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Similar Corticospinal Excitability in Military Men and Women During Simulated Operational Stress

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Sleep- and caloric restriction as well as physical exertion are common during combat, but the possibility that such operational stressors exert sex-specific effects on corticomotor system function is untested. **PURPOSE:** To examine corticospinal responses to simulated operational stress in men and women. **METHODS:** Fifty-two military members (39 men; Age: 26 ± 6yr, Height:174 ± 9cm, Weight: 80 ± 13kg, BF%: 22 ± 7%) completed a corticospinal testing battery on five consecutive days. After familiarization (D0), baseline testing and air-displacement plethysmography were performed on D1. Simulated operational stress was imposed on D2-3, followed by a recovery day (D4). Operational stress consisted of exposure to fatiguing physical exertion, 50% caloric restriction, and sleep restriction/disruption consisting of 2hr segments of sleep separated by 2hr (4hr sleep total). Maximal voluntary isometric contractions (MVC) of the first dorsal interosseus (FDI) and vastus lateralis (VL) were performed each day in conjunction with electromyographic (EMG) recordings. Corticospinal excitability was then assessed with stimulus response curves at 15% MVC using transcranial magnetic stimulation and a figure-of-eight (FDI) or double-cone (VL) coil over the motor cortex hotspot. Motor evoked potentials (MEP) were quantified as peak-to-peak EMG amplitudes 15-65ms post-TMS and fitted to a sigmoidal curve (SC) via nonlinear regression. Corticospinal excitability was determined as the maximum of the SC (SC_{MAX}). Mixed-models ANOVAs with Bonferroni-corrections were used to compare MVC force, EMG, and SC_{MAX} between sexes and across time with body fat percentage as a covariate. **RESULTS:** The FDI and VL presented stereotypic responses, with greater force (adjusted $p<0.001$, diff: 1011.5 ± 451.0N) but smaller MEPs in the VL (diff: 3.0 ± 2.4mV, adjusted $p<0.001$). Men produced greater VL MVC than women (adjusted $p=0.02$, diff: 286.5 ± 843.7N), but SC_{MAX} was similar ($p>0.05$) at each time point regardless of muscle. **CONCLUSION:** Despite differences in maximal lower extremity force, corticospinal function in men and women did not differ in response to military operational stress. These findings provide initial evidence for shared neuromuscular resiliency and recovery profiles in men and women exposed to operational stress.

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