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Evaluating cognitive changes in severe OSAS: Neuropsychological tests may not be as efficient as electrophysiological methods

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Background: Obstructive sleep apnea syndrome (OSAS) is a sleep disorder characterized with upper airway obstructions. Due to these obstructions, reduction in oxygen saturation occurs and causes cognitive deficits in time; particularly in executive functions, memory and attention domains. In the present study we aimed to investigate the cognitive changes in OSAS by using both neuropsychological tests and event-related potentials (ERP) which are often used to evaluate cognitive functions.

Methods: Twenty-three severe OSAS patients (AHI>30; mean age: 40.01) and 18 healthy controls (mean age: 39.22) were included. All participants underwent a detailed neuropsychological testing, followed by an EEG recording in which a classical visual oddball paradigm was used. EEG was recorded according to international 10-20 system. Artifacts were manually rejected and the remained epochs were filtered between 0.5-25 Hz for ERPs. Maximum peak amplitude and latency of P300 and N200 components were measured from F₃, F_z, F₄, C₃, C_z, C₄, P₃, P_z, P₄, O₁, O_z and O₂ electrode sites.

Results: Neuropsychological test scores did not differ between groups. Repeated measures of ANOVA revealed a main GROUP effect on P300 amplitude [$F_{(1,39)}=6.003$; $p=0.019$], indicating significantly lower P300 amplitudes over F₃, F_z, and F₄ electrode sites in OSAS patients compared to matched controls. There were no main GROUP effects on P300 latency or N200 amplitude. However, there was a main GROUP effect on N200 latency [$F_{(1,39)}=7.017$; $p=0.012$], indicating prolonged N200 latencies in OSAS patients at F₄, C_z, C₄ and P₄ electrode sites. OSAS patients were divided into two subgroups according to disease duration. Healthy controls showed shorter N200 latencies than both early and late diagnosed OSAS patients over F₄ electrode site and shorter N200 latencies than late diagnosed OSAS patients over P₄ electrode site.

Conclusion: OSAS patients showed reduced P300 amplitudes over frontal regions and prolonged N200 latencies at right frontal, central and parietal locations compared to matched controls. This is the first study that reports reduced frontal P300 amplitudes in OSAS and this finding is consistent with the pathological processes of the disease. Our findings indicate that electrophysiological methods can be used as an efficient measure for detecting early cognitive changes, when neuropsychological tests are within normal limits.

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Combination of Neurofeedback and cognitive training in attention deficit due to multiple sclerosis

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Background: Attention deficit is a common consequence of brain injury that leads to difficulties in everyday life and employment. Cognitive rehabilitation in progressive diseases is challenging and to date is mostly based on behavioral compensatory strategies. Rapidly developing technological methods aim to improve the function itself.

Methods: Patient Y., 40 y.o. female, was admitted for outpatient rehabilitation with relapsing-remitting multiple sclerosis (9 years after the start of the disease) and gamma-knife treated left cerebellopontine angle meningioma (1.5 years before). She complained of difficulties focusing on tasks, memory deficit, fatigue and gait instability. Neuropsychological assessment revealed executive dysfunction with impulsivity, confabulations, instability of memory traces. Y. underwent computerized everyday attention training “Wikium” for 1 month. During the first 2 weeks she experienced a 11% gain in attention score, and then reached a performance plateau. She found no improvements in everyday life. We performed 10 sessions of infra-low frequency neurofeedback – bipolar training from T3T4 site with the “Cygnat” system, once a week.

Results: After the introduction of neurofeedback Y. reported an improvement in attentiveness and working efficacy, which correlated with resuming gains in her attention score – 9% during the neurofeedback period. After the course completion she, once again, reached performance plateau. One month after the last neurofeedback session she reported preserved results.

Discussion: Attention is known to improve with cognitive trainings, but their therapeutic potential is limited, especially in progressive diseases. Neurofeedback, being an intervention on the physiological level, may present additional opportunities for rehabilitation.

Conclusion: The observed case demonstrates the efficacy of neurofeedback in restoration of attention. Controlled studies are needed to exclude a possible placebo-effect and to evaluate the therapeutic power of the intervention.

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Exercise related cardiovascular response in terms of time irreversibility in older people with symptomatic orthostatic intolerance

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Orthostatic intolerance (OI) is a clinical syndrome, which is characterized by symptoms and loss of consciousness before syncope that can be caused by orthostatic hypotension (OH). The phenomenon of irreversibility is inherent to non-equilibrium systems such as the complexity interaction between heart and neural regulation capable of producing a change in only one direction. The database