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Changes in Bone Turnover Biomarkers in Men and Women During Marine Corps Officer Candidates School

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Military training environments can expose individuals to novel, unaccustomed mechanical loading patterns that can influence bone density, structure, and strength, but structural changes may not be evident for several weeks or months. Alternatively, assessing changes in biomarkers of bone turnover may provide timely insight regarding the influence of military training on bone adaptation in the shorter term. **PURPOSE**: To examine changes in bone-related biomarkers in men and women undergoing Marine Corps Officer Candidates School (OCS). **METHODS:** Blood samples were collected at the start and end of the 10-week training program to assess markers of bone turnover in 313 men (24.7±0.2 yrs, 80.9±0.5 kg) and 72 women (24.3±0.4 yrs, 65.5±0.8 kg). Commercially available enzyme-linked immunoassays (ELISAs) were used to determine concentrations of human procollagen type 1 N-terminal propeptide (P1NP), tartrate-resistant acid phosphatase 5b (TRAP5b), osteocalcin (OC), and sclerostin (SOST). Generalized linear fixed effects models tested the effect of sex (male, female), time (pre, post), and their interaction (sex*time) on each analyte. When significant interaction effects were found, simple main effects with Bonferroni adjustments were used to identify the location of differences; α=0.05. **RESULTS:** No significant sex*time interactions were observed for either P1NP ($p=0.190$) or OC ($p=0.983$). Both P1NP (men: 43056.46±1051.54 to 48735.83±1247.97 pg/ mL, women: 33806.12±1551.84 to 42354.64±1598.79 pg/ mL) and OC (men: 24082.75±791.01 to 26315.50±813.52 pg/ mL, women: 18877.65±2483.40 to 21138.77±1637.17 pg/ mL) concentrations increased during training (Main effect time: $p<0.001$, $p=0.001$) and were greater in men than women (Main effect sex: $p<0.001$, $p=0.016$). A significant sex*time interaction was observed for TRAP5b ($p=0.008$) and SOST ($p<0.001$). In men, decreases in concentrations of TRAP5b (3.29±0.04 to 3.22±0.04 U/L, $p=0.019$) and SOST (27.49±0.53 to 24.19±0.42 pmol/ L, $p<0.001$) were observed, but not in women (TRAP5b: 2.92±0.09 to 3.03±0.09 U/L, $p=0.069$; SOST: 22.24±0.90 to 21.61±0.72 pmol/L; $p=0.310$). **CONCLUSION:** Following training, bone turnover markers commonly associated with bone formation increased similarly in men and women; however, sex differences were evident for biomarkers of bone resorption and osteocyte activity to potentially favor positive bone balance. Arduous military training may promote adaptive bone formation, which may also be dependent on sex. **SIGNIFICANCE/NOVELTY:** Military training environments may provide an osteogenic stimulus to those who complete training. Differences in biomarker changes between men and women may relate to sex-differences in bone density, structure, strength, and future fracture risk.

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