

Combined Effect of Body Mass Index and Aerobic Fitness on Stress Fracture Risk among Women

Keith G. Hauret, Shamola Greene, Stephen Rossi, and Bruce H. Jones, FACSM

Army Institute of Public Health, Aberdeen Proving Ground, MD

Stress fractures (SFs) are among the most serious overuse injuries experienced by soldiers in Army basic training (BT) and athletes. Reported risk factors for SF include female gender, aspects of bone anatomy, lower levels of aerobic fitness, lower body mass index (BMI), and older age. Previous studies have not been designed to examine the combined effects of BMI and aerobic fitness for SF incidence. **PURPOSE:** To evaluate the combined effects of BMI and aerobic fitness on incidence of SFs among female recruits during 10-week Army BT. **METHODS:** Soldier demographics, height, weight, and 2-mile run time (2MRT) on the final Army Physical Fitness Test were acquired for female BT recruits from October 2009 to September 2012. These data were linked to injury encounter data from the Defense Medical Surveillance System. Stress fractures were identified by diagnosis codes 733.93-733.98 (International Classification of Diseases, 9th Revision, Clinical Modification). Quintiles (Q) of BMI (weight/height²) (Q1: lowest BMI; Q5 highest) and 2MRT (Q1: fastest 2MRT; Q5: slowest) were created. SF incidence (percent of women with SF) was calculated for all women and for women in each combination of BMI and 2MRT Qs. Relative risk (RR) and 95% confidence intervals (CI) were calculated for women in each combination of BMI and 2MRT Qs compared to women in BMI Q5 (highest)/2MRT Q1 (fastest) (referent). **RESULTS:** Overall SF incidence was 3.7%. For Qs of 2MRT, SF incidence was lowest for women in Q1 (1.7%) and increased for each successively slower Q of 2MRT (Q5: 6.6%; trend: $p=0.01$). For Qs of BMI, SF incidence was highest for Q1 (4.6%) and decreased for each successively higher Q of BMI (Q5: 3.2%; trend: $p=0.02$). Compared to women in the referent category (BMI Q5 [highest]/2MRT Q1 [fastest]), women with the lowest BMI who had the fastest 2MRT (BMI Q1/2MRT Q5) had the highest RR (RR: 8.0; 95% CI: 4.3-14.7). On the other hand, women with highest BMI who ran fastest (BMI Q1/2MRT Q1) had the lowest RR (referent: 1.0). **CONCLUSION:** This investigation found that women with the lowest BMI and slowest 2MRT had the highest risk of SF while women with the highest BMI but who ran fastest had the lowest RR. These findings have important implications for screening applicants for military service.

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