OCULAR VESTIBULAR EVOKED MYOGENIC POTENTIALS USING HEAD STRIKER STIMULATION

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Introduction: Over the last two decades, several studies have been published on the impact of long-duration (i.e., 22 days or longer) spaceflight on the central nervous system (CNS). In consideration of the health and performance of crewmembers in flight and post-flight, we are conducting a controlled prospective longitudinal study to investigate the effects of spaceflight on the extent, longevity and neural bases of sensorimotor, cognitive, and neural changes. Multiple studies have demonstrated the effects of spaceflight on the vestibular system. One of the supporting tests conducted in this protocol is the Vestibular Evoked Myogenic Potential (VEMP) test that provides a unilateral measure of otolith (saccule and utricle) function. A different approach was taken for ocular VEMP (oVEMP) testing using a head striker system (Wackym et al. 2012). The oVEMP is generally considered to be a measure of utricle function. The the otolithic input to the inferior oblique muscle is predominately from the utricular macula. Thus, quantitatively, oVEMP tests utricular function. Another practical extension of these relationships is that the oVEMP reflects the superior vestibular nerve function.

Methods: Ground testing was administered on 16 control subjects and for 8 subjects over four repeated sessions spanning 70 days. The oVEMP was elicitied via a hand held striker by a vibrotactile pulse presented at the rate of 1 Hz for 24 seconds on the side of the head as subjects lay supine on a gurney. Subjects were directed to gaze approximately 25 degrees above straight ahead in semi-darkness. For the oVEMP electromyograms will be recorded with active bipolar electrodes (Delsys Inc., Boston, MA) on the infra-orbital ridge 1 cm below the eyelid with a reference electrode on the below the knee cap.

The EMG potentials were amplified; band-pass filtered using a Bagnoli^{TM} Desktop EMG System (Delsys Inc., Boston, MA, USA). This EMG signal is sampled at 10 kHz and the data stimulus onset to 100 MS was averaged over 24 trial repetitions for the vibrotactile VEMP. The typical oVEMP EMG response is an excitatory potential with first peak occurring at 11–12 ms and second peak at 18 ms. This requires a total recording time of approximately 29 seconds per trial which includes 5 seconds of no vibrotactile stimulation at the beginning of the protocol. The primary dependent measures consist of the latency and peak-to-peak amplitude from the EMG signals, which will be normalized to EMG levels at the beginning of the protocol. Data were collected for 3 repeated trials with striker stimulation on both the left and right side of the head

Results: The oVEMP p1 range was observed at 3-14 ms and n1 at 7-19 ms. The striker system provided a consistent and rapid method for oVEMP testing.

Discussion: Crew testing is in progress to determine changes in results between pre and post flight.

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