Measurement of Spinal Active Range of Motion among Different Military Occupations in Combat Aviation Brigade

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Context: A high incidence of low back and neck pain is reported in aviators and crews who ride in helicopters. Limited low back and cervical range of motion (ROM) are reported risk factors for low back and neck pain. It is unknown if spinal ROM differs between air-based military occupational specialty (MOS) and ground-based MOS. **Objective:** To compare cervical, thoracic, and lumbar spinal active ROM among aviators, crews, and signals. It is hypothesized that air-based MOS (aviators and crews) would exhibit limited ROM compared to ground-based MOS (signals). **Design:** Cross-sectional. **Setting:** University-operated, military human performance research laboratory. **Participants:** Thirty-four active-duty male soldiers (28.7±7.4yrs, 177.5±7.4cm, 83.0±15.7kg) were recruited from the 159th Combat Aviation Brigade of the Army 101st Airborne Division: aviators (n=12), crews (n=9), and ground-based signals (n=13). All soldiers were healthy, had no history of surgery, and were cleared for physical training. **Interventions:** A standard digital inclinometer was calibrated and used to measure spinal active ROM in accordance with the American Medical Association guidelines. Cervical spine flexion, extension, and lateral flexion ROM were measured with the inclinometer on the top of head with the subject in a seated position. Cervical right and left rotation ROM were measured in the supine position with the inclinometer on the center of the forehead. Thoracic and lumbar flexion and extension ROM were measured in the sitting and prone position, respectively. Spinal lateral flexion ROM was measured in an upright standing position. Spinal rotation ROM was measured in a standing position with the trunk forward flexed and rotated to the right or left. For thoracic and lumbar ROM, the inclinometer was placed on C7, T12, and L5, and the differences between C7-T12 and T12-L5 were used for thoracic and lumbar ROM, respectively. **Main Outcome Measures:** Degrees of cervical, thoracic, and lumbar spinal rotation in six directions (flexion, extension, right and left lateral flexion, right and left rotation). A one-way ANOVA with the Bonferroni post-hoc test was used for statistical analysis. **Results:** Lumbar extension, right and left lumbar lateral flexion, and left cervical rotation ROM were statistically significant ($p>0.05$). The post-hoc tests revealed that aviators had limited lumbar extension ROM compared to signals (aviators=37.6°±6.7, signals=50.8°±11.2, $p=0.004$). Both aviators and crews had limited right and left lumbar lateral flexion ROM than signals (Right: aviators=20.8°±6.7, crews=20.1°±5.7, signals=26.5°±3.5, $p=0.013$; Left: aviators=22.2°±6.7, crews=21.0°±5.1, signals=29.6°±6.3, $p=0.001$). Aviators had limited left cervical rotation ROM compared to signals (aviators=84.0°±8.1, signals=92.4°±5.0, $p=0.034$). **Conclusions:** Aviators and crews have limited spinal ROM compared to ground-based signal soldiers. These ROM limitations may place these MOS groups at greater risk for low back and cervical pathology. Additional studies should focus on

interventions to restore spinal ROM in order to reduce the potential risk of injury. **Word Count:** 450