**Correlation of Tibial Accelerations with Knee Kinematics and Kinetics during Single-Leg Landings**

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**Context:** Anterior cruciate ligament (ACL) injuries remain a serious problem in competitive and recreational sports. To date there have been many studies investigating potential risk factors for this injury, however, there has not been any documented decline in injury rates. A portable, cost effective, and easy to use device that is correlated to biomechanical measures of ACL risk factors will be helpful in the prospective examination of risk factors for ACL injury and injury preventative measures. **Objective:** Examine the relationship between tibial accelerations (TA) and kinematic and kinetic measures at the knee. **Setting:** University research laboratory. **Patients or Other Participants:** Ten highly active varsity and club level college female athletes (Age = 20.3 ± 0.8 years, Mass = 63.3 ± 6.2 kg, Height = 168.6 ± 9.0 cm) **Interventions:** Two landing tasks including a single-leg drop landing from a 12 inch box and a single-leg stop-jump from a distance equal to 40% of the participant’s body height. During these tasks TA was collected using a tri-axial accelerometer attached to the proximal tibia (medial plateau) and knee kinematics and kinetics were measured using a 3D video based motion analysis system. Additionally, tibiofemoral kinematics were measured using hi-speed dynamic stereo x-ray (DSX) video. **Main Outcome Measures:** Pearson product moment correlation coefficients were used to determine the linear relationship between peak TA and the following: peak knee angles; peak proximal anterior tibial shear force; peak ground reaction forces (GRFs); and peak tibiofemoral motion during landing. **Results:** Peak TA was significantly correlated to peak knee flexion in axis three (anterior-posterior/medial-lateral direction) during the stop-jump task (r= -0.79, p=0.007). Peak TA was significantly correlated to peak vertical GRFs in the vertical axis during the stop-jump and drop-landing task (r= 0.80 and 0.67, p=0.006 and p=0.033). Vertical GRFs during the stop-jump task were also correlated to peak TA in the transverse plane and resultant directions (r= 0.78, p=0.007 and p=0.008). Among DSX measures, knee flexion was correlated with axis three of the accelerometer (r= -0.70, p=0.022) and peak tibial translation magnitude was correlated with vertical and resultant directions of the accelerometer (r=0.68, 0.67, p=0.045 and p=0.049). All other variables had low and non-significant correlation coefficients. **Conclusions:** The results of this study demonstrate that TAs have moderate but significant correlations with landing GRFs, knee flexion, and tibial translation. Tibial acceleration may be a good measure of landing impact at the knee and may provide some information related to knee flexion and tibial translation magnitude during landing. The use of such a device may help facilitate the prospective evaluation of ACL risk factors. More studies are needed to further investigate these relationships in different populations and during different tasks. **Word Count:** 445