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Lower Extremity Motor Evoked Potential Latency as a Biomarker for Warfighter Fatigue: Preliminary Data

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Single pulse transcranial magnetic stimulation (TMS) non-invasively characterizes corticospinal system function *in vivo*, inducing multiple successive excitatory volleys observed as motor evoked potentials (MEP). Latency of the MEP is a relatively stable measure, providing evidence of differences in direct and transcallosal pathways, with longer latencies indicative of stress. Observation of the differences between target (T) and non-target (NT) muscles may provide insight into use of MEP latency as a biomarker for fatigue. **PURPOSE**: To analyze preliminary observations of MEP latency as a biomarker for fatigue within military warfighters. **METHODS**: Three warfighters (25.01±3.5 years) were recruited to identify individual markers of cognitive degradation during operational stressors. Subjects completed physical and mental tasks for 5 consecutive days, testing TMS each afternoon to assess the motor cortical excitability as a biomarker for fatigue. During a seated isometric squat at 15% (±5%), 40 stimuli were delivered to the dominant vastus lateralis (VL) or first dorsal interosseous (FDI), two at each 5% interval from 5% to 100% stimulator output. During days 2 and 3, subjects were limited to 50% of normal sleep and calorie intake, with normal sleep and food during days 0, 1, and 4. MEP latency was measured from TMS to peak of MEP, if present, in the T and NT FDI and VL. The difference between T and NT MEP were analyzed across days for mean, standard deviation, and graphic representations. **RESULTS**: The differences in VL T and NT MEP latencies were greatest on day 0 (2.63±1.3ms) decreased day 1 (1.58±0.7ms) increased on fatigued days 2 (3.31±0.9ms) and 3 (3.19±0.8ms), with a slight decrease on day 4 (2.90±0.9ms). The latencies between T and NT FDI presented with minimal differences across days. **CONCLUSION**: The increased latency on day 0, as compared to day 1, is suggested to be due to task familiarization. The increased differences in VL T and NT latency during days 2 and 3, compared to 1 and 4, may be due to interhemispheric signaling, as increased fatigue stresses the transcallosal pathways. Lack of differences during FDI activation may be due to the increased lateralization of the hand. However, more trials are necessary to assess familiarization and difference between T and NT MEP latency as a fatigue biomarker.

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