Vestibular meeting abstract 1: 253 words

Stimulus Characteristics for Vestibular Stochastic Resonance to Improve Balance Function

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Stochastic resonance (SR) is a mechanism by which noise can enhance the response of neural systems to relevant sensory signals. Studies have shown that imperceptible stochastic vestibular electrical stimulation, when applied to normal young and elderly subjects, significantly improved their ocular stabilization reflexes in response to whole-body tilt as well as balance performance during postural disturbances. The goal of this study was to optimize the amplitude characteristics of the stochastic vestibular signals for balance performance during standing on an unstable surface. Subjects performed a standard balance task of standing on a block of foam with their eyes closed. Bipolar stochastic electrical stimulation was applied to the vestibular system using constant current stimulation through electrodes placed over the mastoid process behind the ears. Amplitude of the signals varied in the range of 0-700 microamperes. Balance performance was measured using a force plate under the foam block, and inertial motion sensors were placed on the torso and head. Balance performance with stimulation was significantly greater (10%-25%) than with no stimulation. The signal amplitude at which performance was maximized was in the range of 100-300 microamperes. Optimization of the amplitude of the stochastic signals for maximizing balance performance will have a significant impact on development of vestibular SR as a unique system to aid recovery of function in astronauts after long-duration space flight or in patients with balance disorders.

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