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Research article

The Lower Extremity Biomechanics of Single- and Double-Leg Stop-Jump TasksLi-I Wang Citations in
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The anterior cruciate ligament (ACL) injury is a common occurrence in sports requiring stop-jump tasks. Single- and double-leg stop-jump techniques are frequently executed in sports. The higher risk of ACL injury in single-leg drop landing task compared to a double-leg drop landing task has been identified. However the injury bias between single- and double-leg landing techniques has not been investigated for stop-jump tasks. The purpose of this study was to determine the differences between single- and double-leg stop-jump tasks in knee kinetics that were influenced by the lower extremity kinematics during the landing phase. Ground reaction force, lower extremity kinematics, and knee kinetics data during the landing phase were obtained from 10 subjects performing single- and double-leg stop-jump tasks, using motion-capture system and force palates. Greater peak posterior and vertical ground reaction forces, and peak proximal tibia anterior and lateral shear forces ($p < 0.05$) during landing phase were observed of single-leg stop-jump. Single-leg stop-jump exhibited smaller hip and knee flexion angle, and knee flexion angular velocity at initial foot contact with the ground ($p < 0.05$). We found smaller peak hip and knee flexion angles ($p < 0.05$) during the landing phase of single-leg stop-jump. These results indicate that single-leg landing may have higher ACL injury risk than double-leg landing in stop-jump tasks that may be influenced by the lower extremity kinematics during the landing phase.

Key words: Anterior cruciate ligament, kinematics, kinetics, ground reaction

force

Key Points

- Non-contact ACL injuries are more likely to occur during the single-leg stop-jump task than during the double-leg stop-jump task.
- Single-leg stop-jump exhibited greater peak proximal tibia anterior and lateral shear forces, and peak posterior and vertical ground reaction forces during the landing phase than the double-leg stop-jump task.
- Single-leg stop-jump exhibited smaller hip flexion angle, knee flexion angle, and knee flexion angular velocity at initial foot contact with the ground.
- Single-leg stop-jump exhibited greater peak knee extension and valgus moment during the landing phase than the double-leg stop-jump task.
- Single-leg stop-jump extended the hip joint at initial foot contact with the ground.

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