

Lumbopelvic Stability During a Single Leg Step Down Predicts Elbow Varus Torque During Baseball Pitching

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ABSTRACT

During a baseball pitch, energy is transferred from the lower extremities through the lumbopelvic junction to produce ball velocity. Reduced lumbopelvic stability has been associated with elbow injury in pitchers, and commonly ulnar collateral ligament (UCL) tears. The primary biomechanical mechanism of UCL tears is high elbow varus torque. Understanding how decreased lumbopelvic stability influences the development of elbow varus torque could identify risk factors of UCL elbow injury. **PURPOSE:** Characterize the predictive ability of lumbopelvic stability on elbow varus torque during a baseball pitch. **METHODS:** NCAA Division 1 baseball players (N=44; 19.6±1.3yrs) participated. Pitchers threw ten fastballs from a mound to a catcher over regulation distance. Elbow varus torque was recorded using an inertial measurement unit and ball velocity was recorded with a radar gun. Pitchers also completed a single leg step down (SLSD) task. Triplanar kinematics were recorded for both legs, pelvis and trunk using inertial measurement units. Statistical analysis consisted of a cluster analysis, principal component analysis (PCA), and a multivariate logistic regression model to determine the relationship between lumbopelvic stability and elbow varus torque. **RESULTS:** Cluster analysis revealed 2 subgroups of pitchers: Low Torque-High Velocity and High Torque-Low Velocity. PCA analysis indicated 4 patterns of SLSD motion variability (principal components): 1-sagittal plane, 2-transverse plane, 3-frontal plane trail limb, and 4-frontal plane lead limb. Increased transverse plane motion of the trunk and pelvis predicted higher odds of belonging to the High Torque-Low Velocity cluster; trunk [Odds Ratio=2.9 (95%CI:1.1,8.0), p=0.036] and pelvis [Odds Ratio=2.6 (95%CI:1.1,6.0), p=0.031]. **CONCLUSIONS:** Lumbopelvic motion assessed during the SLSD in pitchers can identify deficits that predict high elbow varus torque and low ball velocity during the baseball pitch. Specifically, higher pelvis and trunk transverse plane motion was associated with pitchers in the High Torque-Low Velocity cluster. The SLSD provides an easily accessible method for coaches and clinicians to identify a potential risk factor related to increased elbow varus torque and UCL injury in pitchers.