

SPACE LIFE SCIENCES SYMPOSIUM (A1)
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INFLUENCE OF SHORT ARM CENTRIFUGATION ON EEG DURING TILT TABLE TESTING

Abstract

Brain waves are in a constant dynamic change, depending on current psychological and physiological conditions. It is well known that psychological, especially emotional arousal can alter brain wave patterns remarkably (1,2). The question rises what happens to EEG or wave frequency during physical arousal like exercise or cardiovascular stress. Nevertheless, psychological factors and conditions can never be neglected, because they influence brain activity in every situation, particularly in hostile environments like microgravity or hypergravity. Recent studies put physical factors more and more into picture, since the influence of emotional arousal has been well proven (1,2). With equipment becoming increasingly practicable and usable during spaceflight or centrifugation, examining neurocognitive functions during exceptional conditions gets more accurate and feasible. This study observed the influence of 45 minutes of short arm centrifugation on changes in EEG and orthostatic tolerance endurance during LBNP on a tilt table device. Subjects either went through a control day with 60 minutes of HDT followed by LBNP testing or an intervention day with 60 minutes of HDT followed by a staged centrifugation training protocol individualized for each subject and LBNP afterwards. Beside simple endurance time assessment, FFT (fast fourier transformation) brain wave analysis and sLORETA (3) brain activity recording was performed. Subjects showed significant 26.72 % less alpha and 33.48 % less beta rhythm on the intervention day, indicating, that the given centrifugation protocol is sufficient to diminish the delivered stress to the brain, although loading for the cardiovascular system was equal on both days with reaching presyncopal conditions. Results from brain activity measurement suggest the same trend towards less stress with interventional training with a 23.51 % reduce of frontal brain activity. The presented study demonstrates the effectiveness of short arm centrifugation in preventing impairment of neurocognitive functions during microgravity, which is one aspect of the deconditioning process taking place during longer space missions (4-7).