

The Long-Term Effects of ACL Reconstruction on Bilateral Limb Asymmetry in Elite Alpine Skiers

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Abstract

Research on the causation and prevention of anterior cruciate ligament (ACL) injuries in elite alpine skiers has been conducted for numerous years yet the incidence of ACL injuries remains high for both female and male skiers. High rates of re-injury are also prominent due to the internal muscular forces and external environmental forces combined with known neuromuscular changes following ACL reconstruction (ACL-R). The objective of this study was to characterize long-term bilateral asymmetry in thigh volume and multi-joint movements in elite national alpine skiers. Seven female national skiers, 3 with ACL-R and 12 males, 4 with ACL-R performed two dynamic multi-joint closed-chained movements: squat jumps (SJ) and countermovement jumps (CMJ). Vertical ground reaction forces of both legs was measured simultaneously via a Pasco Passport 2-Axis Force Platform Model PS2142 at a sampling frequency of 500 Hz. Five consecutive jumps were performed and the best trial was analyzed. DEXA scans measuring thigh muscle volume were also performed. The results showed that ACL-R skiers displayed a significant bilateral asymmetry in the final ascent phase of jumping for both the SJ ($p=0.0002$) and CMJ ($p=0.0007$). The ACL-R skiers also displayed a significantly greater bilateral asymmetry in thigh muscle volume ($p=0.002$). In conclusion ACL-R skiers exhibit long-term bilateral asymmetries despite long post-operative periods, rehabilitation and full return to sport. The mechanism underlying these asymmetries is unclear although future research should include attention on neural factors.
