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Sex Differences in Body Composition Adaptations during Military Training and their Association with Physical Performance

Dakota Tiede[1], Kristen J. Koltun[1], Jennifer N. Forse[1], Matthew B. Bird[1], Mita Lovalekar[1], Brian J. Martin[1], Bradley C. Nindl[1] FACSM. [1]University of Pittsburgh, Pittsburgh, PA

Individuals participating in military training are subject to physical training that can affect body composition and physical performance. However, changes in body mass may not reflect changes in body composition and may affect men and women differently. **PURPOSE** Examine changes in body composition between sexes and associations between baseline body composition and physical performance. **METHODS** 19 men (age: 26±3 yrs; BMI: 26.4±1.9 kg/m^2) and 11 women (age: 25±2 yrs; BMI: 23.7±2.4 kg/m^2) completed bioelectrical impedance analysis to assess body composition and performed an isometric mid-thigh pull (IMTP) to assess peak force (PF) prior to and upon completion of Marine Corps Officer Candidate School (OCS). During OCS, candidates receive age/sex adjusted scores on two fitness tests: Physical Fitness Test (PFT) and Combat Fitness Test (CFT). Higher scores on both tests indicate better performance. Two-way mixed measures ANOVAs (time*sex) were performed on body mass index (BMI), lean body mass (LBM), percent body fat (%BF), body fat mass (BFM), fat mass index (FMI), lean body mass index (LBMI), and IMTP PF. Pearson's correlations examined the association between body composition and performance metrics (PFT, CFT, IMTP PF); α=0.05. **RESULTS** There were significant interaction effects for LBM (p=0.005, $\eta 2$=0.005), %BF (p=0.005, $\eta 2$=0.020), and LBMI (p<0.001, $\eta 2$=0.015). While LBM (50.1±5.7 kg to 54.5±6.3 kg, p<0.001) and LBMI (18.1± 1.5 kg/m^2 to 19.7±1.7 kg/m^2, p<0.001) both increased in women, neither changed in men. %BF decreased in men (14.3±4.8 to 10.3±3.1, p<0.001) and women (23.6±5.0 to 15.9±4.2, p<0.001). No interaction effects were observed for body mass, BMI, IMTP PF, BFM, or FMI. Main effects of time and sex were observed for body mass, BMI, and IMTP PF (Δ6%), which decreased through OCS and were higher in men, as well as BFM and FMI, which decreased through OCS and were higher in women (all p<0.05). Body mass, IMTP PF and LBM were positively correlated in men (r=0.697, p<0.001) and women (r=0.607, p<0.047). In men, IMTP PF was positively correlated with LMBI (r=0.692, p<0.001) and BMI (r=0.558, p=0.013); PFT score was negatively correlated with %BF (r=-0.734, p<0.001), BFM (r=-0.797, p<0.001), and FMI (r=-0.745, p<0.001); CFT score was negatively correlated with %BF (r=-0.491, p=0.033). In women, PFT score was positively correlated with LBMI (r=0.624, p=0.04). **CONCLUSION** Despite similar reductions in body mass and body fat, only females experienced increases in lean mass during training. Increased lean mass and decreased body fat may relate to improved military physical performance. **SIGNIFICANCE/NOVELTY** This study serves as a model of body composition changes in response to military training without deliberate weight loss or dietary restriction and aligns with the Marine Corps' efforts to incorporate advanced methodologies for assessing body composition standards.

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