

## Abstract

**Thesis:** Anticipatory Effects on Lower Extremity Kinetics and Kinematics during a Land Cross Step Maneuver in Female Volleyball Players

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Anticipation has been previously shown to affect lower extremity mechanics during both landing and cutting maneuvers. However, little research has been conducted looking at the effects of anticipation on the lower body kinetics and kinematics during a land and cross step maneuver, which due to similar kinematics, may elicit injury. Twelve female, college-level volleyball players performed right and left cross step maneuvers following a landing under anticipated and unanticipated conditions. Kinetics and kinematics were measured for the ankle, knee and hip of the dominant limb during the landing phase of the various movement conditions. Both anticipatory and directional effects were seen for many of the variables including VGRF, ankle, knee and hip power absorption, peak ankle dorsiflexion, inversion and eversion angles, knee angles in all three planes, peak hip flexion and initial contact external rotation angles as well as all joint moments except for knee and hip abduction. However, higher order interactions were seen for knee flexion, abduction and internal rotation (all  $P < .001$ ) at initial contact as well as maximum knee flexion and internal rotation (both  $P < .001$ ). These interactions for the knee are important factors to consider when looking at knee injury. Other contributors to high risk landings including maximum ankle inversion ( $P < .001$ ) and hip external rotation ( $P = .026$ ) had significant interactions at initial

contact. However, effects were not limited to unanticipated trials as high risk positions were recorded during the landing of anticipated trials as well. The findings from the current study suggest that both anticipation and direction played an important role in landing mechanics. Drills familiarizing players with unanticipated changes of direction along with strength training of the muscles required to effectively decelerate the body may help prevent injury.

*Keywords:* Biomechanics; Jump; Anterior Cruciate Ligament