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Load Differences in Male and Female Marine Officer Candidates Quantified by Inertial Measurement Units

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Marine Corps Officer Candidates School (OCS) is a 10-week training course during which men and women undergo the same rigorous and demanding physical training. Field training can be difficult to quantify, and the same absolute workload may impact men and women differently. Wearable technology can be utilized to assess the volume and intensity of training events. **PURPOSE** To evaluate sex differences in step volume and intensity of a loaded 9-mile ruck derived from inertial measurement units (IMUs) placed on the distal tibia. **METHODS** Marine officer candidates (MOCs) completed a loaded 9-mile ruck carrying a 50 lb pack. IMUs were placed above the medial malleolus of each ankle on 12 female (age: 23.5 ± 2.5 yrs; height: 167.7 ± 6.1 cm; body mass: 68.7 ± 6.3 kg) and 34 male MOCs (age: 23.9 ± 3.9 yrs; height: 177.2 ± 7.5 cm; body mass: 79.8 ± 9.7 kg). Impact acceleration was measured by each IMU to determine the intensity (gs) of each step. Step intensity was binned as low (1-5g), medium (6-20g), or high (21-200g). Total step count and proportion of steps at each intensity were compared between male and female MOCs using independent samples t-tests or Wilcoxon Rank Sum tests, as appropriate. Data are mean ± SD and $\alpha = 0.05$. **RESULTS** Male MOCs were taller and heavier than female MOCs ($p < .001$). The total number of steps taken during the ruck was significantly greater in female (26848.2 ± 8383.4) than male MOCs (22373.1 ± 1180.3; $p < .001$). Total step count in the low (females: 22176.9 ± 7931.9; males: 18784.2 ± 2607.8), medium (females: 4632.3 ± 2306.7; males: 3570.8 ± 2522.2), and high (females: 38.9 ± 49.8; males 18.1 ± 23.1) intensity bins were greater in females compared to male MOCs, but these differences were not significant ($p = .172$-$.207$). The proportion of steps in low (females: 82.2 ± 9.4%; males: 84.0 ± 11.2%), medium (females: 17.7 ± 9.3%; males: 15.9 ± 11.2%), and high (females: 0.15 ± 0.20%; males: 0.08 ± 0.10%) intensity bins were not significantly different between sexes ($p = .267$-$.632$). **CONCLUSION** The loaded 9-mile ruck consisted of a high volume of low intensity steps for both male and female MOCs. Female MOCs took significantly more steps than males, resulting in a higher training volume that may contribute to the greater prevalence of musculoskeletal injuries that occur in women compared to men during military training.

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