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Methods: We have developed a user-friendly platform for real-time automated scoring of polysomnography data, named Somnivore. Using a GUI-based approach in the Matlab™ platform we have deployed a support vector machine (SVM) to analyse features from polysomnography inputs (EEG, EMG, EOG, ECG, temperature, etc.) into the various sleep stages. The SVM is trained for each individual subject via a brief session of manual scoring. The system has been validated using mouse, rat and human data collected across a number of different treatments and genotypes and scored by members of collaborating laboratories from Australia, Europe and USA.

Results: With minimal training time, overall scoring agreement rates were consistently above 90% in all species and treatment groups. F-scores in rats and mice were >0.9 for wake, >0.9 for NREM and >0.85 for REM. For human data, F-scores were >0.85 for wake, >0.35 for N1, >0.88 for N2, >0.85 for N3 and >0.91 for REM.

Conclusions: Somnivore provides accurate, reliable, high-throughput scoring and analysis of polysomnography data, in a range of experimental situations from physiology to drug pharmacology, across both animal and human models.

Disclosure: Nothing to disclose.

P508

Continuous sleep profiles clustering with a novel two-step functional data approach

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Objectives: We aim to identify specific sleep temporal profiles reflecting important physiological aspects of sleep.

Methods: We apply the previously developed probabilistic sleep model (PSM) to the polysomnographic data from 146 healthy subjects spending two nights in the sleep lab. Subjects performed a battery of tests for assessment of attention, concentration, memory, drowsiness or mood and questionnaires scoring their subjective sleep quality.

The PSM represents the sleep process by posterior probability values of a finite set of sleep microstates. This representation can in turn be considered as a set of temporal curves. In the presented work functional cluster analysis is used for detecting groups of subjects with similar curve-profiles. When curves are not synchronized in time, classical clustering techniques fail. Therefore, a novel two-step iterative approach combining cluster analysis and curve registration is applied to the extracted sleep microstates curves. Finally, ANOVA is used for testing significant differences in daily measures between the formed clusters.

Results: Relationship between clustering structure and age was detected for a majority of the considered sleep microstates. Curve misalignment causes existing relationships to be partially hidden. By applying our novel two-step approach we identified new relationships between the sleep microstate profiles and age, self-rating questionnaires mirroring sleep quality or drowsiness. ANOVA analysis confirmed the statistical significance level of the observed relationships.

Conclusion: In comparison to the direct clustering of the original misaligned sleep microstate curves, the proposed two-step clustering method shows an improvement in revealing existing relationships between the sleep process structure and daily measures.

Disclosure: Nothing to disclose.

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Non-invasive discrimination of mouse wake-sleep states based on breathing variability

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Objectives: Increasingly number of studies include the use of whole body plethysmography (WBP) to assess breathing disorders or chemoreflex sensitivity in mouse models of pathology. The combination of WBP and sleep studies based on electroencephalographic (EEG) and electromyography (EMG) signals is currently challenging and it cannot be used for large-scale phenotyping or genome-wide cohort association screening studies. Aim of this study was to evaluate a non-invasive method to score mouse wake-sleep states only relying on WBP signal.

Methods: We instrumented 10 C57BL/6j mice with EEG and EMG electrodes and we recorded, via cable, their biosignals while placed into a WBP chamber. Recordings were performed for 2 h exposing mice cyclically to air (10 minutes) or hypoxic/hypercapnic gas mixture (15 minutes). Wakefulness, non-REM sleep (NREMS) and REM sleep (REMS) were scored based on EEG/EMG or WBP variability signal.

Results: We found that the overall agreement between the two methods, evaluated by Cohen's kappa (k), was excellent ($k = 0.851$). Splitting the analysis for each behavioral state, we found that relying only on WBP signal, the accuracy for wakefulness, NREMS and REMS was respectively 91%, 89%, 97% compared to classical EEG/EMG scoring method.

Conclusions: We showed that WBP variability signal provides an accurate assessment of the wake-sleep architecture in mice, both at rest and during mild stress, while entailing continuous quantitative measure of breathing. This may thus represent a valuable, practical, cost-effective tool for routinely studying, screening, and phenotyping cohorts of mice.

Disclosure: Nothing to disclose.

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A feasibility study of bioradar usage for respiration monitoring in small laboratory animals during sleep

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Objectives: The purpose of the present study was to investigate the feasibility of radars usage for monitoring of the sleeping rodents respiration pattern.

Methods: We performed simultaneous recordings of the signal by means of bioradar (BR) and a standard contact method. Continuous wave BR operating at 7 GHz probing frequency was located on the distance of 30 cm from the examined animal. For verification we used standard contact piezoelectric sensor (PES), which was fixed