610 Board #3 May 31 1:00 PM - 3:00 PM

Lateral Extrinsic Foot Muscle Size Best Predicts Time To Stability In Single Leg Landing

Julia L. Dunbar, Sarah T. Ridge, Dustin Bruening, Kelsey R. Garner, Dennis L. Eggett, Aaron W. Johnson. *Brigham Young University, Provo, UT.* (Sponsor: Ty Hopkins, FACSM)

(No relationships reported)

A single leg, barefoot landing is a functional movement often executed in athletic events. The inability to quickly stabilize the ankle joint during a landing may contribute to injury risk.
PURPOSE: To determine whether the size of specific medial and lateral extrinsic foot muscles can be used to predict shorter time to stability in female athletes performing single leg, barefoot landings.
METHODS: Twenty-one female collegiate gymnasts and cheerleaders (age: 21.2 ± 1.4 years; height: 1.6 ± 0.06 m; weight: 58.1 ± 5.7 kg) completed a dominant single leg, barefoot landing onto a force plate from a height of 28 cm. The time to stability was calculated from the recorded medial to lateral force after landing. The size of the tibialis anterior (TA), tibialis posterior (TP), flexor digitorum longus (FDL), fibularis brevis (FB), and fibularis longus (FL) were measured using ultrasound imaging (12L probe, GE Logiq P6). The TA, TP, and FL were assessed at a distance of 30% from the knee joint-line to the tip of the lateral malleolus. FDL was measured at a distance of 50% from the knee joint-line to the medial malleolus while FB was measured at a distance of 50% from the knee joint-line to the lateral malleolus. Muscle sizes (thickness for the TA and TP and cross sectional area for FDL, FB, and FL) were measured from the ultrasound images ($p \geq 0.05$).
RESULTS: A stepwise regression (including height, weight, and muscle size(s)) indicated that the two best predictors of time to stability were the FB and FL (r^2=0.45, FB p=0.002, FL p=0.083; cross-sectional areas: FB=3.4 ± 1.2 cm^2, FL=4.8 ± 1.1 cm^2).
CONCLUSION: It appears athletes with larger FB and FL had shorter time to stability. These results suggest strengthening of the lateral extrinsic muscles may be a key component in both the prevention and rehabilitation of ankle injuries among gymnasts and other barefoot athletes.

611 Board #4 May 31 1:00 PM - 3:00 PM

Landing Patterns of Collegiate Female Volleyball Players During Practice and Game Competition

Jenny L. Kantor, Steven L. Dischiavi, Thomas J. Hockenjos, Jeffrey B. Taylor. *High Point University, High Point, NC.* (Sponsor: Dr. Kevin R. Ford, FACSM)

Email: jtaylor@highpoint.edu

(No relationships reported)

Women's volleyball is generally recognized as a high-volume jumping sport. This repetitive jumping and landing can lead to overuse injuries, especially if performed exclusively on a single-leg. While some data is available regarding jumping volume during competition, there have been few reports on jumping load during practice, and minimal characterization of the double- (DL) and single- (SL) leg landing patterns during the sport to help shape training and/or rehabilitation procedures.
PURPOSE: To quantify and characterize the jump landing patterns that occur during women's collegiate volleyball practice and game competition.
METHODS: Recordings from two video cameras from four consecutive competitions (three practices, one game) of 14 Division-1 collegiate women's court volleyball players were analyzed for this study. Recordings were viewed by one of two raters who noted the total number of jumps and categorized each landing as a DL landing, or SL landing on the right (SL_R) or left (SL_L) side. Repeated measures ANOVAs identified differences in jumping load, and the ratio of DL to SL, and SL_R to SL_L landings among practices and between practice and game competition ($p<0.05$).
RESULTS: On average, there was a significantly higher overall jumping load (practice: 66.7±40.1 jumps (j), game: 41.5±44.6 j; p=0.01), and frequency of DL (practice: 50.5±38.5 j, game: 31.9±38.6 j; p=0.03) and SL (practice: 16.2±12.8 j, game: 9.6±15.8 j; p=0.04) landings during practice than games. However, individual patterns of DL to SL (practice: 0.76±0.13, game: 0.75±0.18; p=0.99) and SL_R to SL_L (practice: 0.35±0.17, game: 0.36±0.39; p=0.89) were consistent across competitive events. There were no significant differences in any of the jumping or landing variables between practices ($p>0.05$), yet substantial variability of landing patterns was identified between individuals, with the percentage of DL landings ranging from 35.8-96.0% of total landings and SL_R landings ranging from 3.6-97.4% of SL landings.
CONCLUSIONS: Volleyball players were found to jump significantly more often during practices than games, but DL and SL landing patterns remained consistent. These data may help clinicians and coaches design training and/or rehabilitation procedures to better simulate the landing demands during volleyball competition.

612 Board #5 May 31 1:00 PM - 3:00 PM

Influence of Hip Extension Strength on Landing Biomechanics In Collegiate Basketball Players

Connor R. Whicker, Jeffrey B. Taylor, Emma F. Zuk, Kevin R. Ford, FACSM, Anh-Dung Nguyen. *High Point University, High Point, NC.* (Sponsor: Kevin Ford, FACSM)

Email: whickc14@highpoint.edu

(No relationships reported)

Decreased hip strength has been suggested to contribute to landing biomechanics that increase the risk of ACL injuries. However, the relationship between hip strength and landing biomechanics is conflicting. Previous studies are limited to examining the peak torque produced during isometric or isokinetic assessments of hip strength. Understanding how the isokinetic torque production of the hip through a range of motion may help clarify the role of hip strength in landing biomechanics.
PURPOSE: To examine the influence of hip isokinetic eccentric (ECC) and concentric (CON) work on landing biomechanics in male and female basketball players.
METHODS: Twenty- three male (N=11, 20.5±1.4yrs, 189.2±8.0cm, 90.2±10.4kg) and female (N=12, 19.9±1.4yrs, 172.4±6.8cm, 78.9±13.8kg) Division 1 basketball players participated. Using an isokinetic dynamometer, 5 repetitions of isokinetic CON and ECC hip extension torque were measured at 60 deg/s, with the work per repetition of the middle 3 repetitions used for analyses. Established 3D motion analysis techniques were used to collect three trials of a drop vertical jump and quantify the left limb's sagittal, frontal, and transverse plane hip and knee joint excursions and peak external joint moments, normalized to body weight and height (BWHT). Separate step-wise, linear regressions determined the extent to which CON and ECC work predicted landing biomechanics in males and females.
RESULTS: In males, the average ECC and CON work per repetition was 0.98±0.15 J/BWHT and 0.92±0.18 J/BWHT, respectively. In females, the average ECC and CON work per repetition was 0.91±0.25 J/BWHT and 0.94±0.21 J/BWHT, respectively. Greater ECC work predicted less hip adduction moment (0.40±0.29 Nm/BWHT, R^2=0.411, P=0.025) in females. ECC and CON work was not predictive of any other hip or knee joint excursions or peak moments in males or females (all $P>0.05$).
CONCLUSIONS: With the exception of hip adduction moment in females, ECC and CON hip strength was not predictive of landing biomechanics. This suggests that a combination of neuromuscular factors at the hip, such as muscle activation, combine to predict lower extremity biomechanics during dynamic activities. Further work is needed to clarify this relationship in more demanding tasks.