Mid Atlantic Regional Chapter
of the
American College of Sports Medicine

Annual Scientific Meeting, November 2nd - 3rd, 2018
Conference Proceedings
International Journal of Exercise Science, Issue 9, Volume 7

Initial Observations on the Influence of Cognitive Stress on Motor Evoked Potentials in Military Personnel

Felix Proessl, Anne Z. Beethe, Adam J. Sterczala, Courtenay Dunn-Lewis, Christopher Connaboy, Bradley C. Nindl, FACSM, Shawn D. Flanagan. University of Pittsburgh, Pittsburgh, PA

Military personnel are exposed to cognitive stress from operational factors such as sleep restriction/disruption, physical fatigue, and caloric deficiency. Assessed via transcranial magnetic stimulation (TMS), corticospinal excitability may represent a sensitive biomarker for such stress, yet little is known in this population. **PURPOSE:** Determine the influence of cognitive stress factors on corticospinal excitability in military personnel. **METHODS:** In this ongoing study, three male US Army reserves (25.0 ± 3.5 yrs) completed five consecutive days of evaluation, including a familiarization (D0), baseline assessment (D1), two days of stress (D2 & D3), and a recovery day (D4). D2 and D3 included exhaustive physical exercise, caloric deficits, and restriction of sleep to two 2hr sequences (7hr on D1 & D4). To characterize the corticospinal system, stimulus response curves were produced during bilateral isometric contractions of the first dorsal interosseous (FDI; 8 x 25s with 30s rest between) at 15% maximum voluntary force. Forty TMS pulses were delivered to the M1 FDI hotspot in pairs of 5% increments from 5-100% stimulator output (SO) in a random order. Motor evoked potentials (MEP) were quantified as the peak-to-peak EMG amplitude over the 5-50ms post-stimulus interval. Nonlinear regression was used to fit MEP responses to a Boltzmann sigmoidal curve (BSC), with the slope, maximum, and SO at 50% maximum (V50) determined each day. **RESULTS:** Individual measures of corticospinal excitability were generally greatest on D2 or D3 and recovered on D4. On average, BSC slope increased by 22% (5.9 ± 2.6 to 7.2 ± 2.4), max by 90% (2.1 ± 0.1 to 4.0 ± 0.3 mV), and V50 by 21% (52.4 ± 2.9 to 63.6 ± 2.7 SO) from baseline to D2. On D4, corticospinal excitability decreased (BSC slope: 4.1 ± 1.5, Δ: -42%; max: 3.2 ± 0.2 mV, Δ: -20%; V50: 56.9 ± 1.7 SO, Δ: -11%) relative to baseline. **CONCLUSION:** Our preliminary evidence indicates that corticospinal excitability is sensitive to military operational cognitive stress. If further validated, these physiologic metrics may provide an objective means to characterize, monitor, or discriminate responses to cognitive stress and clarify our understanding of cognitive resilience.

Supported by the Department of Defense W81XWH-16-PHTBIRP-CR3A.