

# Biomechanical And Muscle Strength Risk Markers Of Anterior Cruciate Ligament Injuries In Soccer: The Influence Of Match Related Fatigue

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## Abstract

High prevalence of non-contact anterior cruciate ligament (ACL) injuries in soccer players during the later stages of match-play have been attributed to match related fatigue. This study aimed to investigate the influence of simulated soccer match-play on markers of ACL injury risk related to knee mechanics and isokinetic muscle strength. Fifteen male recreational soccer players (age  $26 \pm 4$  years; height  $181 \pm 11$  cm; body mass  $78 \pm 12$  kg) completed a 90 min lab-based multi-directional match-play simulation, comprising two 45-min halves separated by a 15-min half-time interval. Three-dimensional kinematics and kinetics of the support leg during unanticipated  $45^\circ$  side cutting manoeuvres (open and crossover) were recorded as part of the simulated match-play, providing multiple trials within each 15 minutes interval. Participants also performed five maximal dominant-limb isokinetic contractions at  $120^\circ \cdot s^{-1}$  for concentric quadriceps (Qcon) and eccentric hamstrings (Hecc) prior to match simulation (time 0 min), at the beginning and end of half-time interval (time 45 min and 60 min), and post-match simulation (time 105 min). A one-way repeated measures ANOVA was used to identify significant differences over time, with  $\alpha=0.05$ . Peak knee abduction moments at weight acceptance phase were significantly reduced during the intervals 60-75 and 90-105 min compared to the interval 0-15 min. Knee extension angles were significantly more extended at initial contact during the intervals 60-75 and 90-105 min compared to the interval 0-15 min. A significant reduction in Hecc peak torques and functional Hecc:Qcon ratio were observed at all times compared to pre-match simulation values. The more erect knee landing posture, reduced eccentric hamstring strength and impaired muscle imbalances suggested a greater risk of ACL injury during the later stage of match-play, and implying that pre-season/return-to-sport screening during/after simulated match-play may be more effective in identifying increased ACL injury risk in soccer players.

## Keywords

fatigue, anterior cruciate ligament, isokinetic, knee mechanic, soccer