

Kinematic adaptations with interceptor body armor in Soldiers of the Army 101st
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Context: Interceptor body armor (IBA) is critical to the protection of military personnel. The additional weight of the IBA may increase the musculotendinous demands and susceptibility to injury if training requirements have not specifically addressed the extra loads. **Objective:** The purpose of this study was to compare kinematic and force changes with and without IBA during a drop landing task. It was hypothesized that wearing IBA would result in altered landing mechanics and forces. **Design:** A within-subject, repeated measures design was utilized. **Setting:** University sports medicine laboratory. **Patients or Other Participants:** Twenty five 101st Airborne Soldiers participated (Age: 28.2 ± 6.9 years; Height: 1.78 ± 0.07 m; Mass: 82.8 ± 11.6 kg). **Interventions:** A 3D motion analysis and force plate system was used to capture kinematic and force data while subjects performed a single-leg, 50 cm drop landing task. The task was performed under eyes open and eyes closed conditions and with and without IBA. The IBA weighed 13.6 kg and represented the minimum additional weight required to be carried by the Soldiers. **Main Outcome Measures:** The dependent variables were knee flexion and valgus angle at initial contact, maximum knee flexion, time to maximum knee flexion, peak ground reaction forces, time to peak ground reaction forces, and average and peak slope of the ground reaction forces. **Results:** For the eyes opened condition, maximum knee flexion increased (NIBA: $80.9 \pm 16.5^\circ$; IBA: $91.0 \pm 13.4^\circ$; $p < 0.001$), time to maximum knee flexion increased (NIBA: 242.3 ± 99.0 ms; IBA: 350.9 ± 217.2 ms; $p = 0.004$), peak ground reaction forces increased (NIBA: 352.2 ± 88.4 %BW; IBA: 378.6 ± 76.0 %BW; $p = 0.011$), time to peak ground reaction forces increased (NIBA: 36.3 ± 12.1 ms; IBA: 41.5 ± 8.7 ms; $p = 0.011$), and average slope of peak ground reaction forces decreased (NIBA: 36.3 ± 12.1 ms; IBA: 41.5 ± 8.7 ms; $p = 0.011$). For the eyes closed condition, maximum knee flexion increased (NIBA: $78.9 \pm 15.0^\circ$; IBA: $85.5 \pm 10.8^\circ$; $p = 0.001$), time to maximum knee flexion increased (NIBA: 242.0 ± 118.1 ms; IBA: 300.0 ± 80.9 ms; $p = 0.003$), and peak ground reaction forces increased (NIBA: 353.8 ± 80.3 %BW; IBA: 373.6 ± 66.2 %BW; $p = 0.039$). **Conclusions:** Wearing IBA during the drop landing tasks resulted in altered mechanics and ground reaction forces. Proper integration of IBA into training is necessary to ensure musculoskeletal adaptation to carrying the additional loads required of tactical operations. Insufficient adaptations will likely result in undue musculotendinous stress and increase the risk of unintentional injury. **Word Count:** 429

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