Landing Impact, Hip Kinematics, and Hip Strength Predict Dynamic Postural Stability in Army 101st Airborne

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Postural instability contributes to unintentional lower extremity musculoskeletal injury. It is unclear if reported contributors to knee injury influence dynamic postural stability. **PURPOSE:** To determine if peak vertical ground reaction force (vGRF), sagittal and frontal plane knee and hip kinematics at initial contact, knee flexor/extensor strength, and hip abductor/adductor strength significantly predict dynamic postural stability index (DPSI). **METHODS:** Thirty nine male Army 101st Airborne (Air Assault) soldiers participated (26.3±5.6 yrs, 176.9±8.5 cm, 81.0±17.7 kg). Three dimensional kinematic and ground reaction forces (GRFs) were captured with a motion capture system interfaced with a force plate. Subjects performed a double-leg forward jump over a 12" hurdle with a single-leg landing on a force plate positioned at a distance of 40% subject height. Subjects landed on the dominant limb, stabilized as quickly as possible, and maintained single-leg balance with hands at the waist. DPSI was calculated using three dimensional GRFs from the first three seconds following initial contact. Isokinetic knee strength at 60^o/sec and side-lying isometric hip strength at 10^o hip abduction were tested using a multi-mode dynamometer. Strength and peak vGRF were normalized to % body weight. A stepwise multiple linear regression was performed to determine if the independent variables significantly predicted DPSI. The F probability for variable entry of .05, F probability for variable removal of .10, and alpha level of .05 for model significance was set a priori. **RESULTS:** Significant predictors in the linear regression model of DPSI include peak vGRF, hip abduction strength, and hip flexion/extension angle at initial contact ($p < .001$; $R^2 = .88$; respective β=.0001, -.0013, .0018; constant=.0141). **CONCLUSIONS:** Dynamic postural stability for soldiers of the Army 101st Airborne (Air Assault) may be optimized by decreasing landing impact, increasing hip abduction strength, and increasing hip flexion at initial contact during landing tasks. Current injury prevention strategies targeting the significant knee injury contributors may concurrently benefit dynamic postural stability. Investigations are warranted to assess effects of training targeting the hip on dynamic postural stability.

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