Sleep Breathing Disorders

THE RISK OF OBSTRUCTIVE SLEEP APNEA IN A BRAZILIAN BIRTH COHORT: PRELIMINARY RESULTS

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Introduction: Obstructive Sleep Apnea (OSA) is a prevalent disease. A Brazilian study estimated the prevalence of OSA in the adult population in 32.8%. The most frequent signs and symptoms of OSA are snoring, apnea, excessive sleepiness, nocturia, cognitive impairment, depressive symptoms, difficulty concentrating, sexual impotence and morning headache. Birth cohort studies bring the possibility of conducting research with a temporal window that begins at birth and extends to the present, representing an opportunity that may help us to understand the mechanisms that lead to OSA. In this preliminary results, we will evaluate the quality of sleep, excessive daytime sleepiness, and the presence of obesity and high blood pressure in a population stratified by risk of OSA.
Materials and methods: The study population came from a larger study called COBRAS (COortes BRASileiras) and started in the 1970s with the initial objective of studying the development of live births in the region of Ribeirão Preto, São Paulo, Brazil. Firstly, a cross-sectional study of this population was carried out to evaluate the risk of OSA, sleep quality (Pittsburgh Sleep Quality Index – PSQi), sleepiness (Epworth scale) and anthropometric data such as weight, height, BMI and blood pressure. To stratified the risk of OSA, the STOP-BANG questionnaire was used. It consists of the evaluation of eight domains (Snoring, Tiredness during daytime, Observed apnea, high blood Pressure, Body mass index, Age, Neck circumference and Gender).
Results: Out of more than 5000 individuals, 1560 were interviewed so far. The mean age and standard deviation were 33 ± 7.6 years. Of these, 1239 (78.4%), 270 (17.1%) and 51 (3.2%) were, respectively, a low, intermediate and high risk for OSA. We observed a worse quality of sleep in the population with a high risk of OSA compared to low and intermediate risk ($p < 0.001$), and the intermediate risk population versus the low-risk population ($p < 0.001$). An increased of daytime sleepiness was associated with an increased risk for OSA ($p < 0.002$). Individuals with excessive daytime sleepiness have a higher risk for AOS – OR (Confidence Interval ± 95%) = 2.07 (1.11-3.86). We observed an increase in the proportion of individuals with High Blood Pressure (HBP) associated with increased risk for OSA ($p < 0.001$). People with HBP have greater risk for high risk for AOS – OR (Confidence Interval ± 95%) = 10.1 (5.12-19.92). An increase in the proportion of individuals with obesity was associated with an increased risk for OSA ($p < 0.001$). Obese people have a higher risk for high risk for AOS – OR (Confidence Interval ± 95%) = 33.16 (17.64-61.98).
Conclusions: The presence of poor sleep quality, excessive daytime sleepiness, HBP and obesity are associated with an increased risk for OSA.
Acknowledgements: Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Programa de Apoio a Núcleos de Excelência (PRONEX), Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP).

Technology/Technical

RELATIONSHIP BETWEEN BRAIN ACTIVITY AND OCULAR MOVEMENTS DURING WAKEFULNESS AND DROWSINESS

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Introduction: Drowsiness is a physiological condition that is characterized by an uncontrollable desire to sleep and by impairments of performance. Among the different approaches for detecting drowsiness, the use of images of the eye, called photooculography (POG) seems to be the most suitable for many applications since it is objective and non-invasive. The goal of this study is to analyze the relationship between ocular parameters extracted from images of the eye (related to eyelids movements and pupil dilation) and the presence of different activities (alpha and/or theta) in polysomnographic (PSG) signals – considered to be the "gold standard" – during wakefulness and drowsiness.
Materials and methods: We conducted an experiment in which 27 healthy volunteers performed three visual Psychomotor Vigilance Tests (PVTs) under increasing sleep deprivation. During each test, we recorded PSG signals and POG images. For each 1-minute epoch, (1) we manually scored the PSG signals to determine the presence of alpha rhythm, theta activity, and slow eye movements, and we also computed a PSG-based level of drowsiness (LoD) which is our own version of the Karolinska Drowsiness Score (KDS); (2) we automatically extracted from images of the eye a set of ocular parameters including the PERCLOS, the mean blink duration, the percentage of microsleeps, and the pupil diameter, and we also computed a POG-based LoD.
Results: Results will investigate the relation between the ocular parameters automatically extracted from images of the eye with the features extracted from PSG signals. In particular, we will analyze the correlation between the variation of the pupil diameter and the presence of alpha rhythm and/or theta activity in PSG signals. We will also compare the POG-based LoD with the PSG-based LoD to determine if they are in concordance as a function of time.
Conclusions: Besides highlighting the relationship between ocular parameters indicative of drowsiness and the presence of alpha rhythm and/or theta activity in PSG signals, the aim of this study is also to validate the POG-based drowsiness monitoring system that we have developed and to show that it is able to reliably and objectively determine drowsiness and ultimately to help and facilitate the diagnostic of sleep pathologies.

Basic Research

SLEEP-WAKE HYPOTHALAMIC PATHWAYS CHARACTERIZING THE HIBERNATING SPECIES ARCTIC GROUND SQUIRREL (*UROCITELLUS PARRYII*)

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Introduction: Hibernation is an adaptive strategy characterized by metabolic suppression and a decrease in body temperature (Tb). During hibernation metabolism is suppressed to 1-2% of resting metabolic rate and Tb approaches ambient temperature (2°C). Previous study in the arctic ground squirrel (AGS) reported the role of A1 adenosine receptor (A1AR) in the generation of torpor. Treatment with N6-cyclohexyladenosine (CHA), an A1AR agonist, promotes the onset of hibernation, but AGS show a seasonal difference in sensitivity to CHA. However, what regulates the seasonal control of the agonist response is still unknown. Seasonal differences in sleep-wake pathways may underlie the difference in agonist response.
This research tests the hypothesis that sleep-wake pathways are differentially activated in AGS depending on season.
Material and methods: Using cFos as a neuronal indicator for active neurons, we treated AGS with CHA or vehicle in summer and winter. CHA (0.5 mg/kg) was administered intraperitoneally and after 3 hours AGS were perfused with 4% paraformaldehyde and brains removed for immunohistochemical analysis. Brains, cryoprotected through a gradient of sucrose from 5% to 30%, were cut using a cryostat into 40 μm sections. Free-floating immunohistochemsitry was used to localize active nuclei as indicated by cFos-immunoreactivity in the hypothalamus (mouse anti-cFos 1:20,000, Millipore). Blinded analysis of cFos immunoreactivity in hypothalamic nuclei is in progress. Statistical analysis is performed in R.
Results: CHA produced a hibernation-like response in winter, while in summer CHA produced a slight decrease in Tb and metabolic rate. This slight decrease was followed by return to the initial value of Tb and metabolic rate. Blinded analysis is in progress to identify neuronal pathways associated with the different physiological response to CHA in summer and winter AGS.
Conclusion: These results suggest a seasonal activation of neuronal pathways that prevent the hibernation promoting effect of CHA. Work is in progress to optimize double immunohistochemistry of cFos nuclear staining and phenotypic markers in the Perifornical Nucleus, Preoprtic area and Paraventricular nucleus.
Acknowledgement: NIH R03 NS081637 NSF IOS-1258179 Alaska INBRE P20GM103395.