (SleepOn, USA), and Circul Ring (Bodymetrics, USA). Data was acquired in the timeframe of Aug. - Nov. 2022 on a regular Apple iPhone (SE, 6) using the latest version of OS and ring manufacturers latest mobile software version in the Charité University Berlin sleep laboratory in parallel to PSG (Somnomedics, Randersacker, Germany), which was evaluated following the latest AASM standard. The study was conducted under local ethics board approval. 45 patients were included, and consented to participation. Absolute values for total sleep time (TST) were analyzed as primary end-point and compared against a previously determined non-inferiority threshold. Ensuing and ongoing statistical analyses of secondary endpoints include the diagnostic accuracy of sleep stages and epoch-by-epoch analyses.

Results: In a total of 45 measurement nights on 45 different patients, data was successfully acquired for 29 nights (Oura), 34 nights (SleepOn) and 30 nights (Circul), with non-usable measurements resulting from different reasons. Regarding the primary endpoint TST, the Oura and SleepOn over-estimated, while Circul underestimated in their measurements; the 98,3% confidence interval exceeded the previously defined equivalence limit of +/-26 Minutes for all 3 rings. Oura had a confidence interval from 3,7 to -40,3 Minutes, SleepOn from -41,2 to -79,3 Minutes and Circul from 57,7 to -13,9 Minutes. The Mean of the differences were: -18,31 Minutes (Oura), -60,29 Minutes (SleepOn) and 21,87 Minutes (Circul). Additional epoch-by-epoch analysis is currently ongoing.

Conclusions: Ring trackers are not able to measure sleep, as expressed by TST, with high enough accuracy to be considered equivalent to in lab-PSG. Different models of finger ring trackers over- and underestimated the primary outcome variable, TST. Moreover, use of the ring-trackers in an all-comers sleep-lab population led to a high number of non-usable recordings. The increasing popularity of finger ring trackers as wearable devices warrants a more critical consideration of their measurement accuracy. Further analyses of measurement performance parameters are currently ongoing and will be published in the future. We call for further systematic evaluation of consumer grade trackers, finger rings, and others, to educate the general public about their real performance.

Deep transfer learning for sleep staging using ear-EEG

A. Specht[1], J. Berent[1], C. Dong[2], P. Saini[2], D. Rye[2], D. Ehrens[1]
[1]NextSense Inc., R&D, Mountain View, United States, [2]Emory University, School of Medicine, Sleep Center, Atlanta, United States

Introduction: Traditional sleep monitoring using polysomnogram (PSG) presents numerous challenges. Not only are they cumbersome and uncomfortable, but they also come with significant expenses, demand expertise in operation, and are time-consuming. The result is often a procedure that can be biased and unfit for longitudinal studies. In contrast, Ear-EEG emerges as a beacon of hope, offering a convenient, minimally-intrusive alternative that is more accommodating for users while preserving the integrity and quality of sleep data.

Materials and Methods: Our primary data source was the Excessive Daytime Sleepiness (EDS) Study Dataset, meticulously gathered between 2021-2022 at the Emory Sleep Center. This encompassed simultaneous ear-EEG and PSG data from eight healthy participants. The ear-EEG data was captured using a device developed by NextSense, complemented by sleep annotations from three expert technologists. Despite a relatively small dataset, we utilized advanced pre-trained EEG models, including SeqSleepNet, SleepTransformer, and L-SeqSleepNet, leveraging the capabilities of deep learning. We integrated both direct transfer and a range of transfer learning strategies, adapting EEG models for ear-EEG data. Model performance was stringently evaluated using the Macro-F1 metric, coupled with a rigorous cross-validation leave-one-out strategy subject-wise, ensuring a clear demarcation between training and validation sets. An entropy-based confidence metric was also incorporated to systematically judge prediction accuracy at all time.

Results: Remarkable performances in sleep staging was achieved using NextSense ear-EEG data: Accuracy 90%, Macro-F1 78%, Cohen's Kappa 83%. Transfer learning methods, especially when paired with state-of-the-art models, revealed a clear overlap in features between ear-EEG and traditional scalp EEG. An internal study further illuminated this, indicating an agreement score exceeding 80% between ear-EEG and standard EEG consensus. Delving deeper, an examination of the attention mechanism in SleepTransformer provided insights into the model's prioritized input regions, clarifying the perceived similarities and distinctions between EEG and ear-EEG. The entropy-based confidence metric discerningly predicted model accuracy. In instances we found a compelling correlation between the model's certainty and the degree of agreement among human annotators.

Conclusions: The advent of ear-EEG technology heralds a transformative era in sleep monitoring. By melding convenience with high-level data capture, it presents vast potential beyond traditional monitoring. The user-friendly nature of ear devices, coupled with their sleep staging capabilities, makes them ideal for diverse applications – from personalized sleep pattern tracking for individuals to broader clinical and research studies. Their adaptability and striking resemblance to conventional EEG techniques hint at a future where sleep monitoring is more accessible and integrated into daily life.

Desktop app for detecting sleep spindles from sleep EEG data

K. Fujiwara[1], S. Saeda[1], Y. Sumi[2], H. Kadotani[2]
[1]Nagoya University, Nagoya, Japan, [2]Shiga University of Medical Science, Otsu, Japan

Introduction: Polysomnography (PSG) is the gold standard for sleep tests, which collects multiple physiological data overnight, including electroencephalography (EEG), electromyography (EMG), electrocardiography (ECG), respiration, oxygen saturation (SpO2). Sleep specialists visually scored these data and utilized them for diagnosing sleep disorders. Sleep spindle and K-complex are clinically important EEG waveforms that characterize non-REM sleep stage 2 (Stage N2). In addition, sleep spindles may be an important biomarker in various psychiatric disorders. According to the Sleep Scoring Manual, a sleep spindle is a series of sinusoidal waves with a frequency of 11-16 Hz, a duration of at least 0.5 seconds, and a maximum amplitude at the central electrodes. Spindle detection has been performed manually by experts; however, it is burdensome even for experts to manually detect sleep spindles because it is based on visual observation of EEG data overnight. Thus, an accurate and automatic spindle detection method has been required to achieve consistent spindle detection and reduce the burdens on experts.

Materials and methods: We have developed a machine learning model, referred to as SST-RUS, for detecting sleep spindles by utilizing synchro-squeezed wavelet transform (SST) and RUSBoost. SST is a time-frequency analysis method for extracting appropriate features of spindle detection, and RUSBoost is an efficient classification algorithm for a dataset with imbalanced labels. Its average classification performances between spindles and non-spindles waveforms of SST-RUS were the F-measure of 0.70, the sensitivity of 76.9%, and the positive predictive value (PPV) of 61.2%. Although SST-RUS may be useful for clinical sleep medicine as well as sleep studies, SST-RUS was not easy to use in hospitals since it was performed in MATLAB only. In this study, we developed a desktop app for sleep spindle detection based on SST-RUS. The app performs in a stand-alone manner on Windows and Mac OS and provides an easy-to-use graphical interface (GUI). The software source codes and the pre-trained model file, in addition to the executable files, can be downloaded from GitHub (https://github.com/hps-laboratory/Spindle-Detection-Application.git).

Results: The app requires an EDF file that contains the C3 channel signal and the corresponding CSV file containing a sleep stage scoring table. This app analyzes the C3 channel signal and does not score sleep stages because most PSG analysis software has already provided automatic sleep staging functions. The developed app can output the locations of spindle waveforms on the EEG data, the number of detected spindles in each epoch, and their total numbers. Using our developed app, clinicians and researchers can detect spindles automatically from their sleep EEG data.

Conclusions: We developed a desktop app for automatic spindle detection based on SST-RUS. The developed desktop app provides an easy-to-use GUI. Sleep spindles are automatically detected from the input EEG data, whose file format is EDF. Our app enables researchers to accelerate sleep studies based on spindles as well as to reduce the burdens of experts on sleep scoring in hospitals.

Development and validation of an automated and portable sleep staging system based on a single-channel EEG device

M. Melo[1,2], J. Vallim[1,2], K. Sousa[2], L. Soster[3,2], S. Garbuio[2], G. Pires[1,2], R. Bonaldi[2]
[1]Universidade Federal de São Paulo, Department of Psychobiology, São Paulo, Brazil, [2]SleepUp Tecnologia em Saúde LTDA, São Paulo, Brazil, [3]Universidade de São Paulo, Hospital das Clínicas, São Paulo, Brazil

Introduction: Sleep staging is based on the analysis of electroencephalogram (EEG) frequency bands and is supplemented by the analysis of eye movements and muscle tone. It is a laborious process that requires skilled human personnel, is subjected to analysis bias, and often presents a reduced interscorer agreement rate. Automated sleep staging systems can standardize polysomnography (PSG) scoring, enabling its large-scale application, which may be helpful in clinical and epidemiological assessment of sleep. In addition, ensuring system portability by reducing the number of EEG channels can be a powerful ally for remote and home sleep monitoring, potentially expanding sleep awareness and identification of sleep disorders. Therefore, the aim of this study was to validate an automated and portable sleep staging system based on a single-channel EEG device in a heterogeneous population (with and without sleep disorders) in order to develop a robust model able to discriminate different inputs.

Materials and methods: Twenty-seven subjects (56% female, mean age 42.415.6 years - range: 23-74) underwent a full-night type I PSG while wearing a single-channel flexible EEG headband device. Of the 27 subjects, 16 had obstructive sleep apnea (50% mild - mean AHI: 8.81.7, mean age: 42.114.7 years; 12% moderate - mean AHI: 22.32.3 and mean age: 55.56.4 years; 38% severe - mean AHI: 50.627.8, mean age: 58.715.7 years). The headband signal was segmented into 30-second epochs, according to PSG stages (scored by board-certified sleep technologist), and 17 time and frequency-domain features were extracted from the segments. The 30-second epochs were divided into training and test sets according to an 80/20 principle. An ensemble of bagged trees classifier, with 30 learners was validated using 5-fold cross-validation.

Results: For the validation set, we obtained an overall accuracy of 98.6%, with precision of 0.99 for wakefulness, 0.94 for N1, 1.0 for N2, 0.98 for N3, and 0.99 for REM and recalls of 0.99, 0.95, 0.99, 0.99 and 0.99, respectively. The highest error was for N1 which was confounded with N2 (error rate=6%). For the test set, we obtained an overall accuracy of 99.3%, with precision of 0.981 for wakefulness, 0.991 for N1, 0.995 for N2, 0.996 for N3, and 0.993 for REM and recalls of 0.957, 0.991, 0.993, 1.0 and 0.997, respectively.

Conclusions: Our previous studies have validated the use of non-sleep tracking wearables for sleep staging in a non-clinical population. This study demonstrates the potential of using the same single-channel EEG device to accurately classify sleep in a sample of sleep-disordered and healthy individuals, demonstrating its robustness to application in a heterogeneous group without overfitting.

Do state-of-the-art sleep-scoring algorithms preserve clinical information?

M. Bechny[1,2], L. Fiorillo[2], G. Monachino[1,2], J. van der Meer[3], M.H. Schmidt[3,4], C.L.A. Bassetti[3], A. Tzovara[1,3], F.D. Faraci[2]

[1]Institute of Computer Science, University of Bern, Bern, Switzerland, [2]Institute of Digital Technologies for Personalized Healthcare, University of Applied Sciences and Arts of Southern Switzerland, Viganello, Switzerland, [3]Inselspital, Bern University Hospital and University of Bern, Department of Neurology, Bern, Switzerland, [4]Ohio Sleep Medicine Institute, Dublin, United States

Introduction: Machine and Deep Learning (ML/DL) algorithms promise to enhance the time-consuming task of sleep scoring. DL algorithms tend to have higher accuracy but lack explainability compared to feature-based ML. The computer science field often prioritizes average epoch-wise accuracy metrics, overlooking subject-wise performance. We emphasize that constructed hypnograms play a crucial role in deriving clinically-relevant parameters (e.g., %-sleep-stages, REM-latency) helping clinicians to determine eventual sleep disorders. Our study aims to quantify potential biases in state-of-the-art sleep-scoring algorithms towards these parameters.

Materials and Methods: As a ML approach, we utilized publicly available YASA[1], and as a DL approach, we retrained U-Sleep[2,3], a deep convolutional neural network, on 13 open-access databases. For objective testing, we used 4010 out-of-domain PSGs from the BSDB* containing primarily sleep-wake-disordered subjects. As ground truth, clinical parameters calculated from physician-scored hypnograms were compared to those derived from algorithms' predictions utilizing the same input biosignals. To quantify the bias, i.e., the systematic error in the algorithm's predictions, we modelled the difference between predicted and actual values of clinical parameters using locally weighted regression, while controlling for age, gender, apnea-hypopnea- and periodic-limb-movement-indices (AHI/PLMI). Significant biases were identified when 95% confidence intervals of expected errors differed from 0.

Results: (YASA, U-Sleep) achieved average on-subject accuracy of (75.0, 79.6)%, respectively. Both performed best for subjects in their 20s with decreasing performance for younger and older subjects and also with AHI and PLMI. YASA overestimated %-Wake, with bias peaking at 20% for subjects in their 70s. Consequently, it overestimated WASO and underestimated sleep-efficiency. U-Sleep underestimated %-Wake, with bias >5% for subjects under 10 and over 70 years, resulting in underestimated WASO and overestimated sleep-efficiency. YASA overestimated %-N1 in children, while both algorithms underestimated it for adults: bias up to 20% for males in their 70s for YASA. Both algorithms overestimated %-N2, especially U-Sleep in children (bias >25%), and underestimated %-N3 with an error of ~7% in children under 10. %-REM was underestimated in children and overestimated in adults. Hence, REML was overestimated in children and underestimated in adults by ~15-20 minutes. YASA overestimated hourly sleep-stage transitions in children and underestimated them in adults. U-Sleep consistently underestimated transitions for adults. In most of the cases, higher AHI/PLMI correlated with greater bias with no gender differences.

Conclusions: Despite the good accuracy of both algorithms, we find quantifying bias towards clinical parameters understudied yet critically important. Our research presents a computational framework for bias quantification and preliminary results on a rich database. We revealed bias in the identification of the wake state, also reflected in wake-derived parameters, by both algorithms. Moreover, both YASA/U-Sleep struggle to capture age-related differences in sleep manifestation, indicating the need to include age information for the training of sleep-scoring algorithms. In summary, future efforts in optimization of the automatic sleep-scoring algorithms should rather be concentrated towards the accuracy of clinically relevant parameters than individual epochs.

References:
[1] https://doi.org/10.7554/eLife.70092
[2] https://doi.org/10.1038/s41746-021-00440-5
[3] https://doi.org/10.1038/s41746-023-00784-0

DReAMy: a library for the automatic analysis and annotation of dream reports with multilingual large language models

L. Bertolini[1], A. Michalak[2], J. Weeds[1]
[1]University of Sussex, Department of Informatics, Brighton, United Kingdom, [2]IMT School for Advanced Studies Lucca, Lucca, Italy

Introduction: Dream researchers have long faced the challenge of consistently and automatically annotating large sets of textual reports describing oneiric experiences. While machine learning (ML) algorithms for the automatic analysis of sleep-related physiological data have remarkably improved, the automatic analysis of dream reports has lagged behind. They remain largely based on dated approaches lacking the ability to reason over the full context of a report and required considerable data preprocessing (e.g., distributional semantics models or dictionary-based analyses). In this work, we introduce the DReAMy (Dream-Report Analysis Methods with python) library, a tool based on powerful and state-of-the-art large language models (LLMs), which enables the analyses and a fast annotation of vast numbers of dream reports with respect to emotions and characters in each report.

Materials and Methods: To test DreAMy we conducted two main experiments, using a set of dream reports from DreamBank.net annotated following the Hall & Van de Castle (HVDC) framework. The first experiment involved character identification (CI), where an English-only text-generation LLM was trained to reproduce characters identified in each report by expert annotators. In the second experiment, sentiment analysis (SA), we trained a multilingual and an English-only LLM with a text classification setting, to determine if any of the five HVDC emotions (i.e., anger, apprehension, sadness, confusion, happiness) were present in a report. We also trained a text-generation LLM to predict which emotion was present *and* which character was experiencing it. Text-generation models were evaluated via the Rouge1 metric (R1, [0,1]), while text classification models were evaluated via F1 scores [0,1].

Results: The text-generation models achieved a high R1 score (0.78 for CI, 0.79 for SA) and produced coherent and grammatically correct output, in line with the HVDC notation. For instance, given the same report, the CI model generated *"individual female known adult; individual male stranger adult; individual male known adult."*, while the SA model produced *"The individual female known adult experienced apprehension."*. It is important to note that, given a report, the CI and SA tasks do not necessarily overlap, since, according to the HDVC system, not all characters must be associated with emotions. Both text classification models performed well, producing a high F1 (0.83 for English-only and 0.86 for multilingual), and were robust to relevant biases in the dataset.

Conclusions: We introduce DReAMy, a [fully open-source](#) tool that leverages state-of-the-art LLMs to support expert annotators and standardize dream analysis research. The proposed tool and models provide a reliable and efficient means for extracting information about characters, emotions, and their combinations from textual reports while remaining easy to use, without the need for any data pre-processing. Aside from these, DReAMy comes equipped with other relevant and conveniently accessible features, such as reports' encodings, dimensionality reduction and clustering methods.

Enhancing inter-database generalization and data-privacy safe-warding in automatic sleep staging using decentralized deep-learning strategies

A. Anido-Alonso[1], D. Alvarez-Estevez[1]
[1]Universidade da Coruña, Centre for Information and Communications Technology Research (CITIC), A Coruña, Spain

Introduction: Despite the number of attempts reported in literature, the automation of sleep-staging remains an active area of research interest. The maintenance of robust generalization performance when automatic algorithms operate in multiple-database scenarios (other than the local setting where the algorithm was initially developed) remains a challenge, which raises concerns about their practical use at large scale. Lack of inter-database generalization performance can be tackled by increasing the amount and heterogeneity of training data. Other approaches use part of the target data to fine-tune the final model, i.e. transfer learning. However, these approaches require data centralization which involves disadvantages concerning privacy preservation, inflexible design, and scalability issues. We explored different decentralized deep-learning strategies in the context of automatic sleep staging, in particular, local model assembling and Federated Learning, in order to achieve robust generalization performance across different databases while overcoming the aforementioned limitations

Materials and Methods: We conducted four experiments to compare the two proposed data-decentralized learning strategies (i.e. ensemble and federated models) with respect to another two baseline approaches, namely single-database and data-centralized derived models. The ensemble approach integrates several locally pre-trained models to be combined together producing a final staging classification. More specifically, we explored four ensemble techniques namely output averaging, max-voting, size-proportional weighting, and Nelder-Mead optimization. The other investigated approach, Federated Learning, comprises collaborative and distributed learning through an iterative optimization process that uses only parametric information from the independent "client" datasets. Remarkably, both proposed approaches avoid the exchange of sensitive local raw data during the learning process, in contrast to tested baseline counterparts.

We used six heterogeneous and independent public databases for performance assessment using a leaving-one-database-out scenario. In other words, for each possible combination of five datasets to be used as training data, the remaining database was used to evaluate the resulting generalization performance. A state-of-the-art deep-neural network architecture with common configuration settings was used to conduct the experiments. Cohen's kappa index was used as reference metric of agreement between predicted output and human-expert assigned labels

Results: Our results indicate that baseline single-database derived models show the lowest performance when predicting external databases, $k_{average} = 0.49$. Overall, database-combined models achieved the best performance, $k_{average} = 0.66$, however, this strategy involves aforementioned limitations concerning high computational resources, inflexible design, and sharing of sensitive data. Remarkably, the proposed decentralized methods achieved similar levels of generalization in comparison with the best baseline approach. More specifically, Federated Learning obtained the best result ($k_{average} = 0.65$) followed by the ensembling strategies of size-proportional weighting ($k_{average} = 0.64$), Nelder-Mead ($k_{average} = 0.63$), output averaging ($k_{average} = 0.62$) and max-voting ($k_{average} = 0.59$).

Conclusions: The use of decentralized approaches offers a viable alternative attaining comparable levels of generalization with respect to best data-centralized baseline approaches, with additional advantages in terms of scalability, flexibility, and data-privacy protection.

Estimated sleep durations and sleep architecture obtained from a large U.S. sample by home-based under-mattress monitoring devices

J. Zitser[1], A. Cotton-Clay[2], L. Fava[2], V. Easwar[2], A. Kinsolving[2], P. Kahn[2], C.A. Kushida[3]
[1]Tel Aviv Sourasky Medical Center, Neurology, Tel Aviv, Israel, [2]Fullpower Technologies, Santa Cruz, United States, [3]Stanford University, Redwood City, United States

Introduction: Consensus recommendations published by the American Academy of Sleep Medicine and National Sleep Foundation recommend a minimum of seven hours of sleep per night for adults to promote optimal health and reduce the risk of adverse outcomes. Sleep architecture refers to the basic structural organization of normal sleep. NREM sleep constitutes about 75 to 80 percent of total time spent in sleep, and REM sleep constitutes the remaining 20 to 25 percent. However, a population-based assessment of sleep duration and architecture, to our knowledge, has never been reported. This study aims to characterize sleep duration and architecture in a large U.S. sample.

Materials and methods: Descriptive analysis was performed on collected de-identified data from 28821 users (45% female, mean age 49±13 years) of a commercially available home sleep monitoring device (Sleeptracker-AI Monitor, Fullpower Technologies, California, USA) who had 300 days of recordings between May 2022 and April 2023. The device passively monitors sleep using piezo-electric sensors that register the forces exerted through the mattress. Only the 21694 users (51% female, mean age 47±12) with mean AHI<5 were included in the primary analysis. Total Sleep Time (TST), Wake After Sleep Onset (WASO), percentage of light, deep and REM sleep were included as parameters. Users were divided into 5 years groups (from 15 years until 95 years of age), yielding a total of fifteen different age groups. Statistical analyses were performed with a linear mixed-effects model using the statsmodels package (Seabold & Perktold, version 0.14.0) in python (Python Software Foundation, version 3.10.11).

Results: 7,139,915 recorded nights were included in the primary analysis, and 9,493,901 overall. In minutes, overall estimated TST mean (95% Confidence Interval) was 431.0 (425.2, 436.8) minutes for the 20-25 year group, 413.4 (411.8, 414.9) for the 50-55 year group and 420.5 (411.3, 429.6) minutes for the 80-85 year old group. Regarding sleep architecture, the 20-25 year olds had 15.9% (15.9,16.2) of deep sleep and 26.0% (25.6,26.3) of REM sleep, while the 50-55 group had 14.3% (14.3,14.4) and 25.7% (25.6,25.8) of deep and REM sleep respectively and the 80-85 group had 13.1% (12.6,13.6) and 22.9% (22.3,23.4). Interestingly, when the same age groups but considering users with a mean AHI>5 were analyzed, we found a percentage of deep sleep of 0.9% (-0.4,2.2), 1.4% (1.2,1.5) and 2.1% (1.5,2.9), lower in all of groups when compared with the users without OSA.

Conclusions: We described sleep duration and sleep architecture in a large population, confirming the U-shape distribution of sleep duration, where people in middle age sleep less. We also found an expected decline in deep sleep and REM sleep in the older group. Interestingly, when subjects with sleep apnea were analyzed, we found a further decline in deep sleep independent of age.

Evaluating the feasibility of out-of-center sleep testing (OCST), level II polysomnography (PSG) — The experience of a Canadian service provider

J. Leech[1], C. Guilbault[1], T. Kendzerska[2], S. Helgason[3], N. Morin[3], C. Teixeira[3]
[1]Somnocor, Gatineau, Canada, [2]Ottawa Hospital Research Institute, Ottawa, Canada, [3]Nox Medical, Reikjavik, Iceland

Introduction: In-lab or level I PSG is considered the gold standard for objective measurement of sleep, but it is time-consuming and resource-intensive. Unattended or level II PSGs essentially involve recording the same physiological signals as in-lab PSG but in the patient's home. As these tests are unattended and the patients spend, sometimes up to 16 hours with the sensors attached, the likelihood of possible failures is significant. With this in mind, as a part of the quality improvement initiative, we wanted to evaluate the feasibility of performing level II PSG and better understand level II PSG's capabilities for the diagnosis of sleep-disordered breathing (SDB) in a Canadian community-based sleep center (Somnocor, Gatineau Quebec).

Materials and Methods: We included in the analysis all consecutive individuals 17 years and older, who were referred to the sleep center for SDB assessment, from February 2021 to May 2023, and underwent a level II PSG study using the Nox A1 and A1s equipment (Nox Medical, Reykjavik). The PSG montage and electrodes were applied by a registered sleep technologist in the laboratory setting prior to releasing the patient home to sleep. We retrospectively analyzed all the studies to assess the feasibility of utilizing level II PSG by collecting information on the number/proportion of test failures and the reason for failure. A valid study was defined as at least 4 hours of recorded interpretable data (electroencephalogram [EEG], oximetry, and flow). Moreover, we analyzed the overall signal quality that was determined as the lowest quality value of the following signals: oximeter, airflow, abdominal or thoracic respiratory effort signals, from 0 to 100%.

Results: Of the 317 patients (172 males [54%] with a median age of 50 [IQR 40-59] and a mean BMI of 30.2 [IQR 25.2-33.8]) with suspected SDB tested with level II PSG, 6 (2%) had inconclusive tests due to technical failure. The reasons for failure included: data accidentally erased in 1 (0.31%), equipment didn't start the programmed study in 4 (1.2%), and sleep was not recorded in 1 (0.31%). All 6 participants, who had inconclusive test results, underwent a second study, each producing a valid recording. From the valid studies (311/317), we have obtained a mean total sleep time (TST) of 403 min (95%CI 395-411) with a mean sleep efficiency of 80.9% (95%CI 82.1-79.6), and a mean signal quality overall of 95.9% (95%CI 97.1-94.8).

Conclusions: This retrospective community-based single-center study on an adult population referred for sleep assessment with suspected SDB demonstrated a low failure rate, overall good signal quality, and prolonged TST for level II PSG. These encouraging results are aligned with previously published data, and give confidence towards making level II an appropriate OCST sleep test to diagnose SDB.

Exploring non-invasive sensor methods for sleep apnea detection: image and audio processing approaches

J. Chire[1], T. Vidigal[2], F. Ruiz[1], G. Hashioka[1], L. Castro[1,2]
[1]Vigilantes do Sono, Sao Paulo, Brazil, [2]Universidade Federal de São Paulo, Sao Paulo, Brazil

Introduction: Obstructive sleep apnea (OSA) is underdiagnosed but common. It impacts quality of life, cognition, mental health, and increases cardiometabolic risk factors. Polysomnography is the gold standard for detection, but non-invasive methods like oximetry and smartphone-based audio/image processing are gaining attention. This study applies supervised machine learning models to develop and validate such an approach.

Materials and Methods: The approach covers two steps: Signal Processing and Machine Learning. We have two kinds of inputs (image, audio) and we are initially studying them separately. The Image Processing involves Facial Recognition, used to identify landmarks of interest and to calculate the distance between them. We used a set of 436 pictures (front and profile) from a sample of 218 outpatients (42.9±12.6 years, 59.6% males) who underwent full polysomnography and completed a set of questionnaires, including the BERLIn Questionnaire, sociodemographic and clinical characteristics. A dataset was built inputting features (landmarks' distances) and probabilistic labels (2 classes) considering the prognosis related to the apnea and hypopnea index (AHI). Therefore our dataset is distributed as follows: IAH<5 (n=80) and IAH≥5 (n=138). The experiments were performed using cross validation with K=10, comparing well-known classification algorithms with support for an imbalanced dataset, such as Decision Tree, Random Forest and XgBoost. Next on, Audio Processing is considering feature extraction using MFCC (Mel Frequency Cepstral Coefficients). Forty coefficients were extracted from a dataset with 1.000 audio samples (500 snore, 500 non-snore) and experiments were also performed using cross validation with K=10 and classification algorithms, such as Naive Bayes, Logistic Regression, Decision Tree, Random Forest, XgBoost.

Results: The preliminary results obtained from cross-validation revealed promising outcomes in the classification of risk factors for OSA. Three scenarios were considered for input data. Initially, only the features related to the BERLIn Questionnaire were employed, resulting in an accuracy metric of 67.3%±7.3. Subsequently, the inclusion of sociodemographic features led to an improvement, yielding an accuracy of 84.4%±8.9. Finally, the addition of image features further enhanced the classification, reaching an accuracy of 83.5%±8.2. These results were achieved using the Xgboost algorithm, which proved to be the most effective. Moreover, when assessing snore detection, the mean accuracy metric surpassed 80%, with the best results obtained using XgBoost, achieving a final accuracy close to 95%.

Conclusions: This study presents the preliminary results obtained from both image and audio sources for detecting OSA, reinforcing the proposed approach. It is important to note that the initial results obtained from Image Processing are based on a limited dataset, indicating the potential for further improvement by expanding the dataset with additional collected samples. By leveraging the combination of cameras and microphones on mobile devices, this research aims to propose an affordable, feasible, and low-cost non-invasive screening method for detecting different levels of OSA.

Functional Ultrasound imaging as an emerging tool for whole brain imaging of sleep in rodents

A. Bergel[1], M. Matei[1], N. Zucker[1], S. Pezet[1], M. Tanter[1,2]
[1]Inserm/ESPCI PSL Paris /CNRS, Institute Physics for Medicine, Paris, France, [2]Iconeus, Paris, France

Introduction: Present in most mammalian species, rapid-eye-movement sleep (REMS) is a peculiar brain state combining the behavioral components of sleep and the electrographic patterns of wake. Long associated with dreaming, emotional content and memory consolidation, REMS is thought to exhibit a general state of the brain largely comparable to active behavior as their electrophysiological profiles are strongly similar. Nevertheless, the question of the function of REMS remains today debated and its study is hampered by the lack of neuroimaging techniques able to image the whole brain activity with sufficient sensitivity and spatiotemporal resolutions. Recent advances in ultrasound imaging provides a well-adapted tool for such studies of metabolic and neurovascular dynamics during non-REM and REM sleep.

Materials and Methods: We implemented functional ultrasound imaging (5500 Hz pulse repetition frequency, 128 elements linear array, 15 MHz central frequency) on rats over multiple coronal and sagittal brain sections during hundreds of spontaneous REMS episodes to provide the spatiotemporal dynamics of vascular activity in N=259 brain regions (Matei *et al* 2022). fUS imaging was performed concurrently with intra-hippocampal extracellular recordings of local field potentials (LFP).

Results: In a first set of experiments, we revealed brain-wide spatiotemporal hemodynamics of single REMS episodes and demonstrated the close association between massive hyperemic events and fast gamma oscillations in rats. REMS hemodynamics consist in a tonic increase in cerebral blood volume (CBV), interleaved with large-amplitude brain-wide phasic hyperemia. The intensity and spatial reach of these "vascular surges" (VS) largely outmatched wake levels, revealing brain-wide amplification, strongest in the dorsal hippocampus and dorsal thalamus. Additionally, we found LFP precursors to VS in the fast gamma (80-110 Hz) bands in the CA1 region.

In a second series of experiments, a dissociation between basal/midbrain and cortical structures was found, the first ones sustaining tonic activation during REMS while the others are activated in phasic bouts. We isolated the vascular compartment in our recordings and identified arteries in the anterior part of the brain as strongly involved in the blood supply during REMS episodes. Finally, we found a peculiar activation pattern in the posterior amygdala, which is strikingly disconnected from the rest of the brain during most REMS episodes (Matei *et al* 2022).

Conclusions: The mechanisms and functions of these energy-demanding vascular patterns remain elusive and a global picture of brain activation during REMS is currently missing. Our findings at the whole brain scale suggests that the amygdala undergoes specific processing during REMS and may be linked to the regulation of emotions and the creation of dream content during this very state. Another hypothesis would be that this decorrelation of the amygdala, coupled with the low amplitude of their vascular activity, could be linked to a defensive mechanism preventing the production of negative emotional content during REMS and preventing its premature termination.
Matei M. *et al*, Commun. Biol., 5:1306, 2022.

Functional ultrasound tools for automatic atlas registration and chronic neuroimaging on naturally behaving and sleeping rats

F. Cybis Pereira[1,2], N. Ialy-Radio[1], S. Bhattacharya[2], M. Nouhoum[2], B.-F. Osmanski[2], S. Pezet[1], M. Tanter[1]
[1]Physics for Medicine Paris, INSERM U1273, CNRS, ESPCI Paris, PSL Research University, Paris, France, [2]Iconeus, Paris, France

Introduction: Brain-wide functional images of freely moving and naturally sleeping animals are key to understanding how cognitive behaviors may emerge from dynamic activation across different areas of the underlying neural circuitry. Functional Ultrasound (fUS) imaging has recently been demonstrated to robustly record brain-wide cerebral blood volume (CBV) dynamics as an indirect measure of neural activity over several weeks or months in anesthetized or movement-constrained rodents. However, fUS experiments on naturally behaving or sleeping rodents are scarce and limited by the difficulty to identify cerebral structures during experiments based solely on the Doppler images and the shape of the vessels. A solution for coupling unrestrained cognitive experiments, fUS data and reproducible imaging is essential and can provide reliable use of this technique in a wide variety of behavioral setups, including sleep/awake paradigms.

Materials and Methods: Here we provide tools for automatic vascular-based registration and neuronavigation that allow for precise mounting and positioning of lightweight ultrasonic probes in any plane of interest. The full implementation is divided into three steps: first a fully-automatic volume registration based on the cerebrovascular print of the animal is performed using custom 3d printed setup coupled with miniaturized translation and rotation motors, then the light probe and probe holder are positioned by the motors onto the plane of interest and finally the setup is fixed for chronic imaging as a plug-and-play technology at the beginning of each recording session.

Results: We evaluated an averaged Pearson correlation of 0.90 with 0.05 of standard deviation between cerebral blood flow images across different recording sessions in a month. These tools were used on sleep experiments that revealed reproducible vascular surges during REM sleep on rats both in sagittal and coronal planes. Similarly, awake open-field experiments revealed correlations between neurovascular activity in the hippocampus formation and the speed of the animal.

Conclusions: We introduce a complete toolkit for wide-brain ultrasound neuroimaging in naturally behaving and sleeping rodents. It represents an important technological step for the adoption of Ultrasound as whole-brain functional neuroimaging technique and for future longitudinal studies linking behavior during active wake and sleep.

'High-Density-SleepCleaner': a semi-automatic artifact removal routine tailored to high-density sleep EEG, available as an open-source solution

S. Leach[1], G. Sousouri[1], R. Huber[1,2]
[1]University Children's Hospital Zurich, Child Development Centre and Children's Research Centre, Zurich, Switzerland, [2]University Children's Hospital Zurich, Department of Child and Adolescent Psychiatry and Psychotherapy, Zurich, Switzerland

Introduction: The advent of high-density electroencephalography (hd-EEG) with up to 256 channels has become essential in the field of sleep research. However, the abundance of data generated by this extensive channel configuration in overnight EEG recordings poses challenges in effectively removing artifacts. Reliable approaches that give the user good control of the data while, simultaneously, being practical and time-efficient are rare for sleep hd-EEG recordings.

Methods: To bridge this gap, we developed a novel MATLAB-based artifact removal routine, specifically tailored for high-density sleep hd-EEG recordings. This routine is freely available on GitHub (Hd-SleepCleaner) and online explanation videos exist. Hd-SleepCleaner utilizes a user-friendly graphical user interface (GUI) that allows users to assess epochs based on four sleep quality markers (SQMs). For their computation, the EEG of each channel is, when needed, normalized using robust z-standardization for the comparison of all channels altogether. By considering the topography and underlying EEG signal, users can identify and remove artifactual values. Basic knowledge of both the desired (patho-)physiological EEG and artifactual EEG is required to accurately identify artifacts. In the background, automatic outlier detection procedures support the artifact removal routine, which effectively identifies and removes obvious artifacts. The output of Hd-SleepCleaner is a binary matrix (channels x epochs), indicating the presence or absence of artifacts. In cases where artifacts are detected, affected channels can be restored within the affected epochs using the epoch-wise interpolation function provided in the online repository.

Results: In total, the procedure was successfully applied in 54 nights. The efficacy of our routine was assessed through a comprehensive evaluation that involved the examination of two nights of ~8 hours of sleep representing extreme cases (with few and many artifacts). The night with bad EEG quality showed an abnormal topography of slow-wave activity (SWA; 0.5–4.5 Hz) and numerous outliers in the time course before artifact removal. Applying Hd-SleepCleaner resulted in the removal of 207 singular artifact values, 37 bad epochs (epochs in which all channels were affected), and two bad channels (channels in which all epochs were affected). Thereafter, the topography and time course of SWA exhibited a physiologically plausible pattern with a fronto-central hotspot and a cyclic pattern that gradually decreased throughout the night, typical for NREM sleep in young adults. Conversely, in the night with good EEG quality, the initial analysis demonstrated a physiological topography and minimal outliers in the time course of SWA. Hd-SleepCleaner removed 187 singular artifact values and two bad epochs; no bad channels were identified.

Conclusion: Existing artifact removal methods are often tailored for short wake EEG recordings, limiting their applicability in overnight sleep studies. Hd-SleepCleaner offers a transparent, practical, and efficient solution specifically designed to detect artifacts in overnight sleep hd-EEG recordings. Notably, this method excels in its ability to simultaneously identify artifacts across all channels and epochs, resulting in a time-saving routine that enables a comprehensive assessment of the night's recording quality.

Insights on sleep wearables: investigating sleep, sleep-related healthcare, and perceived impacts associated with the use of sleep trackers in Canada

K. Dion[1,2], E. Lee[1,3], T. Kendzerska[4], A. Douglass[1], M.-H. Pennestri[5], R. Godbout[6], D. Gallson[7], R. Robillard[1,2]
[1]University of Ottawa Institute of Mental Health Research at The Royal, Sleep Research Unit, Ottawa, Canada, [2]University of Ottawa, School of Psychology, Ottawa, Canada, [3]Royal Ottawa Mental Health Centre, Sleep Disorders Clinic, Ottawa, Canada, [4]The Ottawa Hospital Research Institute, Ottawa, Canada, [5]McGill University, Department of Educational & Counselling Psychology, Montréal, Canada, [6]Université de Montréal, Faculty of Medicine, Montréal, Canada, [7]Mood Disorders Society of Canada, Belleville, Canada

Introduction: As of 2021, the global market for sleep wearables was valued at 1.8 billion dollars and is expected to double in the next 5 years. Despite the growing popularity of sleep wearables amongst the general public, most studies to date have focused on their application in clinical and research settings resulting in a limited understanding of their real-life implications. The current study thus aimed to investigate the use and perceived effects of sleep wearables in Canada and to examine how this relates to sociodemographic factors, sleep, and engagement in sleep-related healthcare.

Materials and Methods: An online survey on sleep and mental health was distributed in September 2021 to a representative sample of Canadians. Participants had to be Canadian residents of 16 years or older and were selected semi-randomly based on age, sex, and geographic region. The survey contained custom-made questions on wearable use and sleep patterns as well as validated questionnaires including the Insomnia Severity Index-3 (ISI-3) and the Generalized Anxiety Disorder-7 (GAD-7).

Results: A total of 1,200 individuals aged between 16 to 88 years old (53% women) completed the survey. Amongst respondents, 19% (n=231) reported having used a wearable device to monitor sleep. Younger age, being part of a racialized group, being retired, having a higher income level, being on both provincial and private healthcare insurance plans, and having a diagnosed sleep disorder were associated with an increased likelihood of using wearables (χ^2(15)=101.41, p<.001). Of all users, 44-45% indicated that using a wearable had an overall positive impact on their sleep and stress levels, while only 4% perceived a negative impact. Compared to non-users, wearable users reported significantly longer sleep onset latency (users: M=46.7+/-74.5min.; non-users: M=33.9+/- 42.4min.), slept about 1 hour less (users: M=5.7+/-2.1hours; non-users: M=6.6+/-1.7hours), and endorsed more severe insomnia symptoms (ISI-3; users: M=4.7+/-3.0; non-users: M=4.0+/-3.1). The proportion of wearable users was almost double in those who indicated having informed a healthcare provider about sleep difficulties (users: 28%; non-users: 16%) and in those having used sleep medications (users: 30%; non-users: 16%). Lastly, wearable use was identified as a significant moderator of the effect of anxiety symptoms on sleep duration, with users (B=-.014, SE=.002, p<.001) experiencing a steeper decline in total sleep time as anxiety increases compared to non-users (B=-.167, SE=.186, p<.001).

Conclusions: Approximately 1 in 5 Canadians acknowledged having used sleep wearables with age, ethnicity, occupational status, income level, insurance coverage, and sleep disorder diagnosis being significant predictors of usage. Although a majority perceived positive effects of wearables on sleep and stress, users also endorsed higher rates of sleep difficulties, greater engagement sleep-related healthcare, and worse effects of anxiety on sleep duration. Further studies are needed to clarify the relationship between sleep difficulties and wearable use and to identify individual factors associated with beneficial versus harmful use (i.e., "orthosomnia") of wearables.

Integration of drowsiness management tools: experience of three different tools in the mining area

J. Nascimento[1]
[1]UNOPAR, Quality Department, Parauapebas, Brazil

Introduction: Drowsiness is a biological function, defined as an increased probability to sleep. Currently, due to advances in the modern economy, several activities are carried out on a 24-hour basis, such as mining activities. Within this activity, this work regimen has a result significant increase in risks, especially for off-road truck operators, not only due to the variation in the work schedule, but also due to the large size of this equipment, with potential risks of catastrophic accidents. The main objective of the project is the safety of workers and consequent improvement of the individual's sleep hygiene.

Materials and Methods: This is an exploratory descriptive study about a development and a methodology for sleepiness management that consists of two system: The first system, installed in the truck cabin, measures the level of sleepiness in real time within the JDS drowsiness scale, the second technology is the fit for duty test used before the start of the work shift to verify possible behavior deviations, while the third system it is based on a drowsiness redundancy test performed in case the other systems raise alarms. These tools have been used simultaneously for about two years, resulting in a significant and measurable reduction in the number of drowsiness alarms during operation. This project has the participation of more than 500 truck operators monitored 24 hours and more than a million hours of continuous drowsiness monitoring.

Conclusions: Managing drowsiness in dangerous operations such as mining is essential to ensure safety and provide feedback to the health area with inputs from employees who present deviations indicated by monitoring tools.

Keywords: Drowsiness Management, SSMA, Fatigue

Isolated and symptomatic RBD in Parkinson's disease share a common neurophysiological pattern: a pilot TMS study

G. Lanza[1,2], F.I.I. Cosentino[1], B. Lanuzza[1], M. Tripodi[1], M. Morreale[1], A. Galeano[1], G. Toscano[3], M.P. Mogavero[4,5], F. Fisicaro[6], M. Pennisi[6], R. Bella[7], W. Paulus[8], R. Ferri[1]
[1]Oasi Research Institute-IRCCS, Department of Neurology IC and Sleep Research Center, Troina, Italy, [2]University of Catania, Department of Surgery and Medical-Surgical Specialties, Catania, Italy, [3]Oasi Research Institute-IRCCS, Department of Geriatrics, Troina, Italy, [4]Vita-Salute San Raffaele University, Milan, Italy, [5]San Raffaele Scientific Institute, Division of Neuroscience and Sleep Disorders Center, Milan, Italy, [6]University of Catania, Department of Biomedical and Biotechnological Sciences, Catania, Italy, [7]University of Catania, Department of Medical and Surgical Sciences and Advanced Technologies, Catania, Italy, [8]Ludwig Maximilians University, Department of Neurology, Munich, Germany

Introduction: Previous studies found an impairment of the short-interval intracortical inhibition (SICI) and intracortical facilitation (ICF) to transcranial magnetic stimulation (TMS) in Parkinson's disease (PD), including its early stages, compatible with a disinhibition and hypofacilitation of the motor cortex, largely mediated by GABAergic and glutamatergic dysfunction, respectively. Conversely, little is known on the TMS correlates of isolated REM sleep behavior disorder (iRBD), which can long precede the onset of synucleinopathies, such as PD. In a first study in iRBD patients compared to age-matched healthy controls (HC), we observed a significant decrease of ICF and, to a lesser extent, of SICI. Similarly, we showed that iRBD and RBD in the context of PD shared a similar electrocortical profile to TMS. However, a direct comparison between iRBD and PD with (PD+RBD) or without RBD (PD-RBD) is currently lacking.

Materials and Methods: A total of 46 subjects were included: 10 de novo patients with iRBD (median age 68.5 years, interquartile range 60.0-71.0); 10 de novo patients with PD+RBD (70.0 years, 58.0-79.0); 10 de novo patients with PD-RBD (66.5 years, 66.0-75.0); 16 HC (65.0 years, 60.5-70.0). Resting motor threshold, cortical silent period, latency and amplitude of the motor evoked potentials to single-pulse TMS, as well as SICI at interstimulus interval of 3 ms and ICF at interstimulus interval of 10 ms to paired-pulse TMS, were recorded from the right first dorsal interosseous muscle of all participants. Polysomnography-derived REM atonia index (RAI), Mini Mental State Examination (MMSE), Epworth Sleepiness Scale (ESS), and Geriatric Depression Scale (GDS, short form) were also assessed. All participants were right-handed and drug-free.

Results: The groups were all comparable in terms of age, sex, education and, patients, for PD or RBD duration. RAI was indicative of RBD in both iRBD (0.750, 0.683-0.782) and PD+RBD groups (0.814, 0.455-0.853), without difference between them, whereas it significantly differed from that obtained in the PD-RBD group (0.940, 0.934-0.979; p = 0.0001). Neurological examination, MMSE, and GDS were normal in iRBD and HC, whereas PD subjects (with or without RBD) showed a mild-to-moderate motor impairment (MDS-Unified PD Rating Scale, part III <32). ESS was slightly but significantly higher in all patients' groups, although median scores were still within the normal limits. Compared to HC, the other groups exhibited a significant decrease of ICF (iRBD: 0.70, 0.28-0.90; PD+RBD: 0.16, 0.10-0.23; PD-RBD: 0.37, 0.23-1.31; controls: 1.55, 1.40-2.05; p = 0.00001), with a large effect size (η^2 = 0.492) and without any difference between the patient groups.

Conclusions: iRBD, PD+RBD, and PD-RBD shared the same electrocortical profile to TMS, thus suggesting that this approach may be able to uncover neurophysiological markers of synucleinopathy before its clinical onset and supports the view that iRBD itself is already a clinical expression of neurodegeneration. Translationally, this also highlights the glutamate activity as a new potential therapeutic target for both iRBD and PD. Follow-up studies are needed to further support the impact of RBD in the course of PD.

Managing Operator Drowsiness: An experience from a Brazilian mining company

A. Lima[1], M.S.S. Mariana Soares[2], A.P.S.d.S. Alex Solidade[3], F.d.A.d.A.d.S. Alencar de Sousa[4], S. Cristina de Andrade[5]
[1]Universidade Pitagoras, São Luis, Brazil, [2]Cruzeiro do Sul, São Paulo, Brazil, [3]Uniter, Cientista de Dados, Parauapebas, Brazil, [4]Unopar, Tecnologia da Informação, Parauapebas, Brazil, [5]Instituto Vale, Minas Gerais, Brazil

Introduction: Feeling drowsy significantly increases the risk of accidents. However, because of drowsiness, drivers are often unaware of their condition, or even believe that in their current state of fatigue they can continue with their activity. This means that drivers can fall into a micro-sleep, long enough to drift out of their lane and generate an occurrence. Unfortunately, accidents caused by drowsy driving tend to be the most serious in terms of bodily injury and even fatalities. At this mining company, among principles and values, the number one value is "Life First", and based on this premise, in 2014 the Drowsiness Management was implemented as part of the Fatigue Prevention Program. Using the latest generation technologies in real time monitoring of the drivers in their activities, and a set of protocols and control systems, we guarantee immediate action in each sign of drowsiness of the drivers, thus fomenting a rich database that serves as a trigger for individual monitoring by occupational medicine, which we can act preventively and individually, anticipating possible risk situations.

Materials and Methods: This is a exploratory descriptive study. The company developed and improved a methodology for sleepiness management that consists of four pillars: 1st Pillar - Training: Ensures that everyone involved understands the steps, protocols and tools that make up the program.2nd Pillar - Monitoring: Using technologies that enable the follow-up in time, a dedicated team carries out the monitoring and interventions following the protocols according to the level of each event.3rd Pillar - Management: This is the partnership that interconnects all the others, and that in the implantation had a great contribution, and currently is responsible for managing all the users as well as guaranteeing the functioning and improvement of the whole structure.4th Pillar - Health Approach: Carries out directed and individual clinical follow-up, referring for treatment the identified pathological cases as well as providing psychological and social support and promoting programs to encourage quality of life.

Conclusions: Each employee has his or her own unique challenges and this way the service is also personalized, and control measures and routines are developed. As a result we have the mitigation of accidents resulting from drowsiness within the mine operation, as well as the identification of the best working hours for each operator and directing them to the appropriate schedule, and this entire process encourages the employee to seek quality of life in order to improve their diet, exercise and a focus on rest and preparation for the day's work. In this way the

Acknowledgements: Sleepiness Control Program contributes daily with safety inside one of the most complex mines in the world, monitoring more than 800 people and guaranteeing that all of them return safely to their homes.

Modeling EEG data using deep learning for automatic sleep stage classification in mice

L. Rose[1], A.N. Zahid[2], L. Piilgaard[1], C.G. Hviid[1], C.E. Jensen[1], F.L. Sørensen[3], M. Andersen[3], T. Radovanovic[3], A. Tsopanidou[3], S. Bastianini[4], C. Berteotti[4], V.L. Martire[4], M. Borsa[5], R.K. Tisdale[6], Y. Sun[6], M. Nedergaard[3], A. Silvani[4], G. Zoccoli[4], A. Adamantidis[5], T.S. Kilduff[6], N. Sakai[7], S. Nishino[7], S. Arthaud[8], C. Peyron[8], P. Fort[8], E. Mignot[9], B.R. Kornum[1]

[1]University of Copenhagen, Department of Neuroscience, Copenhagen, Denmark, [2]Technical University of Denmark, Department of Applied Mathematics and Computer Science, Lyngby, Denmark, [3]University of Copenhagen, Division of Glial Disease and Therapeutics, Center for Translational Neuromedicine, Copenhagen, Denmark, [4]University of Bologna, Department of Biomedical and Neuromotor Sciences, Bologna, Italy, [5]University of Bern, Department of Biomedical Research, Bern, Switzerland, [6]SRI International, Center for Neuroscience, Biosciences Division, Menlo Park, United States, [7]Stanford University School of Medicine, Department of Psychiatry and Behavioral Sciences, Stanford, United States, [8]Université Lyon, Lyon Center for Research in Neuroscience, Lyon, France, [9]Stanford University School of Medicine, Center for Narcolepsy, Department of Psychiatry, Stanford, United States

Introduction: One of the major difficulties when modelling mouse EEG is the large within-subject and between-subjects variation in the EEG sleep patterns. Additionally, there is a huge variability in how experiments are conducted between laboratories, since each lab usually has different hardware and recording setups. Within a single lab, experiments further differ based on the experimental paradigm, genetic background, disease model, sex and age. Such large variation raises the need for an automatic sleep stage classification model that is robust across experimental paradigms. *U-Sleep* is a recent high-performing state-of-the-art model from the human sleep stage classification domain that has shown exceptional generalizability when tested across unseen external cohorts.

Materials and Methods: Here, we present a *U-Sleep* model adapted from human to mouse sleep. We have used transfer learning to take advantage of the previously learned sleep staging features from humans by initializing the mouse model with pre-trained weights from the original *U-Sleep* model. Our model is trained on pairs of EEG and EMG electrodes from 97 wildtype mice recorded in 5 different laboratories. The data are sampled from 5 data cohorts to obtain a robust classifier capable of achieving a good performance across various laboratories. We further examine how much the model benefits from seeing both the EEG and EMG channels by comparing the performance of U-Sleep trained on pairs of EEG and EMG electrodes (U-Sleep-All) as opposed to only being trained on either the EEG (U-Sleep-EEG) or the EMG channel (U-Sleep-EMG) alone.

Results: We report a mean accuracy of 0.89 ± 0.03 when testing U-Sleep-All across 4 validation sets, in which each validation set represents data from a different laboratory. We found that U-Sleep-EMG obtained a mean accuracy of 0.75±0.05 and U-Sleep-EEG reached a mean accuracy performance on 0.88± 0.02 when tested on the same 4 validation cohorts.

Conclusions: Our findings demonstrate a robust performance of the three automatic sleep stage classification models (U-Sleep-All, U-Sleep-EEG and U-Sleep-EMG) when tested on wildtype mice from different labs. The small performance difference between U-Sleep-All and U-Sleep-EEG indicates that the U-Sleep-EEG model might be sufficient to learn the sleep-staging patterns for mice. This observation may allow sleep scientists to work with a simpler experimental setup while maintaining similar sleep staging evaluation performance. Although the results are in line with state-of-the-art models, we intend to add additional training to all models to improve classification performance.

It is further of interest to examine whether we can use the three models to predict cataplexy and other disease related sleep stages. We are currently conducting experiments using the three models for predicting sleep stages in narcoleptic mice, and then examining areas of model disagreement. We hypothesize that the dissociation segments where U-Sleep-EEG predicts Wake and U-Sleep-EMG predicts REM could indicate the occurrence of cataplexy. Utilizing an ensemble-dissociation approach could potentially make it possible to present a model that not only classifies the original sleep stages, but also disease-related stages in mice.

Observing ultradian sleep dynamics with a non-contact radar sensor

H.S.A. Heglum[1], H.J. Drews[2,1], H. Kallestad[1,3], D. Vethe[1,3], K. Langsrud[3,1], T. Sand[4,5], M. Engstrøm[4,5]
[1]Norwegian University of Science and Technology, Department of Mental Health, Trondheim, Norway, [2]University of Copenhagen, Department of Public Health, Copenhagen, Denmark, [3]St Olavs University Hospital, Division of Mental Health Care, Trondheim, Norway, [4]Norwegian University of Science and Technology, Department of Neuromedicine and Movement Science, Trondheim, Norway, [5]St Olavs University Hospital, Department of Neurology and Clinical Neurophysiology, Trondheim, Norway

Introduction: In a new psychiatric hospital building, a radar sensor was installed in the ceiling of all patient rooms. This sensor can detect body movements without direct physical contact. In previous work, we established that models for wrist actigraphic sleep/wake classification can be adapted for use with contact-free radar data. In the present work, we sought to investigate if another data processing tool known as Locomotor Inactivity During Sleep (LIDS), also originally developed for wrist actigraphy, could be adapted for the radar data and used to study more complex aspects of ultradian dynamics during sleep without requiring any on-body equipment.

Patients in an acute psychiatric ward typically have low or no tolerance for on-body sensor equipment, and the therapeutic task of restoring normal sleep conflicts with the need for close observation of patients at risk of suicide or self-harm. Moreover, objective measures of sleep from this population for the purpose of research and to document response to treatment have typically been unavailable. The simple and fully transparent method explored here, used with contact-free sensor data, could both help improve current clinical practice in this setting, and provide new insights into the sleep of populations where obtaining objective measures traditionally has been challenging.

Materials and Methods: In a controlled trial, twelve healthy young adults resided in the hospital ward over a period of two weeks. The participants were monitored simultaneously with radar and wrist actigraphy for the duration of the study. Four nights per participant also included simultaneous polysomnography (PSG). The LIDS transformation was adapted for the radar sensor and applied to radar and actigraphy recordings. Radar and actigraphy LIDS signals were compared to each other and to reduced-resolution representations of the polysomnographic hypnograms, subjected to a simple harmonic analysis, and examined for trends on a group level.

Results: Radar-derived LIDS were highly correlated with actigraphy-derived LIDS ($r>0.84$), and both were highly correlated to the PSG hypnogram representations ($r_{radars}>0.80$, $r_{actigraph}>0.76$). Significant differences were not found between estimates of harmonic parameters. Mixed model analysis revealed similar trends on the group level.

Conclusions: The LIDS technique can be used with data from a contact-free radar sensor. This novel data processing technique could become an important tool for improving sleep monitoring and research by providing a simple and transparent way to study ultradian dynamics of sleep from fully unobtrusive recordings of body movement.

On the use of transformer-based detection models for accurate sleep event annotation and analysis

A. Neergaard Zahid[1], M. Jonika[1], P.F. Hulgaard[1], M.Y. Chen[1], M. Mørup[1]
[1]Technical University of Denmark, Department of Applied Mathematics and Computer Science, Kgs. Lyngby, Denmark

Introduction: The transformer architecture has facilitated major advantages within several scientific fields including computational sleep science, where it has excelled in automatic sleep stage classification. However, analysis of sleep patterns also requires accurate annotation of several types of discrete sleep events, such as arousals, sleep spindles, and breathing disturbances. Each event is uniquely characterized by their origin, spatial localization in the polysomnogram (PSG), and signal characteristics in the time/frequency domains, which poses major challenges not only for experienced sleep technicians annotating the sleep study, but also for computer models designed for automatic detection of these events. Sleep event annotation can be posed as an object detection problem, wherein one or more objects in an image are both localized by bounding boxes and subsequently classified. Here, we investigate using state-of-the-art object detection models from the computer vision literature, specifically the Detection Transformer (DETR), for automated PSG event detection.

Materials and methods: We consider different variants of the DETR model for joint arousal (Ar), limb movement (LM), and sleep-disordered breathing (SDB) event detection using a complete PSG, as well as sleep spindle detection using only a single EEG channel. The DETR model consists of a backbone module for generating high-dimensional feature representations, and an encoder-decoder transformer module for generating object predictions based on the outputs from the backbone. Since the original DETR model operates on visual images, we investigate two strategies for input representation (time-domain only, short-time Fourier transform, STFT), as well as different strategies for backbone realization including low-complexity (DC-low), high complexity (DC-high), and pretrained backbones using feature extractors from state-of-the-art models. We compare DETR-based models to established baseline models (DOSED, SUMO, A7) trained on PSG recordings from the MASS dataset using the MODA sleep spindle annotations for sleep spindle detection, and from the MrOS Sleep Study for arousal, leg movement and sleep-disordered breathing event detection. Performances are compared using F1 scores for each event type.

Results: Using the DC-high model, we found increased Ar (F1=0.71) and SDB (F1=0.76), and slightly decreased LM (F1=0.63) detection performance, when comparing to the baseline DOSED model (F1$_{Ar}$=0.66, F1$_{SDB}$=0.66, F1$_{LM}$=0.66, respectively). Comparing against the baseline SUMO and A7 models for sleep spindle detection, we found similar F1 scores for all three models, however, we found high variability in the sleep spindle predictions between all detection models meaning that different spindles were detected by each model.

Conclusions: Transformer models can be successfully applied in computational sleep science as state-of-the-art event detection algorithms. Merging outputs from multiple event detectors should be explored in future work as a viable alternative.

Orofacial myofunctional therapy in the treatment of sleep respiratory disorders: technology-based strategies to enhance adherence

E. Rivera[1], C. Diaz[2], E. Bianchini[3]
[1]Universidad de Pamplona, Speech Therapy, Pamplona, Colombia, [2]NEUMOMED, Sleep Medicine, Medellín, Colombia, [3]Universidad del Museo Social Argentino, Speech Therapy, Buenos Aires, Argentina

Introduction: One of the challenges faced by Orofacial Myofunctional Therapy (OMT) is patient adherence, despite recommendations regarding duration, frequency, and manual recording charts. In this study, the attrition behavior of patients with Obstructive Sleep Apnea and Primary Snoring (PS) treated with OMT was analyzed using survival curve estimation. OMT was conducted through a therapeutic model mediated by Telemedicine (TM) and Artificial Intelligence (AI) technologies, along with Cognitive Behavioral Therapy (CBT), Mindfulness, and Tiny Habits strategies.

Materials and Methods: An observational study of a single cohort was conducted. Observation window: one year, location: Medellín, Colombia; Population: 769 patients over 18 years old who were treated with OMT at the "IPS NEUMOMED" sleep clinic: 57.5% women and 42.5% men; average age: 46.72 years; average Body Mass Index: 27.70 Kg/m^2. Sleep data: average AHI (Apnea-Hypopnea Index): 10.64/h; average snoring index: 243.9/h; CT90: 14.25%; average baseline Epworth Sleepiness Scale (ESE): 11.

Using the Kaplan-Meier estimator, a survival analysis was performed, establishing as censorship outcomes those patients who completed the OMT in a time equal to or less than the predefined period, and as an event when treatment abandonment was detected before its completion. The survival curve $S(t) = P(T > t)$ estimated the probability that a patient continues or abandons the OMT. The relationship between intervals greater than fifteen days (GAP) between levels and the probability of treatment abandonment was evaluated.

The treatment OMT was conducted through a therapeutic model mediated by Telemedicine (TM) and Artificial Intelligence (AI) technologies, along with Cognitive Behavioral Therapy (CBT), Mindfulness, and Tiny Habits strategies; was structured in six levels, with a total of 56 sessions, mediated by the Doctor Neumo® App, enriched with AI, and using strategies from Cognitive Behavioral Therapy (CBT), Tiny Habits, and Mindfulness. A team of speech therapists supervised using management software resources: Smart Therapy Management software (NEUMOMED Corp 2023) for real-time monitoring; video calls via Doxy.me (Doxy.me Company, 2020), ensuring privacy according to HIPAA 1996.

Results: On average, patients took between 15 and 28 days to complete each level. 158 days were required to complete the entire treatment. The survival curve indicated that 59% of patients who maintained an interval of less than 15 days between levels showed greater adherence to treatment. The estimator revealed a gradual decline in adherence as levels progressed. Patients who completed level 1 had an 84.2% probability of finishing level 2; 68.2% of completing level 3 after finishing level 2; 50.2% to complete level 4 after finishing level 3; 41.2% to complete level 5 after finishing level 4, and 34.4% to finish level 6.

Conclusions: This study suggests that the waiting interval between consultations (GAP) may be a determining factor in adherence. The care model, supported by telemedicine resources and artificial intelligence in OMT treatment, shortens the response times, promoting treatment adherence.

We propose a study to determine whether perceptions of improvement between levels influence the patient's early termination of OMT.

Prediction of insomnia risk using sleep data from a smart bed

T. Winger[1], D. Guzenko[2], S. Barr[1], V. Chellamuthu[1], S. DeFranco[1], B. Gorski[1], G. Garcia Molina[1]
[1]Sleep Number, San Jose, United States, [2]GlobalLogic, Kyiv, Ukraine

Introduction: Insomnia is a highly prevalent sleep disorder reportedly affecting between 10 to 30% of the adult population, characterized by difficulty initiating sleep, maintaining sleep, or early-morning awakening with inability to return to sleep. The Insomnia Severity Index (ISI) is a 7-question instrument designed to assess the severity of nighttime and daytime insomnia symptoms. The responses to the ISI questions in a scale from 0 to 4, are added up to obtain a score which indicates no clinically significant insomnia if ISI score ≤ 7, or different degrees of insomnia otherwise.
Insomnia is frequently missed by primary healthcare personnel unless asked for. This motivates the need for frequent quantification of insomnia risk which can be accomplished through (preferably unobtrusive) consumer sleep technology such as smart beds

Materials and methods: Four IRB approved surveys which included among others the ISI questionnaire, were administered at a six-week-long interval to opting-in Sleep Number's smart bed customers. The first survey was presented on November 22, 2021 and the fourth survey on March 28, 2022. A total of 4182 individuals (mean age 51 [SD:13] years old; 2290 women and 1892 men) participated in the study, resulting in a total of 618326 sleep sessions.
Each sleep session of study participants who used their smart bed during the study resulted in a feature-vector composed of 1) biometrics including the mean (across the sleep session) respiratory rate, heart rate, and heart rate variability, 2) duration metrics including, sleep, restful sleep, time to fall asleep, and restless sleep, 3) sleep regularity index and sleep debt. The ISI score for a given sleep session was assigned depending on the ISI of the closest survey.
The entire feature-vector data from 70% of participants were used to train a generic (i.e., subject-independent) model (implemented as a passive-aggressive classifier PAC) to detect insomnia risk (ISI > 7).
The data from each of the remaining 30% of subjects were partitioned into two subsets (priming and testing). The priming data were used to personalize the generic model via transfer learning of the PAC and the testing data were used to quantify the PAC accuracy in terms of the area under the receiving-operating curve (AUC), positive predictive value (PPV), and sensitivity (SE) of insomnia risk detection at the sleep session leve

Results: The mean AUC for the generic model (i.e., zero sessions in the priming set) was 0.55 (PPV 0.67, SE 0.68). The addition of five sleep sessions to the priming set increased the AUC to 0.83 (PPV 0.83, SE 0.91). The maximum AUC=0.87 (PPV 0.85, SE 0.88) was reached for 40 sessions in the priming set. No gains in accuracy were obtained by further increasing the size of the priming set.

Conclusions: Insomnia risk (ISI>7) may be detected at a sleep session level, using unobtrusively acquired data from a smart bed. The accuracy of risk detection is substantially increased through model personalization by a modest utilization of priming data (only five sleep sessions are enough to increase the AUC from 0.55 to 0.83).

Preliminary validation results: improving AHI scoring accuracy using an AI model for Sleep state and arousal classification from Home Sleep Apnea Testing

A. Árnason*[1], A.K. Sigurðarson*[1], E. Leonardsson*[1], H.Þ. Hildur Þóra Hákonardóttir*[1], H. Finnbogadóttir*[1], L. Kristjánsdóttir*[1], L.Ó. Andrésdóttir*[1], M. Árnadóttir*[1], S. Sigurðarson*[1], T.O. Pétursson*[1], Þ.B. Sigmarsdóttir[2], V. Valsdóttir[2], C. Teixeira[2], A.S. Islind[3,1], E.S. Arnardóttir[3,1], J.S. Ágústsson[2]
[1]Reykjavik University, Reykjavik, Iceland, [2]Nox Medical, Reikjavik, Iceland, [3]Sleep Revolution, Reykjavik, Iceland

Introduction: The current gold standard method used to diagnose obstructive sleep apnea (OSA) is polysomnography (PSG). Included in a PSG recording is a full electroencephalogram (EEG), enabling scoring of sleep stages and arousals, cumulating in a relatively accurate apnea-hypopnea index (AHI) value and therefore diagnosis of AHI severity.

Using in-lab PSG as a standard of care method to diagnose OSA severity is costly, time-consuming, and limited to sleep technicians' availability and the number of beds in each clinic. Home sleep apnea testing (HSAT) is therefore often used instead due to wide availability and lower cost. However, the lack of EEG signals in most HSATs has two important implications. Those studies are only able to measure total recording time (TRT) instead of total sleep time (TST) and are unable to capture arousals, both of which contribute to HSATs´ tendency to underestimate AHI severity. This directly affects the management of sleep apnea and can have lasting effects as long-term complications of sleep apnea have been directly correlated with its severity.

The Nox BodySleep 2.0 is a deep learning algorithm, built upon Nox Medical's previously released algorithm, the Nox BodySleep. When used with HSAT sleep studies, the Nox BodySleep 2.0 uses raw respiratory inductance plethysmography (RIP) and activity signals as inputs and the outputs are estimated sleep stages (Wake, NREM, REM) and arousals for 30 seconds epochs. This enables a more accurate AHI estimation to be derived from HSAT studies.

Materials and Methods: To assess the Nox BodySleep 2.0's performance across a wide demographic (including subgroups with potentially interfering conditions or using potentially interfering medication), external validation of the performance of the algorithm was performed through retrospective data analysis.

This was done with manually scored HSAT studies that included limited EEG signals and PSG studies (n = 2709 after application of exclusion criteria). The data included in the validation had not been present in training, validation, or test datasets.

Positive percentage agreement (PPA), negative percentage agreement (NPA), and overall percentage agreement (OPA) were calculated to compare AHI severity classification when sleep was scored manually versus when estimated by Nox BodySleep 2.0. The calculations were performed overall and for different subgroups (age, sex, BMI). Additionally, the performance of Nox BodySleep 2.0's AHI severity classification for individuals with atrial fibrillation, asthma, and nGER, as well as individuals using beta-blockers, benzodiazepines, and antidepressants, was investigated. Agreement for correct classification of sleep stages and scoring of arousals was also investigated.

Results: Preliminary results suggest that across all groups considered, different demographics, individuals taking different medications and with different conditions, the Nox BodySleep 2.0 algorithm performed well at classifying individuals based on AHI severity. Performance was especially good for individuals with AHI over five.

Conclusions: Compared to the gold standard method, the Nox BodySleep 2.0 applied to HSAT data, shows similar performance at classifying individuals based on AHI severity.

REM sleep alpha and theta oscillations can be modulated using phase-locked closed-loop auditory stimulation in humans

V. Jaramillo[1,2,3], H. Hebron[1,3], S. Wong[4,3], G. Atzori[2,3], U. Bartsch[2,3], D.-J. Dijk[2,3], I. Violante[1]
[1]University of Surrey, School of Psychology, Guildford, United Kingdom, [2]University of Surrey, Surrey Sleep Research Centre, Guildford, United Kingdom, [3]Imperial College London and the University of Surrey, UK Dementia Research Institute Care Research and Technology Centre, Guildford, United Kingdom, [4]Imperial College London, UK Dementia Research Institute, London, United Kingdom

Introduction: Rapid eye movement (REM) sleep contributes to cognitive function and is reduced in mild cognitive impairment and Alzheimer's disease. In animals, theta oscillations during REM sleep have been linked to learning and plasticity. Analogous functions have been hypothesized for REM sleep oscillations in humans, but the evidence is scarce. This is in part due to a lack of approaches that can modulate REM sleep oscillations non-invasively. Moreover, oscillations are more transient, and it is therefore less clear which oscillation is the human analogue to the rodent theta, albeit oscillations in the theta (4-7 Hz) and alpha (8-12 Hz) range have been proposed. Phase-locked auditory stimulation has emerged as a powerful tool to modulate slow oscillations during non-rapid eye movement (NREM) sleep, but its usefulness in modulating the faster brain rhythms that characterise REM sleep is yet to be established. Here we aim to test the feasibility of using phase-locked auditory stimulation to modulate REM sleep oscillations in healthy young adults.

Materials and Methods: We recorded high-density EEG (128 electrodes) during an extended overnight sleep period (10 h) in 18 healthy young adults (23.0 ± 2.0; 7 males; 1 non-binary). Auditory stimulation (pink noise, 20 ms pulses, 50-60 dB) was delivered during REM sleep in alternating 6 s ON (stim) and 6 s OFF (no stim) windows. Stimuli were phase-locked to four orthogonal phases of ongoing alpha (7.5-12.5 Hz) or theta (4.5-7.5 Hz) oscillations detected in a frontal electrode (Fz) using an endpoint-corrected Hilbert Transform. Power changes were calculated as a ratio between ON and OFF windows and were log-transformed. These changes were compared across the four different phases that were targeted (separately for alpha and theta frequency stimulation) and for each electrode using linear mixed effects models.

Results: Participants were able to sleep even though they received auditory stimulation during REM sleep (sleep efficiency: 82.3 ± 7.8 %). The four orthogonal phases of ongoing alpha and theta oscillations were targeted with high accuracy at the stimulation electrode (accuracy quantified as resultant with a value of 1 representing perfect phase-locking; alpha: 0.67 ± 0.04; theta: 0.76 ± 0.03). Stimulation phase-locked to alpha and theta oscillations induced phase-, and frequency-specific power changes at the target location (alpha: $p < 0.05$, lme, cluster-corrected; theta: $p < 0.05$, lme, cluster-corrected).

Conclusions: Phase-locked auditory stimulation during REM sleep is well tolerated and can target specific phases of alpha and theta oscillations in healthy young adults. We observed phase and frequency specific effects of stimulation, providing the first demonstration that faster REM sleep rhythms can be modulated by phase-locked auditory stimulation. Future studies can now leverage this approach to investigate how modulation of REM sleep oscillations affects the contribution of sleep to brain function.

Risk assessment of attention deficit hyperactivity disorder in children with sleep-disordered breathing

M. Zhi[1], L. Yang[1]
[1]Shenzhen Hospital of Southern Medical University, Shenzhen, China

Introduction: As the attention and planning function of Das-Naglieri cognitive assessment system has a good ability of prediction in the diagnosis of children with attention deficit hyperactivity disorder(ADHD), we can analyse the risk of ADHD in children with sleep-disordered breathing(SDB) with the system. this study was to explore risk of ADHD in children with SDB and the benefit of continuous positive airway pressure(CPAP) treatment.

Materials and methods: A total 64 of children with snoring were recruited, completing standard PSG as well as cognitive assessment. The attention and planning functions of children with different severity of SDB were analyzed according to the examination. 8 children with severe SDB were selected for CPAP and followed up for 2 months.Finally, factors of ADHD in children with SDB were analyzed by multiple linear regression.

Results: There was no difference in attention and planning function between children with sleep breathing by severity. 8 children with severe SDB had improved oxygen saturation and attention function, but there was no difference between sleep structure and planned function and baseline.Multiple linear regression analysis found stage 3 sleep as a contributing factor for decreased attentional and planning function in children with SDB.

Conclusions: The risk of ADHD in children with SDB is not related to severity, but may be related to decreasing in stage 3, and CPAP treatment can improve ADHD-like symptoms.

Self-supervised learning of accelerometer data provides new insights for sleep and its association with mortality

H. Yuan[1], T. Plekhanova[2], R. Walmsley[1], A.C. Reynolds[3], K.J. Maddison[4], M. Bucan[5], P. Gehrman[6], A. Rowlands[2], D.W. Ray[7], D. Bennett[1], J. McVeigh[8], L. Straker[8], S.D. Kyle[9], A. Doherty[1]
[1]University of Oxford, Department of Population Health, Oxford, United Kingdom, [2]University of Leicester, Diabetes Research Centre, Leicester, United Kingdom, [3]Flinders University, College of Medicine and Public Health, Adelaide, Australia, [4]University of Western Australia, Centre of Sleep Science, School of Human Sciences, Crawley, Australia, [5]University of Pennsylvania, Department of Genetics, Philadelphia, United States, [6]University of Pennsylvania, Department of Psychiatry, Philadelphia, United States, [7]University of Oxford, Oxford Centre for Diabetes, Endocrinology and Metabolism, Oxford Kavli Centre for Nanoscience Discovery, Oxford, United Kingdom, [8]Curtin University, Curtin School of Applied Health, Perth, Australia, [9]University of Oxford, Sir Jules Thorn Sleep & Circadian Neuroscience Institute, Nuffield Department of Clinical Neurosciences, Oxford, United Kingdom

Introduction: Sleep is essential to life. Accurate measurement and classification of sleep/wake and the different stages of sleep are important in clinical studies for sleep disorder diagnoses and in the interpretation of data from consumer devices for monitoring physical well-being. Existing non-electroencephalogram sleep classification techniques mainly rely on heuristic methods in relatively small cohorts. Thus, we aimed to establish the accuracy of a deep neural network for sleep classification using wrist-worn accelerometers and showcase the utility of machine-learning-derived sleep measurements by describing the association between sleep duration and efficiency (proportion of total time asleep when in bed) with mortality outcomes.

Materials and methods: We developed and validated a self-supervised deep neural network for sleep stage classification using concurrent laboratory-based polysomnography and accelerometry data from three countries (Australia, the UK, and the USA). The model was validated within-cohort using subject-wise five-fold cross-validation for sleep-wake classification and in a three-class setting for sleep stage classification {wake, rapid-eye-movement sleep (REM), non-rapid-eye-movement sleep (NREM)} and by external validation. We assessed the face validity of our model for population inference by applying the model to the UK Biobank with ~100,000 participants, each of whom wore a wristband for up to seven days. The derived sleep parameters were used in a Cox regression model to study the association of sleep duration and sleep efficiency with all-cause mortality.

Results: After exclusion, 1,395 nights of multicentre participants were used to train the sleep classifier. The difference between the model classifications and polysomnography on the external validation was -5.1 minutes (95% limits of agreement (LoA): -49.5 to 59.7 minutes) for total sleep duration, 9.3 minutes for REM duration (95% LoA: -99.6 to 80.9 minutes) and -14.4 minutes (95% LoA: -82.7 to 111.6 minutes) for NREM duration. The derived sleep architecture estimate in the UK Biobank sample showed good face validity. Among 62,760 UK Biobank participants, 1,566 mortality events were observed. Normal sleepers (7 to 7.9 hours) had a 38% lower risk of mortality (Hazard ratios (HRs): 0.62; 95% confidence intervals (CIs): 0.51 to 0.74) compared to short sleepers (<6 hours). Participants with a high sleep efficiency (>90%) had a 19% (HRs: 0.81; 95% CIs: 0.78 to 0.90) lower risk of mortality compared to participants with a low sleep efficiency (<80%).

Conclusions: Deep-learning-based sleep classification using accelerometers has a fair to moderate agreement with polysomnography. Derived sleep parameters in large-scale accelerometer datasets can advance our understanding of the aetiology of sleep-related diseases and the clinical interpretation of wearable sensing data.

Shift work and sleep monitoring: benefits and challenges of wearable devices in real scenarios

E. S B Medeiros[1], H. W S Cabral[1], W. F Soares[2], T. C Jesus[3], M. S L Paulo[1], V. R da Silva[4]
[1]Escola Superior de Ciências da Saúde da Santa Casa de Misericórdia de Vitória - EMESCAM, Medicine, Vitoria, Brazil, [2]SME, Diretoria de Conhecimento, Vitoria, Brazil, [3]SME, Vitoria, Brazil, [4]Secretaria de Saúde do Estado do Espírito Santo, Vitoria, Brazil

Introduction: Previous scientific studies have shown that shift work is related to higher risks for several health issues. The negative influence in sleep-wake pattern requires close and frequent assessment, primarily to recognize sleep disorders and develop early beneficial interventions. In this context, wearable devices (WD) represent a simple and affordable tool available, in comparison to the gold-standard polysomnography. Additionally, the actigraphic measure of sleep characteristics is recommended by the 3rd edition of the International Classification of Sleep Disorders, in diagnostic criteria for Shift Work Disorders. Possible benefits in WD on managing sleep disturbances are associated with improving job performance and lowering risk of accidents. Considering recent innovations, this review aimed to comprehend WD use's strengths and limitations in real work context, monitoring sleep and helping prevent further health problems.

Materials and Methods: A systematic literature review was performed in June/2023, using PubMed/MEDLINE, Cochrane Library and Virtual Health Library electronic databases. Additional studies were selected through reference checking. The search terms were "Shift Work", "Wearable Devices" and "Sleep", used in different combinations to amplify results. Studies were included if described WD use in shift workers, in real life context, published in any language, from inception to 2023. The exclusion criteria was use of assistive WD, focused on specific pathology and laboratory or virtual scenarios. The final process selected 18 publications to embase this analysis.

Results: Among a total population of 1089 shift workers, the main WD used were wrist-worn devices, in their majority Fitbit (in different versions) and Actiwatch models. Association of actigraphy with physiological measures, such as heart rate, provided higher sensibility to the sleep-wake cycle. The majority of studies indicated good sensitivity for sleep detection but poor specificity, leading to an overestimated measure of sleep duration. Most recent versions had sleep stages identification, improving qualitative available data. According to scientific recommendation, associating sleep diaries and/or questionnaires enhance the outcomes, rather than actigraphy alone, which was reported by most of the manuscripts. Other variables assessed included performance, mood status, cognition, fatigue and quality of life. As a noninvasive method, WD was considered easy to use in daily life, with low rates of discomfort and distraction, theoretically allowing a longer use. However, most studies collected data between 2 to 4 weeks only, limiting the follow-up. Other limitations were need for standardization, equipment malfunctions due to technical issues, dust or sweat, questions about skin color and green light efficacy, the private algorithm regulation making it hard to compare results because of unknown updates, and compliance rates regarding personal benefits and data privacy.

Conclusions: WD offers an accessible opportunity to manage health and sleep, allowing data interpretation and leading to innovative and preventive interventions. However, an accurate and careful analysis must be performed in planning and using in daily life, since it might vary according to different variables. The applicability of WD has been evolving, but still has its blind-spots - that could be mitigated with complementary tools, such as validated instruments and cognitive assessments, adapted and inserted WD.

Sleep stage classification with a network of wearable and contactless devices

O. Gnarra[1,2,3], J. D. Warncke[1], S.M. Gerber[3], S.E. Knobel[3], C.L. Bassetti[1], R. Riener[2,4], T. Nef[1,3], M.H. Schmidt[1,5]

[1]Insel University Hospital of Bern, Sleep-Wake Epilepsy Center, NeuroTec, Department of Neurology, Bern, Switzerland, [2]Institute of Robotics and Intelligent Systems, ETH Zurich, Sensory-Motor System Lab, Department of Health Sciences and Technology, Zurich, Switzerland, [3]Gerontechnology and Rehabilitation Group, ARTORG Centre for Biomedical Engineering Research, University of Bern, Bern, Switzerland, [4]Spinal Cord Injury Center, University Hospital Balgrist, Zurich, Switzerland, [5]Ohio Sleep Medicine Institute, Dublin, United States

Introduction: Polysomnography (PSG) is the gold standard for assessing sleep disorders, involving the attachment of wired electrodes to the patient's body. Typically conducted over a single night in a hospital, PSG requires trained personnel. The emergence of wireless technologies has facilitated the development of wearable and contactless devices that closely correlate with PSG, enabling consecutive nights of sleep pattern measurement in patients' homes without disturbing their natural sleep. This study evaluates a sensor network of one wearable device and two non-contact devices trained on a large dataset of patients with sleep disorders.

Materials and methods: The participants slept one night in the hospital, where simultaneously with PSG, sleep stages were recorded using a smartwatch (Fitbit Inspire 2), a radar device (Somnofy), and a sensing mattress (Emfit). The performance of each device's sleep stage algorithm was assessed through Bland-Altman analysis, sleep stage distributions, and epoch-by-epoch concordance with PSG. Sleep stage epochs from each device were then fused in a network using a random forest classifier, and the model's performance was compared to PSG and the individual devices using balanced accuracy.

Results: The study included 156 patients with sleep disorders (mean age: 45 years, range: 18-85 years) with 55% female participants. Sleep-related breathing disorders accounted for 55% of the diagnoses, followed by hypersomnolence (14%) and other disorders, such as insomnia, parasomnias, and circadian rhythm disorders. Bland-Altman diagrams revealed a significant underestimation of wake-after-sleep onset duration and an overestimation of REM and light sleep durations by all devices. However, accurate detection of deep sleep duration without significant differences was observed. Regarding sleep stage distributions, only the radar device demonstrated similar detection of short sleep stage durations to PSG, whereas the smartwatch and sensing mattress failed to detect sleep stages shorter than 3 minutes. Concerning the epoch-by-epoch concordance, the radar device achieved the highest performance in sleep stage classification, with a balanced accuracy of 0.68 (0.07) compared to PSG. The smartwatch closely followed with a balanced accuracy of 0.66 (0.05), while the sensing mattress exhibited lower performance at 0.46 (0.10). Fusion of sleep stage data from all three devices in a sensor network using a random forest classifier outperformed the individual devices, yielding a balanced accuracy of 0.71 (0.05).

Conclusions: This study demonstrates that wearable and contactless devices can achieve sleep stage scoring performance comparable to the interrater agreement by different humans, as shown in previous studies to be, on average, 0.70. The sensor fusion network proved effective in a real-world clinical setting involving patients with sleep disorders, providing reliable sleep information even in the case of one or two device failures. These results pave the way for dependable sleep monitoring and potential screening of sleep disorders in patients' homes, preserving their natural sleep patterns and enabling continuous monitoring of circadian rhythms.

Sleep stage polysomnography classification using machine learning

L. Lauriano[1]
[1]Universidade Federal de Minas Gerais, Interinstitutional Post Graduate Program in Bioinformatics, Belo Horizonte, Brazil

Introduction: Sleep is vital to health across all age groups.Electroencephalography is commonly used as a tool to investigate the sleep architecture, including the organization of sleep cycles. Manual sleep scoring is considered the gold standard, requiring trained sleep technicians to apply visual pattern recognition to the signals. Interrater reliability among scores approaches 0.90, and direct percent agreement approaches 80% to 85%.The automation of sleep analysis is desirable not only to save time and costs but also to improve uniformity between different scoring sessions and experts. In this study we aim to develop an RNN algorithm that maintains class balance variability while using a large amount of data from adult patients of various ages and ethnicities, also including patients with sleep disorders.

Materials and Methods: For the execution of this study, polysomnography data and their annotations were collected from various sources:
1.NSRR (https://sleepdata.org/). From this data center, 2297 polysomnographies were collected along with their respective annotations. The training and testing phases were segmented as follows: HomePAP contained 68 samples, exclusively for training, the remaining datasets were split into training and testing sets. The Mros dataset comprised 468 samples for training and 93 for testing, the SHHS had 517 for training and 199 for testing, the STAGES dataset included 308 for training and 68 for testing, and the MESA dataset consisted of 479 samples for training and 97 for testing. 2.The CAP Sleep Database. From this source, 96 polysomnographies were extracted, used solely for training. 3.Dreem Open Dataset dataset. Each of the 80 PSGs in this dataset was scored by five registered sleep technicians, allowing us to test the algorithm against a consensus of human scorers. The average age of the total population was 62.10 years old. The total number was 2473, 57% male.

Results: The code implemented has defined a deep learning model for multiclass classification using the Keras Sequential API and applies it to classify sleep stages based on different combinations of EEG, EOG, EMG, and demographic features. The model is trained using different feature combinations with specific class weights. The performance of each trained model is assessed using accuracy, precision, recall and F1-score. In summary, the models demonstrated a varied performance across different configurations. Precision was generally high in N2 category across models, though often coupled with a low recall. The model incorporating EEG+EOG+ EMG+Demo data exhibited a promising balanced performance with an overall accuracy of approximately 72% and notable improvements in both precision and recall for N2. This suggests potential for further optimization and application in relevant fields.

Conclusions: This study revealed that despite a large number of individuals from various ethnicities and ages, pre-processing of polysomnography signals is essential for achieving accurate machine learning model results, including the RNN used in this case. Attention must be given to data generalization; in this study, we utilized lower-quality PSG compared to the norm in studies to create a model that mirrors real-world scenarios. Further improvements to the model are planned.

Sleep Staging using explainable probabilistic graphical models

R. Arone[1], J. Soares[1], C. Maciel[1], A. Eckeli[2]
[1]University of São Paulo, Department of Electrical Engineering, São Carlos, Brazil, [2]University of São Paulo, Department of Neuroscience and Behavioral Sciences, Ribeirão Preto, Brazil

Introduction: Sleep staging is a procedure used by medical reviewers as a standard for analyzing sleep to infer sleep quality and possible sleep disorders. This procedure is typically performed manually, and hence, it is a time-consuming task. There are methods for automating classification, however, they typically involve black-box machine-learning techniques. Therefore, we propose a method for classifying using a probabilistic graphical model and reasoning based on expert knowledge from the document upon which the American Association of Sleep Medicine (AASM) classification relies.

Materials and Methods: Polysomnography data from 15 men and 21 women aged between 19 and 79 years old (mean = 48.7, standard deviation = 16.37) and scored by specialists were used to train the network. As inputs, binary variables were used to represent the presence or absence of a characteristic for every 30 seconds of total sleep duration. These characteristics included rapid or slow eye movements, snoring, sleep spindles, slow waves, low chin tone level, chin and legs movement and detect increases in the electroencephalogram's power on the frequencies band relative to the mean. Alongside these variables, the hour information was included. A Bayesian network using the Hill-Climbing algorithm and Monte Carlo Markov Chain (MCMC) was generated and trained using this data. Furthermore, a temporal dependency node between the stage and the previous stage was included in the generated model.

Results: The generated model could classify the stages with 80 % accuracy and an F-score of 81 % using the test data. The model also achieved 90% accuracy in predicting the stage REM, 84% accuracy in predicting both N2 and N3 stages, and 82 % accuracy in the awake stage. The classification of the N1 stage had the lowest precision at 55%. Moreover, states N1 and N2 exhibited elevated levels of entropy and uncertainty during classification. The graph generated by the structure learning algorithm revealed that almost all nodes are in the Markov Blanket of the stage node, with the exception of the frontal lobe EEG and the alpha, beta, and gamma bands from the central lobe EEG.

Conclusions: The results indicated a high level of efficacy in nearly all stages, particularly in REM. Unless there was an apparent change in distribution, the model tended to continue classifying the interval as the previous state. Due to fewer samples and being classified differently by distinct reviewers, the N1 stage demonstrated the lowest performance. The graph used for the inference was densely connected, although the classification proposed by the manual analyzes the data as the characteristics were independent, only dependent on the stage node. Adding more manual rules, such as k-complexes and respiration ratio variability, as input to the system would enhance its accuracy.

Acknowledgments: For this study, we utilized the dataset supplied by the Sleep Medicine Center of the Ribeiro Preto Faculty of Medicine.

Sleep technology use and beliefs in the United States and South Korea

J.M. Dzierzewski[1], D. Jung[2], D. Lee[2], S. Jeon[2], J. Hong[2], S. Lee[2], H. Yang[2], J. Lopos[1]
[1]National Sleep Foundation, Washington, DC, United States, [2]Asleep Co., LTD, Seoul, Korea, Republic of

Introduction: Sleep is critical to all aspects of daily life. Unfortunately, numerous factors can disrupt sleep, resulting in large segments of the adult population experiencing poor sleep health. Recent estimates suggest that between 40-50% of adults in the US and over 60% of adults in South Korea are not sleeping the recommended 7-9 hours per night. When faced with inadequate sleep, people increasingly search for available solutions, and recent years have seen a proliferation of sleep-related technologies. This study sought to provide current, population-level estimates of sleep technology use and beliefs in both the United States and South Korea.

Methods: We conducted two nationally-representative, probability-based surveys, one in the United States and one in South Korea, to assess current sleep technology use and beliefs. The surveys were fielded January and February 2023, respectively, for the US and South Korea. Final sample sizes were 1009 (US) and 1000 (South Korea), both with an estimated margin of error of ~3%. RIM weights were applied to both datasets to ensure accurate representation of national demographics. Survey respondents reported habitual sleep duration and general sleep quality ratings, current sleep technology use, and beliefs and concerns about sleep technology. Measures of central tendency and dispersion were used to characterize responses.

Results: American adults averaged 6 hours and 56 minutes of sleep on weekdays and 7 hours and 25 minutes on weekends. In comparison, Korean adults slept for an average of 6 hours and 13 minutes on weekdays and 7 hours and 11 minutes on weekends. Only 6% of Americans reported their sleep as 'poor;' however, in South Korea 1 in 4 adults (25%) reported their sleep as 'poor.' Conversely, 26% of Americans reported their sleep as 'very good' compared to only 10% of Koreans. Approximately 14% of US adults and 8% of Korean adults use an electronic device or app to track their sleep. Device/app use was not significantly associated with sleep duration, quality, or deficits in either the US or Korea (all p's > .05). Despite rates of use, 35% of US adults and 39% of Korean adults express confidence in technology and apps to help people achieve better sleep. However, the majority of adults, 61% in the US and 57% in Korean, are concerned that the data generated by electronic-sleep tracking devices could be used in a way that intrudes on their personal privacy.

Conclusion: Sleep-related technology holds promise to promote sleep health; however, current estimates suggest only a small portion of the population are current users. Despite differences in sleep duration and quality, adults in the United States and South Korea share similar levels of confidence in technology and apps to improve sleep while also sharing similar levels of privacy-related concerns. More work is needed to fully unlock the sleep-promoting potential of technology and apps, including efforts to address consumer trust and ensure equitable access to technological advances.

Sleep wars: WatchPAT® head to head with NOX T3®

A.R. Pedroso[1], A.L. Vieira[1], J. Lages[1], J. Barbosa[2], N. Pereira[2], R. Fontes[2], C. Ribeiro[2], E. Amorim[2], L. Ferreira[1], M.A. Galego[1]

[1]Hospital de Braga, Pneumology, Braga, Portugal, [2]Hospital de Braga, Cardiopulmonary, Braga, Portugal

Introduction: Sleep-disordered breathing (SDB) is increasingly recognized as a significant medical condition, prompting referrals to hospital consultations. Home sleep apnea tests (HSATs) have emerged as alternatives to in-lab sleep studies. While WatchPAT® has received HSAT approval, its routine clinical application has been hindered due to its use of unconventional signals and its limited utilization within the broader spectrum of respiratory sleep centers. In contrast, NOX T3®, equipped with RIP technology, has gained prominence as one of the most widely used HSATs worldwide. Both devices offer automated scoring through their respective software, presenting a promising perspective amidst the time-consuming nature of manual analysis and the growing burden of SDB on healthcare systems. In this preliminary study, we aimed to evaluate the performance of these auto-scoring systems through a direct comparison in an unselected patient population.

Materials and Methods: We conducted a 3-month prospective evaluation to compare the automated analyses generated by both devices. We included every patient over 18 years with suspected SDB referred to our sleep laboratory. Patients with recording failures in any channel of either device and those with a recording duration of under 4 hours were excluded. Simultaneous utilization of WatchPAT® and NOX T3® was ensured through time-synchronization. The parameters assessed encompassed the Apnea-Hypopnea Index (AHI), mean and minimum oxygen saturation, and mean pulse rate. Patient characterization also incorporated clinical and demographic data.

Results: Among the 49 patients included (12 excluded due to technical failures/insufficient recording time), 63% were male (n=31), with a mean age of 47.5 years and a mean body mass index of 30 kg/m². More than 50% (n=21) presented metabolic, cardiovascular or cerebrovascular comorbidities. The AHI categorization indicated 39% mild obstructive sleep apnea (OSA), 27% moderate OSA, and 16% severe OSA (excluding OSA diagnosis for 9 patients). No statistically significant differences were observed in AHI or other auto-scored parameters (p>0.05*).

Conclusions: Our investigation has unveiled a remarkable agreement between the parameters analyzed by WatchPAT® and NOX T3® devices. Notably, we discovered no statistically significant disparities in the auto-scored parameters: AHI, mean and minimum oxygen saturation, mean pulse rate, and minimum oxygen saturation (p>0.05*). These findings are particularly compelling due to the diverse patient composition of our cohort.

These results are valuable in light of the evolving landscape of sleep medicine, with the potential to mitigate the burden on healthcare systems while providing accurate insights into SDB diagnosis.

Somnomat casa: an innovative sensorized rocking bed for sleep studies and interventions in home environments

A. Breuss[1], M. Fujs[1], R. Riener[1,2]
[1]Sensory-Motor Systems Lab, ETH Zurich, Institute of Robotics and Intelligent Systems, Zurich, Switzerland, [2]Spinal Cord Injury Center, University Hospital Balgrist, Zurich, Switzerland

Introduction: Vestibular stimulation from rocking beds has become a promising alternative to traditional medical treatments for various sleep-related disorders as it has been shown to improve sleep architecture, enhance sleep consolidation, and facilitate faster sleep onset times. However, previous rocking beds were primarily limited to short-term sleep studies due to their complexity requiring engineering expertise. In this paper, we present the *Somnomat Casa*, a newly developed rocking bed platform designed to address these limitations. With dimensions comparable to a standard single bed and operable through a single button, the *Somnomat Casa* offers translational vestibular stimuli. Additionally, the platform can be expanded with a range of sensors, enabling closed-loop interventions and long-term data collection.

Materials and methods: To assess the acceptability of the Somnomat Casa rocking bed platform, we invited four individuals diagnosed with Parkinson's Disease to test the bed in an afternoon session and asked questions regarding their perceived safety, comfort, ease of use, and willingness to use the bed for an extended period of multiple months in their own bedrooms. Based on the feedback received from the Parkinson's patients, minor adjustments were made to the design of the bed. Following these modifications, we placed the *Somnomat Casa* in the bedroom of a pediatric patient with a primary Mitochondrial disease accompanied by a sleep disorder. This study lasted for five months and was comprised of five separate intervention phases (4x 2 weeks and 1x 4 weeks) that simulated the movements of a train ride using superimposed sinusoidal movements with intermittent high-frequency disturbances. Each of these intervention phases were separated by one-week washout phases. Throughout the study, various metrics were evaluated, including sleep quality, sleep duration, caregiving effort, and subjective outcomes such as daytime sleepiness, restlessness, and fatigue.

Results: Among the four Parkinson's patients involved in the study, three could imagine using the rocking bed in their bedrooms for an extended duration. The remaining patient, known to experience motion sickness, declined the use of the rocking bed.
Throughout the use of the bed, significant improvements were observed in the sleep duration of the pediatric patient, as indicated from the Mini Sleep Questionnaire. Additionally, the interactions from the caregiver, as well as the overall caregiving time during nighttime was substantially reduced. Subjective fatigue levels, assessed using the Checklist Individual Strength, exhibited a significant reduction, falling below the threshold for severe fatigue.

Conclusions: Our study demonstrates that the Somnomat Casa is a well-tolerated robotic bed, suitable for applying nocturnal vestibular stimulation in various patient cohorts. Its compact size and simple operation make it easily accessible for both patients and caregivers. Our findings indicate that nocturnal vestibular stimulation could be a promising treatment for sleep disorders in select patient groups. Further research is needed to validate its efficacy in larger patient populations and different medical conditions.

Study on adherence to positive airway pressure treatment for patients with obstructive sleep apnea using real-world big data in a telemedicine management system

H. Yi[1,2], S. Shang[2], Y. Zhang[3], C. Zhang[1], L. Xu[1], J. Wang[1], X. He[4], X. Dong[1], F. Han[1]
[1]Peking University People's Hospital, Department of Sleep Medicine, Beijing, China, [2]Peking University, School of Nursing, Beijing, China, [3]Southwest University, College of Electronic and Information Engineering, Chongqing, China, [4]Curative Medical Technology, Suzhou, China

Introduction: Obstructive Sleep Apnea (OSA) is a disorder that is characterized by obstructive apneas and hypopneas/respiratory effort-related arousals caused by upper airway collapse during sleep. Positive Airway Pressure (PAP) is the first-line treatment for moderate to severe OSA. However, the effectiveness of PAP therapies is contingent on treatment adherence. With the implementation of the wireless transmission for PAP treatment, it is possible to evaluate the objective adherence to PAP use. The purpose of this study is to assess the adherence to PAP therapy of Chinese OSA patients in a telemedicine management system which could fulfill automatic transmission of PAP treatment data.

Materials and methods: We used the telemedicine management system to extract PAP adherence information of OSA adult patients in one week, one month, three months, six months and 12 months. Second, we described the general profile of PAP therapy adherence. Finally, the latent class growth modeling and growth mixture modeling was conducted using Mplus 8.0 to identify the trajectories of adherence over time.

Results: Of all the 662 patients involved in our study, PAP adherence declined over time. After one year, the proportion of days compliant was 53.7%, the proportion of good compliance was 45.2%, the daily usage (all days) was 3.9 h/night, slightly lower than subjective adherence reported in the previous literatures. In addition, we identified three patterns of adherence over time: great users (39.9%; high mean value and level, negative slope, slow decline), good users (34.8%; moderate mean value and level, negative slope, rapid decline) and low users (25.3%; low mean value and level, negative slope, rapid decline).

Conclusions: In brief, telemedicine management system provides a convenient platform for monitoring the treatment compliance of OSA patients powerfully and accurately. To improve the low PAP adherence in China, we should make good use of the PAP therapy telemedicine management platform to detect patients with poor adherence and provide timely intervention. Besides, our research provides a foundation for future studies to explore the determinants of observed trajectories of PAP adherence based on the telemedicine platforms.

Telemedicine and artificial intelligence technologies in orofacial myofunctional therapy for obstructive sleep apnea: perception of effectiveness and satisfaction in adult patients

E. Rivera[1], C. Diaz[2], E. Bianchini[3]
[1]Universidad de Pamplona, Speech Therapy, Pamplona, Colombia, [2]NEUMOMED, Sleep Medicine, Medellín, Colombia, [3]Universidad del Museo Social Argentino, Speech Therapy, Buenos Aires, Argentina

Introduction: Evidence of reported results of effectiveness and satisfaction by patients with Obstructive Sleep Apnea and Primary Snoring treated by Orofacial Myofunctional Therapy (OMT) is scarce. PROMs (Patient Report Outcome Measures) are self-administered questionnaires in which the patient can report the impact of a treatment on their quality of life. Telemedicine and Artificial Intelligence (AI) resources, in the process of monitoring and controlling appointments, seem to make it possible to effectively perceived results and assess the adherence of patients to OMT. This study seeks to evaluate the perception of success and satisfaction in patients undergoing OMT with a therapeutic model mediated by Telemedicine (TM) and Artificial Intelligence (AI) technologies.

Materials and Methods: Single cohort observational study; duration: one year; Location: Medellin, Colombia. Population: 87 patients, 61% women and 39% men; age: 50 to 60 years; Body Mass Index: 25 and 30 Kg/m. Sleep data: AHI: 0/h to 20/h; snoring rate: 200/h - 400/h; (Spo2) < 90% (CT90): 0% to 25%; Baseline Epworth Sleepiness Scale(ESS): 5 to 13. To assess the perception of effectiveness and patient satisfaction, a continuous scale was designed, ranged from 1 to 5. Value 1 represented a perception of ineffectiveness, while value 5 indicated a perception of absolute effectiveness, these results were related to the covariates of sleep, comorbidities, and findings in the OMT exam. Treatment consisted of six levels, 56 sessions, mediated by the Doctor Neumo® App enriched with AI, and use of Cognitive Behavioral Therapy (CBT), Tiny Habits and Mindfulness strategies. A team of speech therapists supervised using management software resources: Smart Therapy Management software (NEUMOMED Corp. 2023) for real-time monitoring; video calls via Doxy.me (Doxy.me Company, 2020), ensuring privacy according to HIPAA 1996.

Results: In the density curve, most scores are located at 4, indicating that the majority of patients consider the OMT treatment satisfactory-effective. The significant relationship between co-variables and effectiveness is condensed into four Groups (G), the first three groups rate OMT as satisfactory-effective: G1: Older patients, with psychiatric and cardiovascular comorbidities, and with central symptoms of Excessive Daytime Sleepiness (EDS) and waking up with shortness of breath. G2: Patients who report a reduction in the score of the Epworth Sleepiness Scale (ESE) from baseline Vs. exit. G3: Patients with a descended-looking soft palate and erythematous palatine pillars, with these last two variables also having a statistically significant association. G4: Corresponds to patients with class III malocclusion (Angle), who rated OMT with less favorable scores.

Conclusions: The results show that the majority of patients perceive OMT as satisfactory-effective. Management software enriched with AI allows for data handling. The study suggests that it's possible to identify subgroups of patients who will have different levels of success with OMT. The relationship between anatomical features and the perception of satisfaction and effectiveness underscores the importance of a comprehensive evaluation. Furthermore, the association between class III malocclusion and less favorable outcomes highlights the need to address this condition before starting OMT.

The use of Bispectral Index (BIS) monitoring during Sleep Endoscopy (DISE) in adult patients with Obstructive Sleep Apnea

P. Spiller[1], L. Ordoyne[2], J. Calligas[1], A. Asarkar[1], K. Dewan[1]
[1]Louisiana State University, Otolaryngology- Head and Neck Surgery, Shreveport, United States,
[2]Louisiana State University, School of Medicine, Shreveport, United States

Introduction: Diagnostic sleep endoscopy (DISE) is essential to determine the location and degree of airway collapse in patients with obstructive sleep apnea (OSA). However, there is little standardization regarding the level of sedation required to adequately mimic sleep and reproduce nightly airway collapse. The Bispectral Index (BIS) monitors electroencephalographic information to produce a value that correlates with the depth of sedation. The purpose of this investigation is to elucidate the relationship between BIS values and the degree of upper airway obstruction in patients with continuous positive airway pressure (CPAP)-failed OSA.
Materials and Methods: In this prospective study 12 patients with clinical indications for sleep endoscopy were included. Preoperatively, subjects were given 0.1 mg of robinol IV and 4 puffs of oxymetazoline nasal spray. In the operating room, a BIS monitor was placed on the subject's forehead. Subjects were pre-oxygenated and sedated using 100-200 mg of propofol IV. Once sedated, a flexible fiberoptic nasal endoscope entered the nares to visualize the oropharyngeal structures. Upon spontaneous respiration, areas of vibration and collapse were noted and recorded at intervals of 10 BIS units until the patient arose from anesthesia.
Results: 58% of the 12 subject study cohort was male with an average age of 55.1±15.3 years, and BMI of 31.1±2.9. Preoperative polysomnogram results demonstrated an average AHI of 32.0±25.2. Airway collapse was noted in a BIS monitor range from 40 to 80. Specifically, epiglottic collapse was noted to occur at an average BIS of 64.5±13.5. Collapse of the soft palate was noted to occur at an average BIS of 64.0±13.3. Base of tongue hypertrophy was noted to play a role in airway collapse at an average BIS of 65.3±12.3.
Conclusions: Results of this interim analysis indicate a relationship between the BIS monitor reading and airway collapse. Data indicates the ideal time sedation level to assess the location of airway collapse is a BIS reading is close to 65. Airway collapse was noted to occur at average BIS readings corresponding to REM and slow wave sleep. With the establishment of target BIS monitor readings during nasendoscopy Otolaryngologists will develop a common language with which to discuss sleep endoscopy outcomes and reproducibility. This is the first step in establishing a uniformity of this clearly invaluable tool for the treatment of OSA.

Translating radar data into sleep insights: a comparative study of machine learning models

S. Sylvester[1], H.S. Amdahl Heglum[1], S. Gallina Ottersen[2], G. Morken[1,3], K. Bach[2], H. Kallestad[1,3]
[1]Norwegian University of Science and Technology (NTNU), Department of Mental Health, Trondheim, Norway, [2]Norwegian University of Science and Technology (NTNU), Department of Computer Science, Trondheim, Norway, [3]St Olavs University Hospital, Division of Mental Health Care, Trondheim, Norway

Introduction: Sleep-wake disruption is ubiquitous among psychiatric inpatients. Treatment of sleep problems can help alleviate comorbid mental disorders as well as improve general wellbeing. However, objective tools for sleep monitoring in this population are lacking since patients admitted for severe mental disorders and/or suicidal risk have limited or no tolerance for on-body sensor equipment. Radars provide a potential solution as they measure body movement contact-free and can be used like actigraphy to derive sleep and wake during the night without disturbing the patients. They have also been shown capable of measuring more complex signals, like respiration frequency, and so may have greater potential for both sleep/wake and sleep stage classification.

Materials and methods: In this study, our goal is to compare different kinds of inputs, models, and outputs for predicting important sleep markers from radar data. We will use a small but highly controlled dataset of healthy participants sleeping in a hospital environment and monitored with radar, wrist actigraphy, and PSG, recording in parallel. As model inputs, we will use body movement (measured with wrist actigraphy and with radar), and, since radar has been shown to have potential for measuring respiration frequency, we will also include a 'perfect' respiration frequency derived from PSG to evaluate the maximum potential value of this input parameter. Performance will be tested for each of these inputs and all possible combinations to find the best input combination. As outputs, we will use classic sleep/wake estimates derived from PSG as well as wake-after-sleep-onset (WASO) and sleep-onset-latency (SOL) measures. To this end, different models will be compared, including a classic moving-window-regression, a shallow tree-based machine learning algorithm, and a deep convolutional neural network (CNN). Moreover, the models will be combined into ensembles to leverage their different approaches. It shall be investigated if the higher computational cost of the ensemble model is compensated by a considerably better performance and in how far this is dependent on the input and output.

Results: We expect that (1) the sleep/wake model will outperform the WASO and SOL models, (2) the performance of a combination of radar body movement features with respiration frequency will lead to state-of-the-art performance, and that (3) the ensemble model including all three types of models will show a considerably better performance and higher robustness as compared to single models. Further, we assume that (4) the CNN will outperform tree-based models, as trees are not capable of directly analyzing a time series and hence features need to be created manually.

Conclusions: The systematic assessment and comparison of inputs, models, and outputs presented here could shed light on the question if state-of-the-art performance of sleep/wake models can be reached with radar data and if respiration frequency is an important factor in determining if a person is asleep. Moreover, by employing different types of models, the complexity of the input/output relationship can be explored and the required model complexity determined. This systematic approach is an important step towards implementation of automatic sleep/wake models in psychiatric hospitals.

Tripolar concentric ring electrodes for capturing localised electroencephalography signals during sleep

N. Stuart[1,2], J. Manners[1,2], B. Lechat[1], D.P. Ngyuen[1], E. Kemps[2], H. Scott[1], P. Catcheside[1]
[1]Flinders University, Flinders Health and Medical Reserach Institute, Adelaide, Australia, [2]Flinders University, College of Education, Psychology and Social Work, Adelaide, Australia

Introduction: This study describes, for the first time, the use of Tripolar Concentric Ring Electrodes (TCRE) to assess sleep. TCRE is a type of electrode designed to record current density underlying each electrode rather than a voltage difference between two conventionally placed EEG electrodes. This approach is more focal and more resistant to electromyographic interference of brain activity signals, but has not previously been systematically evaluated during sleep. This study sought to compare spectral power in TCRE compared to conventional EEG signals across frequency bands most relevant to sleep recordings.

Materials and methods: Twenty healthy sleepers (8 males, *mean±SD* age 27.8±9.6 y) completed a 9-hr sleep opportunity, during which eighteen TCRE electrodes and eight conventional gold-cup electrodes were used to record brain activity. TCREs were placed based on the 10-20 system, with gold-cup electrodes added to the reference sites for traditional EEG recordings. Eye movements, muscle activity, and heart rate were also recorded. TCRE signals are not directly comparable to EEG, so each recording was scored by an independent sleep scorer into conventional sleep stages according to the American Academy of Sleep Medicine sleep scoring manual using conventional EEG recorded from the outer rings of paired TCRE electrodes. A Fast Fourier Transform using multitaper-based estimation was applied in 5-s epochs to calculate absolute and relative powers in delta, alpha, theta, sigma, and beta frequency bands for EEG and TCRE signals.

Results: At the Cz position, TCRE tended to show reduced relative powers in beta frequency bands across sleep stages when compared to EEG. TCRE also demonstrated lower relative beta activity during wake (mean difference [95% confidence lower, upper]; 14.3%, [12.5%, 16.2%]), N1 sleep (5.9%, [4%, 7.8%]), N2 (2.2%, [0.3%, 0.4%]), and REM sleep (4.6%, [2.7%, 6.4%]). TCRE also showed higher relative delta power across all stages of sleep (N1 - 32.3%, [25.5%, 39%]; N2 – 26.3%, [19.6%, 33.1%]; N3 – 11.9%, [5.2%, 18.7%]; REM – 30.3%, [23.5%, 37%]) and wake (47.1%, [40.4%, 53.8%]). Ongoing analyses will compare outcomes across electrode locations.

Conclusions: Quite marked differences between TCRE and EEG brain activity signals support an improved signal-to-noise ratio with markedly reduced electromyographic interference with TCRE compared to EEG. Brain activity acquisition via TCRE may reduce artefact interference and potentially identify new sleep markers that may be associated with sleep quality, health, and functioning.

Unobtrusive monitoring of Restless Legs and periodic leg movements during sleep using a sensorized mattress

A. Breuss[1], C. McCarthy[1], O. Gnarra[1,2], M. Fujs[1], R. Riener[1,3]
[1]Sensory-Motor Systems Lab, ETH Zurich, Institute of Robotics and Intelligent Systems, Zurich, Switzerland, [2]Sleep-Wake Epilepsy Center, NeuroTec, Inselspital, University Hospital Bern, Department of Neurology, Bern, Switzerland, [3]Spinal Cord Injury Center, University Hospital Balgrist, Zurich, Switzerland

Introduction: Periodic Leg Movements during Sleep (PLMS) and Restless Legs Syndrome (RLS) are involuntary, stereotypical leg movements and sensations that can significantly impact sleep quality. PLMS are characterized by leg movements lasting 0.5-10 seconds, occurring in series of four or more, with an inter-movement interval of 5-90 seconds. RLS, on the other hand, involves uncomfortable sensations in the legs, often accompanied by an irresistible urge to move them. Both conditions are linked to disturbed sleep patterns and various sleep-related disorders. Population-based studies have shown a high prevalence of pathological PLMS and RLS, further emphasizing the need for effective monitoring and treatment strategies. However, current research faces challenges due to obtrusive monitoring methods. In this paper, we present a novel unobtrusive method for monitoring and quantifying PLMS and RLS using a pressure-sensitive textile, aiming to enhance at-home monitoring and improve treatment strategies.

Materials and Methods: We placed a 70 cm x 35 cm sensor textile with a resolution of 14 x 28 sensor elements and a sampling rate of 10 Hz in the leg region of a mattress and collected data of characteristic leg movements associated with PLMS and RLS. We did this by performing a series of predefined movements that included the extension of the big toe, the dorsiflexion of the ankle, and the flexion of the knee and hip joints. To ensure data reliability and variability, a minimum interval of 5 seconds was maintained between each motion and the lying position was periodically altered. To collect ground truth data, we additionally recorded electromyography from electrodes placed on the tibialis anterior muscle of the left and right leg.

We implemented two distinct modeling strategies to quantify PLMS and RLS. Using a rules-based approach, we classified leg movement periods by comparing signal-based features against baseline values. In a second approach, we used various machine-learning classifiers that incorporated both signal-based features, such as localized pressure changes, and image-based features, including optical flow, brightness patterns, and pixel displacement between frames.

The performance of the classifiers was evaluated using F1-score, precision, sensitivity, and specificity on 1-second windows.

Results: We observed similar performances for the rules-based- and machine-learning-based approaches. Using the rules-based approach, we were able to achieve an F1-score, precision, sensitivity, and specificity of 0.76, 0.70, 0.84, and 0.91, respectively. The machine-learning-based approach achieved an F1-score, precision, sensitivity, and specificity of 0.76, 0.74, 0.78, and 0.93, respectively.

Conclusions: Both the rules-based and machine-learning approaches closely aligned with the EMG labels in predicting leg movements that are characteristic of PLMS and RLS. However, all methods tended to underestimate leg movement counts and predicted longer durations for single movements, suggesting a need for new scoring criteria specific to this monitoring modality. Further research is now required to validate this approach in larger PLMS and RLS patient populations. If successful, our approach can enhance at-home monitoring and improve treatment strategies for individuals with PLMS and RLS.

Validation of Alice NightOne for diagnosis of obstructive sleep apnea: a single-belt multi-channel portable monitor with reliability in remote data transmission

M. Peng[1], X. Zhang[1], J. Li[1], L. Zhao[1], B. Zhou[1], R. Zhao[1], F. Han[1], X. Dong[1]
[1]Peking University People's Hospital, Department of Respiratory and Sleep Medicine, Beijing, China

Objectives: To validate the performance of a portable monitor (Alice NightOne, Philips Respironics, Pittsburgh, USA) for diagnosis obstructive sleep apnea and its reliability in remote data transmission and scoring for telediagnosis.

Methods: 95 subjects (74.7% males, mean ± standard deviation age 50.4 ± 14.5 years, body mass index 27.1 ± 4.1 kg/m^2) were enrolled and successfully underwent polysomnography (PSG) and Alice NightOne (ANO) monitoring simultaneously. 83 subjects (69.0% males, age 50.7 ± 14.4 years, body mass index 27.3 ± 4.1 kg/m^2) successfully underwent overnight, unattended home sleep apnea testing (HSAT) with ANO. The portable monitor and PSG recordings were scored manually based on AASM guidelines. The ANO recordings were transmitted to cloud database wirelessly in addition to traditional wire transmission. Message digest-5 (MD5) algorithm was utilized to verify the integrity of the cloud data.

Results: The respiratory event index (REI) on HSAT was 24.9 ± 20.9 events/h, corresponding apnea-hypopnea index (AHI) on PSG was 32.1 ± 25.2 events/h (P < .001); and the REI on in-laboratory ANO was 22.8 ± 18.4 events/h and corresponding AHI on PSG was 34.1 ± 24.0 events/h (P < .001). Bland-Altman analysis of REI on HSAT versus AHI on PSG showed a mean difference (95% confidence interval) of -11.3 (-14.3, -8.4) events/h. For simultaneously REI on ANO versus AHI on PSG, the difference is -7.2 (-9.0, -5.5) events/h. With threshold of REI ≥ 5 events/h, HSAT had 94.6% sensitivity, 100% specificity, 100% positive predictive value, and 69.2% negative predictive value. For moderate to severe OSA, HSAT had lower sensitivity (74.6%) but relatively good specificity (91.7%). The simultaneous recordings showed close agreements in multiple parameters, especially the number of respiratory events. For cloud data transmission, MD5 algorithm verified the identity between cloud data and original data.

Conclusions: Alice NightOne is a reliable portable monitor with single thoracic-abdominal belt for diagnosis of obstructive sleep apnea with good sensitivity and specificity especially when night-to-night sleep variability is taken into account. And it provides reliable support for diagnosis based on solid data transmission and scoring synchronization.