Female Soldiers have a significantly higher rate of injury, specifically low back and lower extremity (LB/LE) injuries, compared to male Soldiers. Despite return to full activity following an injury, LE biomechanical asymmetries may persist, leading to an increased risk for recurrent injury. PURPOSE: To assess musculoskeletal and biomechanical asymmetries that may relate to the development of injury in female Soldiers. METHODS: Participants included Active-Duty (Air Assault) Soldiers (n=77; age=27.1±5.9 years) who reported a minimum 3% LB/LE injury. Lower Extremity Musculoskeletal Injury History, Strength, and Biomechanics in Female US Army Soldiers

ABSTRACT

SUMMARY AND CONCLUSIONS

• Female Soldiers demonstrated asymmetrical landing strategies, including decreased right hip abduction compared to the left side.

• Among all female Soldiers, 15.6% (12/77) reported at least one LB/LE injury within the last year, with half of those with injuries reporting a knee injury (6/12) reporting a knee injury (6/12).

• With the expanding role of women in the military, specifically the opening of combat occupations, understanding the mechanisms associated with these asymmetrical movement patterns and increased risk of injury should be a priority in military medicine.

• The purpose of this study was to assess musculoskeletal and biomechanical asymmetries that may relate to the development of injury in female Soldiers.

• Significant asymmetries were found in knee extension strength (R:186.8±39.5 %BW vs L:173.1±39.8 %BW, p<0.001), knee flexion strength (R:90.9±22.3 %BW vs L:86.5±21.1 %BW, p<0.001), knee flexion excursion on the right. These results suggest that in female Soldiers, shock absorption strategies at the knee may be influenced by mechanisms other than maximal knee strength. Further research is needed to determine the interaction between sagittal and frontal plane mechanics during landing in female Soldiers.

• With the expanded role of women in the military, understanding the mechanisms associated with these asymmetrical movement patterns and increased risk of injury should be a priority in military medicine.

• The right side was the most often injured LE among all LB/LE injuries (5 right, 3 left, 3 not specified [n/s], 1 n/a) and specifically knee injuries. Among all female Soldiers, 15.6% (12/77) reported at least one LB/LE injury within the last year, with half of those with injuries reporting a knee injury (6/12). The majority of right-sided injuries and specifically knee injuries occurred on the right side. Significant asymmetries were found in knee extension strength (R:186.8±39.5 %BW vs L:173.1±39.8 %BW, p<0.001), knee flexion strength (R:90.9±22.3 %BW vs L:86.5±21.1 %BW, p<0.001), knee flexion excursion at initial contact (IC) (R:19.5±9.9° vs L:18.4±9.1°, p=0.004) and peak vertical ground reaction force (PvGRF) (%BW) (R:350.3±88.6 %BW vs L:327.2±84.8 %BW, p<0.001). CONCLUSION: Female Soldiers demonstrated decreased right hip abduction strategies, including decreased right hip abduction at IC and increased right PvGRF, potentially placing an increased load on the right limb, which was also the most frequently injured limb. This effect was more pronounced in female Soldiers sustaining at least one LB/LE injury within the previous year. To assess lower extremity biomechanics, a two-legged drop landing task was used.

• Lower extremity kinematic and kinetic data were processed using Vicon Nexus Software according to inverse dynamics and the Plug-in Gait model.

• Participants performed a two-legged drop landing task from a 51 cm platform onto two force plates (Kistler 9286A, Amherst, NY).

• Knee flexion (%BW) 67 90.9.8 ± 22.3  86.5 ± 21.1  0.001*

• To assess hip abduction strength (Figure 2), participants completed three sets of 5-second isometric contractions.

• Values were averaged across 3 successful trials.

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