



## Mid Atlantic Regional Chapter of the American College of Sports Medicine

Annual Scientific Meeting, November 1<sup>st</sup> – 2<sup>nd</sup>, 2019  
Conference Proceedings

International Journal of Exercise Science, Volume 9, Issue 8



### The Physiological and Perceptual Responses of Thoracic Load Carriage During Walking

Benjamin J. Ronemus, Ashley Y. Lesniak, Curt B. Dixon, FACSM. Lock Haven University, Lock Haven, PA

Tactical occupations regularly work while wearing heavy equipment. **PURPOSE:** To investigate the physiological and perceptual responses of thoracic load carriage during walking. **METHODS:** Eight males and one female (age:  $21.0 \pm 1.4$ yr; height:  $178.9 \pm 5.8$ cm; mass:  $86.1 \pm 13.2$ kg; body fat:  $20.2 \pm 7.2\%$ ) without thoracic load carriage experience participated in the study. On separate days, each subject completed four 10 min walking trials on a motorized treadmill at a predetermined unloaded intensity equal to 4 METs. Testing sessions included an unloaded (UL) trial, which served as the control, and wearing a light load (LL; 24lb = 10.9kg), moderate load (ML; 48lb = 21.8kg) and heavy load (HL; 80lb = 36.4kg) weighted vest. The testing order of the weighted vest trials was determined by counterbalanced assignment. Vest weights were selected to approximate common gear of tactical populations: law enforcement (LL), firefighter (ML), and military personnel (HL). Oxygen consumption ( $VO_2$ ), energy expenditure (EE), heart rate and ratings of perceived exertion (RPE) were assessed during all trials. An average value from the last 2 min of exercise was calculated for  $VO_2$ , EE, and heart rate and used in a repeated measures ANOVA for statistical comparison. **RESULTS:** Relative  $VO_2$  increased significantly with vest weight (UL =  $12.38 \pm 1.28$ , LL =  $13.45 \pm 1.26$ , ML =  $14.78 \pm 1.67$ , HL =  $16.65 \pm 1.76$  ml·kg<sup>-1</sup>·min<sup>-1</sup>;  $p < 0.005$ ). When  $VO_2$  was expressed relative to vest weight, no significant differences were observed across trials (LL =  $8.8 \pm 6.5$ , ML =  $9.4 \pm 5.4$ , HL =  $10.0 \pm 3.1$  ml·kg<sup>-1</sup>·min<sup>-1</sup>;  $p = 0.896$ ). Total EE for the walking bout was significantly higher during all LC trials compared to unloaded (UL =  $46.9 \pm 6.0$ , LL =  $53.9 \pm 8.0$ , ML =  $59.2 \pm 8.1$ , HL =  $66.4 \pm 7.7$  kcals;  $p \leq 0.001$ ). Heart rate during the HL trial ( $109 \pm 13$ ) was significantly higher than the other trials (UL =  $91 \pm 12$ , LL =  $96 \pm 12$ , ML =  $101 \pm 18$ ;  $p \leq 0.001$ ). Significant ( $p \leq 0.001$ ) increases in RPE were observed during the ML ( $11.1 \pm 4.0$ ) and HL ( $13.8 \pm 3.6$ ) trials compared to UL ( $8.3 \pm 2.2$ ). **CONCLUSION:** Although all thoracic carriage loads increased the physiological and metabolic burden of walking, a consistent increase in oxygen cost per kg of vest weight was observed in all trials. In addition, only loads greater than 10.9 kg (24lb) altered the perception of effort.

Supported by Lock Haven University's Small Campus Grant