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Author: Mr. Brett Bennett
Association of Spaceflight Professionals, Inc., United States, brett.bennett@spaceflightprofessionals.org

EEG-BASED NEUROFEEDBACK FOR CREW PERFORMANCE TRAINING IN EXPLORATION-CLASS MISSIONS

Abstract

Current risk-reduction strategies for exploration-class missions rely on engineering solutions to decrements in human performance in extreme environments (e.g., pharmaceutical blends for sleep disturbance). In contrast to this problem-first approach, this work proposes a crew training protocol designed to reduce reliance on exogenous countermeasures against environmental stressors. Specifically, EEG-based neurofeedback protocols are hypothesized to increase metrics of resilience to detrimental effects of extreme environment exposure. The novel nature of planned lunar and Mars missions requires that crew training account for these environmental stressors as well as the need for autonomous decision making. Proposed neurofeedback regimens rely on long-term brain-computer interface (BCI) training to achieve sustained positive subjective assessments of high performance in crew. Such a paradigm has not been fully applied to the support of human performance in planned exploration-class missions. This work further develops EEG methods for the cultivation of innate resilience in crew, with the goal of providing a robust, self-sustaining, autonomous, and high-performing operating environment. Ongoing research will focus on the development of EEG systems for pre-launch psychological training integration and in-flight biomedical metrics as extensions of the BCI protocols explored here.