METHODS

STUDY DESIGN AND SETTING:
- Descriptive laboratory study
- University operated, Special Operations Forces human performance research laboratory

INTERVENTIONS:
- Kinematic and kinetic analysis of five different landing tasks (Figure 1):
  - (A) Double-Leg Drop-Landing (DLDL)
  - (B) Single-Leg Drop-Landing (SLLD)
  - (C) Double-Leg Stop-Jump (DLSJ)
  - (D) Single-Leg Stop-Jump (SLSJ)
  - (E) Forward Jump Single-Leg Landing (FJSL)

EQUIPMENT:
- 3D Video-Based Motion Analysis System (Vicon Motion Systems Centennial, CO)
- 6 T-Series Vicon Cameras
- 2 Kistler Force Plates (Type 9286BA)

MAIN OUTCOME MEASURES:
- Hip, knee and ankle joint kinematics
- Peak knee joint forces and moments
- Peak ground reaction forces (GRF)

STATISTICAL ANALYSIS:
- Shapiro-Wilk tests were used to assess normality
- Repeated measures ANOVA or Friedman’s ANOVA, as appropriate, were used to assess within subject differences across tasks. Significance was set to 0.05 a priori
- Post-hoc comparisons used Bonferroni adjustments

RESULTS

- Peak vertical ground reaction force (GRF) (180.1 – 504.0% body weight, p<0.001, Figure 2) and peak knee flexion angle (58.4 – 101.9 degrees, p<0.001, Figure 4) were significantly different between all tasks
- Single-leg landings generated higher vertical GRF (504.0 vs. 342.0% body weight and 271.6 vs. 180.1% body weight, p<0.001) and lower peak knee flexion (68.1° vs. 91.4° and 74.4° vs. 101.9°, p<0.001). FJSL had the lowest peak knee flexion (58.4°) and the second highest peak vertical GRF (435.1% body weight)
- SLDL generated the highest GRFs (504.0 and 502.0% weight, respectively, p<0.001, Figures 2 & 3)
- Peak valgus moment was significantly higher during DLDL (0.83Nm, p<0.001)

SUMMARY AND CONCLUSIONS

- A distinct within subject pattern of similarity between two tasks was not discernable and it does not appear to be one task that is best for eliciting a wide range of biomechanical risk factors of ACL injuries
- Multiple tasks should be considered, as certain tasks may be better suited for evaluating specific strategies as demonstrated by stop-jumps eliciting higher knee valgus angles but drop-landings eliciting higher valgus knee moments and ground reaction forces
- Researchers need to be cautious when comparing results between tasks, Athletic trainers and other clinicians need to consider these findings during evaluation of landing mechanics during assessments or rehabilitation

OBJECTIVE

- The objective for this study was to compare lower extremity biomechanics across five commonly used landing tasks

SUBJECTS

- A total of 66 Air Force Special Tactics personnel participated (age = 27.7 ± 5.0 years; weight = 83.1 ± 9.1 kg; height = 176.5 ± 5.7 cm) in this study

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