

## Comparing the Knee Kinetics and Kinematics during Non-Steady Movements in Recovered Anterior Cruciate Ligament Injured Badminton Players against an Uninjured Cohort: Case-Control Study

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**Abstract :** Background: The Anterior Cruciate Ligament (ACL) helps stabilize the knee joint minimizing tibial anterior translation. Anterior Cruciate Ligament (ACL) injury is common in racquet sports and often occurs due to sudden acceleration, deceleration or changes of direction. This mechanism in badminton most commonly occurs during landing after an overhead stroke. Knee biomechanics during dynamic movements such as walking, running and stair negotiation, do not return to normal for more than a year after an ACL reconstruction. This change in the biomechanics may lead to re-injury whilst performing non-steady movements during sports, where these injuries are most prevalent. Aims: To compare if the knee kinetics and kinematics in ACL injury recovered athletes return to the same level as those from an uninjured cohort during standard movements used for clinical assessment and badminton shots. Objectives: The objectives of the study were to determine: Knee valgus during the single leg squat, vertical drop jump, net shot and drop shot; Degree of internal or external rotation during the single leg squat, vertical drop jump, net shot and drop shot; Maximum knee flexion during the single leg squat, vertical drop jump and net shot. Methods: This case-control study included 14 participants with three ACL injury recovered athletes and 11 uninjured participants. The participants performed various functional tasks including vertical drop jump, single leg squat; the forehand net shot and the forehand drop shot. The data was analysed using the two-way ANOVA test, and the reliability of the data was evaluated using the Intra Class Coefficient. Results: The data showed a significant decrease in the range of knee rotation in ACL injured participants as compared to the uninjured cohort ( $F_{7,556}=2.37$ ;  $p=0.021$ ). There was also a decrease in the maximum knee flexion angles and an increase in knee valgus angles in ACL injured participants although they were not statistically significant. Conclusion: There was a significant decrease in the knee rotation angles in the ACL injured participants which could be a potential cause for re-injury in these athletes in the future. Although the results for decrease in maximum knee flexion angles and increase in knee valgus angles were not significant, this may be due to a limited sample of ACL injured participants; there is potential for it to be identified as a variable of interest in the rehabilitation of ACL injuries. These changes in the knee biomechanics could be vital in the rehabilitation of ACL injured athletes in the future, and an inclusion of sports based tasks, e.g., Net shot along with standard protocol movements for ACL assessment would provide a better measure of the rehabilitation of the athlete.

**Keywords :** ACL, biomechanics, knee injury, racquet sport

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