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Landing mechanics in a single-leg drop landing after anterior cruciate ligament reconstruction

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The purpose of this study was to determine whether athletes who return to sports participation after anterior cruciate ligament (ACL) reconstruction exhibit altered lower limb mechanics during a functional task. The kinematic and kinetic performance of 12 healthy and 12 ACL reconstructed collegiate athletes were compared during a 30-cm single-leg drop landing. The mean time from surgical stabilization to the study was 10.9 months (9-12 months) when subject return to competitive sports activities. Peak and time-averaged angular displacements, peak vertical ground reaction force (VGRF) were analyzed. In the ACL group, the operated limb demonstrated significantly more hip flexion, and less ankle dorsiflexion, knee flexion than the normal limb ($p < 0.05$). In addition, the peak VGRF was significantly lower in the operated limb compared with the normal limb ($p < 0.05$). No significant differences were found in most of kinematic and kinetic variables between dominant leg and non-dominant leg in healthy subjects.

The results indicated the operated limb had a reduced contribution of ankle and knee flexion and increased contribution from the hip flexion in the sagittal plane motion. It is unclear why the operated limb limited flexion of their lower extremity joints. It is inferred from reduction of VGRF that this may be a protective mechanism to limit landing forces and knee join loading. In conclusion, our findings demonstrate that kinematics and kinetics alterations during single-leg drop landing persist 9-12 months after ACL reconstruction.