The Physiological and Perceptual Responses of Thoracic Load Carriage During Walking

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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 ± 1.4yr; height: 178.9 ± 5.8cm; mass: 86.1 ± 13.2kg; body fat: 20.2 ± 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 ± 1.28, LL = 13.45 ± 1.26, ML = 14.78 ± 1.67, HL = 16.65 ± 1.76 ml·kg$^{-1}$·min$^{-1}$; p<0.005). When VO$_2$ was expressed relative to vest weight, no significant differences were observed across trials (LL = 8.8 ± 6.5, ML = 9.4 ± 5.4, HL = 10.0 ± 3.1 ml·kg$^{-1}$·min$^{-1}$; p = 0.896). Total EE for the walking bout was significantly higher during all LC trials compared to unloaded (UL = 46.9 ± 6.0, LL = 53.9 ± 8.0, ML = 59.2 ± 8.1, HL = 66.4 ± 7.7 kcals; p≤0.001). Heart rate during the HL trial (109 ± 13) was significantly higher than the other trials (UL = 91 ± 12, LL = 96 ± 12, ML = 101 ± 18; p≤0.001). Significant (p≤0.001) increases in RPE were observed during the ML (11.1 ± 4.0) and HL (13.8 ± 3.6) trials compared to UL (8.3 ± 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.

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