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The Effect of 12-weeks of Concurrent Exercise Training on Body Composition and Bone Microarchitecture

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Understanding sex-specific bone adaptations to arduous training may yield insight into stress fracture susceptibility and ultimately reduce musculoskeletal injuries in the military. **PURPOSE:** To examine sex-specific adaptations in bone microarchitecture, body composition and turnover markers in recreationally active and military-aged men and women undergoing a 12-week, militarily relevant strength and high-intensity interval training program. **METHODS:** Recreationally active men (n=21, 29 ± 1 y, 1.78 ± 0.08 m, 84.3 ± 3.0 kg, 24.77 ± 7.87 % BF) and women (n=18, 27 ± 1 y, 1.64 ± 0.06 m, 65.0 ± 2.0 kg, 30.58 ± 6.83 % BF) completed the training program. Total body areal BMD and composition (Lunar iDXA, GE Healthcare), volumetric bone density (vBMD) and bone strength at the tibial metaphysis (4% site) and tibial diaphysis (30% site) (high-resolution peripheral quantitative computed tomography (HRpQCT), XtremeCTII, Scanco Medical AG) and biochemical markers of bone metabolism (βCTX and P1NP) from fasted venous blood samples were measured before and after training via immunoassays. All outcomes were assessed with 2 x 2 (sex [male vs female] x time [pre vs post training]) mixed-measures ANCOVAs and reported as main effects. Bone analyses were controlled for change in total mass as alterations in body mass are known to illicit adaptive skeletal responses.[1,2] **RESULTS:** Training increased total body ($p = .008$) and trunk aBMD ($p < .001$), total body lean mass ($p = .001$), leg lean mass ($p < .001$), arm lean mass ($p < .001$), and trunk lean mass ($p = .001$) and decreased regional fat percentage for the total body ($p = .027$), arms ($p = .017$), and legs ($p = .007$) in men and women. No training-induced changes were observed in vBMD, bone strength or bone biomarkers. Basal βCTX and P1NP exhibited main effects of sex ($p < .025$) such that men exhibited greater markers of bone turnover than women. **CONCLUSION:** The bone and body composition findings seem to indicate that men and women respond similarly to military relevant training. Although the training program was

insufficient to induce significant tibial adaption, these findings demonstrate that it is possible to improve bone mineral density and body composition without significantly stressing the tibia.

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