

**Introduction:** It is well established that human perception relies on top-down representations, such as expectations. The extent to which such representations influence the processing of upcoming stimuli in sleep has been only recently investigated. Some studies report disruption of hierarchical predictive coding in sleep, whereas others argue for limited but preserved detection of violation of predictions, with profound implications to studies showing effective learning during sleep. Here, we present preliminary results of how higher-order stimulus statistics modulate the neural responses during sleep.

**Materials and Methods:** We presented participants (N=24) with four different auditory tones presented at a fixed presentation rate (3 Hz). We manipulated the tone transition probabilities creating random and predictable tone sequences. Participants listened to the tones in wakefulness and during a 2.5 hour afternoon nap. We collected simultaneous Electroencephalography (EEG) and Magnetoencephalography (MEG) data. We used the EEG data for sleep staging, and we analyzed the MEG data using multi-level pattern analysis (MVPA) to decode low-level tone properties.

**Results:** Preliminary results indicate that low-level stimulus properties are decodable in N1 and N2, although decoding accuracies drop significantly. This is in line with previous studies showing attenuated cortical activations related to the processing of low-level stimulus properties in sleep. In addition, decoding of ordered tones yield significant and above chance pre-stimulus decoding accuracies, whereas this was not observed for the random tones. This effect was present also in N1 and N2 but decoding accuracies appeared less pronounced and stable than in wakefulness.

**Conclusions:** Detection of stimulus predictability seems to be preserved, at least to some extent, in sleep.

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#### PULSE RATE VARIABILITY PREDICTS DEMENTIA IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA

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**Objective:** We have shown in previous studies that indices of pulse rate variability (PRV) are associated with the incidence of atrial fibrillation (AF) and the occurrence of stroke in patients with obstructive sleep apnea patients (OSA). Given the strong associations between AF, stroke, and dementia, we evaluated in these patients whether PRV indices are also associated with the risk of dementia.

**Patients and methods:** This retrospective study was conducted on OSA patients from the French Pays de la Loire sleep cohort database. Clinical and sleep recording data from 3283 patients aged 60 years and older, without a history of AF were merged with health administrative data to identify the occurrence of dementia (Alzheimer’s or other). Time and frequency-domain parameters of PRV were extracted from photoplethysmography signals. Cox proportional hazard models were used to assess the association between PRV parameters and dementia risk. Association of dementia with clinical parameters as well as OSA severity indices was also assessed.

**Results:** After a median follow-up of 6.8 years, 70 patients had been diagnosed with dementia. Incident dementia was independently associated ( $p < 0.05$ ) with older age, depression, stroke, hypertension, and temporal and frequency indices of PRV. In multivariate analysis only age, depression, and 2 temporal indices of PRV (ln RMSSD: HR [95%CI] = 1.36 [1.08-1.71] and ln SNND: HR [95%CI] = 1.34 [1.05-1.72]) were associated with risk of dementia. However, there was no association between OSA severity indices and dementia.

**Conclusion:** In patients with OSA, older age, depression and increased pulse rate variability assessed by sleep oximetry derived RMSSD and SNND indices may help identify patients at high risk for dementia.

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which the data for this study were obtained and the sleep technicians in Sleep Medicine of Angers University Hospital.

#### QUANTITATIVE AND QUALITATIVE FEATURES OF DREAMING ACTIVITY DURING THE PANDEMIC

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**Introduction:** The COVID-19 pandemic has crucially influenced daily habits, mental health, and sleep. Several findings reveal that dreams are affected by waking experiences and sleep patterns. The lockdown could have provoked strong modifications in dreaming activity. This study aimed to assess dream features during the Italian lockdown. Furthermore, we also investigated the impact of the end of COVID-19 confinement on dream activity through a longitudinal investigation.

**Materials and Methods:** We used a web survey to collect demographic, clinical, sleep, and dream data during the lockdown. The sample included 1091 participants. After filling out the survey, 90 subjects participated in the longitudinal protocol lasting two weeks: (a) the first week (April 28–May 4) of full lockdown; and (b) the second week (May 5–May 11) of easing of restrictions. Participants were asked to record at home their dream experiences and complete a sleep-dream diary each morning.

**Results:** Results obtained from the first protocol showed an increase in quantitative and qualitative dream features during the lockdown, compared to a pre-lockdown period. Higher dream frequency and specific qualitative features were found in females and individuals with poor sleep quality, nocturnal disruptive behaviors, and depressive symptoms. Most of the dream features collected during the lockdown were predicted by age, gender, depressive symptoms, presence of other people at home, and territorial area. Sleep duration and several sleep quality indexes were the best predictors of dream variables. During the lockdown, dreams were also characterized by increased negative emotions, particularly frequent in females, younger adults, and people with poor sleep quality, nocturnal disruptive behaviors, anxiety, and depressive symptoms. Regarding the longitudinal protocol, the analyses showed that participants had higher numbers of awakenings, lower ease of falling asleep, higher dream recall, and lucid dream frequency during lockdown than post-lockdown. Subjects reported more dreams, including “being in crowded places” during post-lockdown than lockdown.

**Conclusions:** Our results confirm the strong influence of the pandemic on dreaming, supporting both the continuity-hypothesis between waking experience and sleep mentation and the view of a key influence of sleep patterns on dreaming. The poorer sleep quality during lockdown is consistent with previous studies. The relationship between traumatic events and dream recall frequency supports the idea of the pandemic as “collective trauma”. Moreover, we hypothesized that the greater lucid dreams frequency during confinement could reflect the attempt to cope with the waking pandemic experiences. The crowded places into dream scenarios during the second week of our protocol are also consistent with the continuity-hypothesis: the possibility to access places frequented by other people could represent a relevant experience after a long period of confinement. Finally, we believe that investigations on COVID-19 infected subjects experiencing the long-COVID-19 syndrome should be carried out since preliminary findings on COVID-19 patients showed strong associations between increased nightmares and the infection severity. This evidence suggests that the more that people were affected by COVID-19, the greater the impact on dream activity and quality of life.

#### RELATIONSHIP BETWEEN OBJECTIVE SLEEP QUALITY AND AGGRESSIVENESS

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**Introduction:** Sleep is linked to different emotions and behaviors, but despite this, studies relating sleep quality or sleep problems with

antisocial behaviors or with aggressiveness and anger are scarce and with contradictory results. Therefore, the study aimed to analyze the relationship between aggressiveness and sleep, evaluated objectively. It is expected to obtain a negative relationship between sleep quality and aggressiveness and anger.

**Materials and Methods:** The subjective assessment consisted of a socio-demographic survey, the Spanish version of the Aggressiveness Questionnaire (Andreu et al., 2002), and the Spanish adaptation of the State-Trait Anger Expression Inventory (STAXI; Miguel-Tobal, Cano-Vindel, Casado, & Spielberger, 2001). The objective evaluation of sleep was performed by polysomnography. For this purpose, the participants were summoned at the same time to the Sleep Laboratory of the University of Granada. Light, noise, and temperature conditions were controlled and were the same in all evaluations. The subjects received instructions on sport, napping, food, and stimulant consumption on the day of the test. Upon arrival at the laboratory, electrodes were placed in the lateral pathways as recommended by the AASM, concerning the opposite preauricular area. The sleep signals were analyzed manually. Participants had a code to link their responses to the questionnaires, thus maintaining anonymity. The questionnaires were applied in a computerized form.

**Results:** The prediction models of the anger and aggression variables explained by the sleep variables were not statistically significant. Nevertheless, the adjusted coefficient of determination was high in some cases: trait anger (R2adjusted = .38); anger expression and control (R2adjusted = .24); verbal aggressiveness (R2adjusted = .47;  $p = .035$ ) and anger (R2adjusted = .2). The variables with the greatest explanatory power were sleep efficiency, REM latency, and total sleep time.

**Conclusions:** The results seem to go in the direction of the hypothesis: the higher the sleep efficiency, the lower the aggression and anger. Nevertheless, the results are not significant, perhaps because of the low sample size or because some subjects reported a poorer sleep quality due to the discomfort of the evaluation. Despite the lack of significance in most of the models, we analyzed the most explanatory variables and observed that the most explanatory variables were sleep efficiency, time the subject spent awake after first falling asleep, total sleep time, and REM latency. This means that surely a larger sample size would give statistically significant results since some of the correlations are high.

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## RELATIONSHIP BETWEEN SUBJECTIVE SLEEP QUALITY AND AGGRESSIVENESS

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**Introduction:** Sleep is associated with different emotions and behaviors. However, studies relating sleep quality or sleep problems with antisocial behaviors or with aggressiveness and anger are scarce and with contradictory results. Therefore, this study aimed to analyze the relationship between perceived sleep quality and levels of aggression. The working hypothesis was that poorer sleep quality would be related to higher levels of aggressiveness and anger

**Materials and Methods:** A total of 130 participants of Spanish nationality (39 men; 30%) were evaluated, with a mean age of 31 years (SD = 12.88). A total of 80.76% had university studies. The evaluation involved a socio-demographic survey, the Spanish version of the Aggressiveness Questionnaire (Andreu et al., 2002), the Spanish adaptation of the State-Trait Anger Expression Inventory (STAXI, Miguel-Tobal, Cano-Vindel, Casado and Spielberger, 2001). A one-week sleep diary was used to assess subjective sleep quality. The data were averaged for each person. The entire evaluation was applied online, using two Google Forms: one for the questionnaires and another for the sleep diary (since it had to be completed seven nights).

**Results:** Different simple linear regression models were performed using anger and aggressiveness as dependent variables and sleep variables (sleep efficiency, number of awakenings, mean duration of awakenings, and latency to sleep). In no case were models found whose fit was statistically relevant. In fact, at the clinical level, the models did not seem to

have a high percentage of explained variance. Similarly, in the Pearson correlations between variables, no statistically significant relationships were observed beyond isolated relationships. Even so, it was observed that the variables with the greatest explanatory capacity were the mean number of awakenings and the mean sleeping time.

**Conclusions:** The results obtained do not support the hypothesis put forward. It should be noted that the results in the literature are inconsistent and this may be due to the use of subjective measures of sleep quality assessment. It may also be because this relationship only occurs in people with sleep problems or disturbances, whose sleep quality is severely affected for sustained periods.

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## SELF-AWARENESS BY WATCHING OWN POLYSOMNOGRAPHY FOR CONTINUOUS POSITIVE AIRWAY PRESSURE

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**Introduction:** Patients with obstructive sleep apnea (OSA) are suspected by observation of the surroundings rather than subjective symptoms, and continuous positive airway pressure (CPAP) is started according to the test results. This results in a lack of insight into the OSA and lowers CPAP compliance.

**Materials and Methods:** This is a randomized controlled study in patients with OSA of an apnea-hypopnea index over 15. All patients with OSA were confirmed through polysomnography and divided into group A in which the patients watched the event of their own sleep apnea and group B without watching the video. After a CPAP titration, all patients had cognitive behavior therapy from the doctor in charge of the sleep center. Then, patients were randomly assigned to either group A or group B and received a CPAP machine. The patients in group A watched their own sleep apnea events that occurred during polysomnography and went home. The patients of group B went home without watching the video. The usage of CPAP was assessed on day 90, and patients were considered as adherent when using their CPAP machine for more than 4 hours per day for 70% of the observed days.

**Results:** A total of 60 patients (30 in each group) were investigated. Group A and group B were compared. On day 90, the average usage per day of groups A and B were  $5.72 \pm 1.02$  and  $5.31 \pm 1.07$ , respectively ( $p = 0.131$ ). The number of used days was more in group A than group B ( $84.77 \pm 7.52$  vs.  $79.70 \pm 10.78$ ,  $p = 0.040$ ). The number of days with more than 4 hours used was more in group A than B ( $73.47 \pm 12.82$  vs.  $64.13 \pm 17.08$ ,  $p = 0.044$ ). The number of CPAP adherence was more in group A than group B ( $n = 29$ , 96.7% vs.  $n = 22$ , 73.3%,  $p = 0.011$ ).

**Conclusions:** To see is to believe. Showing patients their own apnea events can be a plausible option to enhance CPAP adherence.

**Acknowledgements:** This study was registered in the Clinical Trial Registry of Korea (<https://cris.nih.go.kr>): KCT 0005250.

## SLEEP AND THE OPTIMISATION OF MUSICAL LEARNING AND PERFORMANCE

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**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. A growing body of research shows that both quality and quantity of sleep affect memory and learning. Sleep, and specifically certain stages of sleep, are believed to be necessary to consolidate a memory so that it can be successfully accessed in the future. Chronic sleep deprivation degrades the ability to learn, process, and absorb novel information.

The impact that chronic sleep deprivation has on memory and fine motor skills has been looked at in the context of sports performance and within the general population in elegant studies including Dr. Walker's "Practice with sleep makes perfect: sleep-dependent motor skill learning." (Neuron,