The Cardiopulmonary Effects of Thoracic Load Carriage While Resting

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PURPOSE: To investigate the cardiopulmonary effects of thoracic load carriage (LC) while sitting and standing. METHODS: Eight males and one female (Age: 21.0 ± 1.4 yr; Height: 178.9 ± 5.8 cm; Weight: 86.1 ± 13.2 kg; Body Fat: 20.2 ± 7.2%) without LC experience participated in the study. On separate days, subjects completed four trials of sitting quietly for 5 minutes, and then standing quietly for 5 minutes without assistance. 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). Minute ventilation (V\(_e\)), respiratory rate (RR), Tidal volume (T\(_v\)), oxygen consumption (VO\(_2\)), heart rate, and ratings of perceived exertion (RPE) were assessed during all trials. An average value from the last minute was calculated for V\(_e\), RR, T\(_v\), VO\(_2\), and heart rate and used in a repeated measures ANOVA for statistical comparison. RESULTS: While sitting, there were no differences observed across trials in any of the aforementioned variables. While standing, V\(_e\) was significantly higher during ML (p = .013) and HL (p = .005) compared to unloaded (UL = 12.6 ± 3.2, LL = 12.2 ± 1.9, ML = 14.8 ± 3.7, HL = 14.9± 4.1 l·min⁻¹). RR, T\(_v\), and heart rate were not different during any of the standing trials. Relative VO\(_2\) while standing was significantly higher for ML (p = 0.038) and HL (p = 0.001) compared to UL (UL = 4.3 ± 0.6, LL = 4.6 ± 0.6, ML = 5.0 ± 0.7, HL = 5.3 ± 0.8 ml·kg⁻¹·min⁻¹). Standing RPE was significantly higher for ML (p = 0.050) and HL (p = 0.014), compared to UL (UL = 6.1 ± 0.3, LL = 6.9 ± 1.6, ML = 7.6 ± 1.9, HL = 7.9 ± 1.7). CONCLUSION: Sitting while under thoracic load carriage did not elicit any significant changes. While standing, ML and HL elicited an increase in V\(_e\), although it is unclear if this response was due to RR, T\(_v\), or a combination of both. ML and HL increased oxygen consumption by 16% and 23% respectively while standing, as well as increased the perceived effort.

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