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## The Effects of Loaded Fatigue on Loaded Postural Stability

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Military personnel are often required to carry heavy loads for long distances over unpredictable terrain. Additional load carriage, in conjunction with fatigue, has the potential to influence postural control mechanisms which may in turn increase injury risk. **PURPOSE:** To determine if a loaded incremental march to fatigue negatively influences loaded postural stability (LPS). **METHODS:** LPS was measured before and after a loaded incremental march to fatigue in 23 physically active men and women (age:  $24.09 \pm 3.98$  years, height:  $172.34 \pm 11.07$ cm, weight:  $162.17 \pm 38.22$ lbs). LPS was assessed using Sensory Organization Test (SOT) clinical outcome scores and kinetic force plate variables (vertical ground reaction forces: SDvGRF) while subjects were adorned with a weighted vest equating to 30% of their body weight. The SOT consisted of six conditions (C1-C6) aimed to perturb the sensorimotor system, which were performed before and after a loaded fatigue protocol. C1, C2 and C3 challenged the somatosensory system, C4 challenged the visual system, while C5 and C6 challenged the vestibular system. Fatigue was induced with a treadmill march at 4mph with increasing grades of 2% every three minutes until volitional fatigue. After testing for normality, paired sample t-tests or Wilcoxon signed rank tests were conducted to assess pre- to post-fatigue differences. **RESULTS:** Worse LPS was observed post-fatigue with significant reductions in SOT scores found in overall composite scores (pre:  $82.76 \pm 4.65$ , post:  $81.61 \pm 5.18$ ,  $p=0.010$ ), and SDvGRF of C1 (pre:  $1.26 \pm 0.45$ , post:  $2.04 \pm 0.96$ ,  $p<0.001$ ), C2 (pre:  $1.37 \pm 0.60$ , post:  $1.92 \pm 1.19$ ,  $p<0.001$ ), C3 (pre:  $1.35 \pm 0.50$ , post:  $2.05 \pm 1.81$ ,  $p=0.026$ ), and C6 (pre:  $2.52 \pm 2.16$ , post:  $3.49 \pm 3.15$ ,  $p<0.001$ ). No differences were seen for C4 or C5. **CONCLUSIONS:** Significant decrements in LPS, and more specifically the somatosensory and vestibular systems, were caused by loaded fatigue. Findings could aid in future postural stability screenings, load carriage training and strategies for injury prevention in the military.

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