Title
Gender Differences in Static and Dynamic Postural Stability of Soldiers of the Army’s 101st Airborne Division (Air Assault)

Authors
Timothy C. Sell, Jon J. Pederson, Mita T. Lovalekar, Takashi Nagai, Michael D. Wirt, John P. Abt, Scott M. Lephart.
University of Pittsburgh, Pittsburgh, PA, 101st Airborne Division (Air Assault), Blanchfield Army Community Hospital, Fort Campbell, KY

Purpose/Hypothesis
Female Soldiers are at increased risk of musculoskeletal injury compared to male counterparts. The identification of gender-specific risk factors for injury or differences between genders would provide evidence for modification of physical training programs. Postural stability (PS) has been identified as a risk factor for musculoskeletal injuries in civilian athletes with few equivalent studies in military populations. The purpose of this study was to examine static and dynamic PS in male and female Soldiers. We hypothesized female Soldiers would have better static PS but decreased dynamic PS compared to male Soldiers.

Number of Subjects
Data were collected on 25 healthy female Soldiers (age 26.4±5.3 years; height 162.1±6.7 cm; weight 63.2±10.3 kg) and 25 male Soldiers (age 26.4±4.9 years; 176.0±7.9 cm; weight 85.5±11.3 kg) matched on age (±2.0 years), demand rating (exact), and years of service (±2.0 years) from the Army’s 101st Airborne Division (Air Assault). All subjects were cleared for full active duty.

Materials/Methods
Static postural stability was assessed using single-leg stance (eyes open (EO) and eyes closed (EC)) conditions. Ground reaction force standard deviations (GRFSD) were collected in the anterior-posterior (AP), medial-lateral (ML) and vertical (V) force directions to quantify static postural stability. Dynamic postural stability was assessed using a double-leg jump landing requiring the Soldier to jump forward from a starting point of 40% of their height; jump over a 30cm hurdle; land on a single-leg on a force plate; and stabilize for ten seconds. The dynamic postural stability index (DPSI) was calculated based on ground reaction forces immediately following initial contact (3 seconds). Paired t-tests were used to compare differences between genders. Statistical significance was set at p<0.05 a priori.

Results
Female Soldiers had significantly better static PS in EO AP GRFSD (F: 2.9±1.7; M: 3.6±1.0; p=0.028), EO ML GRFSD (F: 2.2±0.83; M: 2.8±0.81; p=0.004), EC AP GRFSD (F: 6.9±2.5; M: 10.0±4.4; p=0.005), EC ML GRFSD (F: 4.6±1.6; M: 6.1±2.2; p=0.009), and EC V GRFSD (F: 9.6±5.1; M: 13.6±7.3; p=0.030). There were no differences between genders for dynamic PS variables (p>0.05).
Conclusions
Female Soldiers had better static PS but similar dynamic PS compared to male Soldiers, partially confirming our hypothesis. Civilian athletic research has demonstrated that females have better static PS but decreased dynamic PS compared to males. The lack of differences in dynamic PS may be explained due to matching of the two groups based on age, years of service, and demand rating. The matching of subjects may indicate that they have had similar exposure to dynamic conditions in physical and tactical training.

Clinical Relevance
Female and male Soldiers of the Army’s 101st Airborne/Air Assault Division have different static PS. Previous literature has indicated that decreased static PS is a risk factor for knee and ankle injury which would indicate that training should include appropriate activities to improve PS.

Key Words
Postural Stability, Balance, Injury Prevention, Dynamic

Funding
Supported by USAMRMC/TATRC #W81XWH-06-2-0070/ W81XWH-09-2-0095