2654 Board #177 June 3, 11:00 AM - 12:30 PM

Identifying Limb Dominance in Adolescent Female Basketball Players: Implications for Biomechanical Research

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(No relationships reported)

The methodology used to determine limb dominance in basketball players is inconsistent, with some studies using self-reported measures and others using results from basketball-specific performance tests. Both the triple hop for distance test (TH) and single-leg countermovement jump (SLCJ) have been reported to elicit side-to-side asymmetries; however, their ability to determine limb dominance in basketball players has not yet been established. Identifying the relationship between limb dominance and these performance measures may be valuable during injury risk screening in basketball athletes.
PURPOSE: To identify relationships between different methods of determining limb dominance in adolescent female basketball players.
METHODS: Forty adolescent female basketball players (age: 15.5±1.17 yrs; height: 168.0±7.31 cm, weight: 63.27±10.97 kg) were asked to self-identify their preferred kicking and jumping limb. Athletes then completed three trials of a SLCJ and TH on each limb. Each test was then used to independently define limb dominance by the limb that produced the largest maximum vertical height and horizontal distance, respectively. Chi square tests for independence were performed to compare self-report and performance measures of limb dominance ($p<0.05$).
RESULTS: A significant relationship was identified between self-reported preferred kicking (R= 36, L=4) and jumping legs (R=25, L=15) ($p=0.006$). However, no significant relationships were found when comparing self-reported measures to performance measures during the TH (R=21, L=19; $p=0.57$) or SLCJ (R=23, L=17; $p=0.80$). Additionally, performance measures did not consistently produce the same definition of limb dominance amongst individuals ($p=0.22$).
CONCLUSIONS: These findings indicate that while various methods of defining limb dominance by self-reported measures provide consistent results, self-selection of the dominant limb is unrelated to actual performance. Furthermore, limb dominance, as defined by vertical jump height, is unrelated to limb dominance defined by horizontal jump distance. The results of this study may call in to question the validity of defining limb dominance by self-report or performance measures in adolescent female basketball players during biomechanical studies.

2655 Board #178 June 3, 11:00 AM - 12:30 PM

Team-Specific Needs-Based Injury Prevention Program Improves Landing Technique in Youth Female Athletes

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Injury prevention programs (IPPs) have been shown to reduce injury risk in female youth basketball athletes, but these programs are not widely used. One way to increase IPP adoption may be to tailor programs to meet team needs in terms of injury risk or movement impairments.
PURPOSE: To determine if a team-specific needs-based IPP can reduce injury risk in female youth basketball athletes after a single season.
METHODS: Sixty-eight youth female basketball players (Age=12±5 yr) in one basketball league (9 teams) completed an injury risk assessment before (PRE) and after (POST) one season. The injury risk assessment was a jump-landing task videotaped from the front/side of the participant and evaluated using the Landing Error Scoring System (LESS) at a later date. The LESS is a valid and reliable scoring tool that quantifies quality of landing technique, where a higher score indicates a higher number of errors. LESS total score is predictive of injury risk in youth athletes. A single rater graded all videos. After PRE, movement errors for all athletes were itemized and the percent of the team demonstrating each individual item on the LESS was calculated. An athletic trainer with experience in exercise prescription and neuromuscular training designed 10-minute IPP warm-ups that specifically addressed movement errors relevant for each team. A paired t-test was performed to evaluate changes in LESS from PRE to POST ($\alpha=0.05$). Based on LESS score at PRE we also stratified participants into high (LESS≥5, n=25) and low (LESS<5, n=21) injury risk groups and performed an independent t-test (Group x LESS Change Score (PRE-POST)).
RESULTS: LESS score significantly improved from PRE to POST (mean difference [PRE-POST]±SD = 1.31±1.97, 95% CI [0.74, 1.90] $P<0.001$). Participants in the high injury risk group improved movement technique by over 2 errors (2.32±1.68) compared to the low injury risk group (-0.05±1.28), $t(44)= -5.30$, $p<0.001$).
CONCLUSION: A team-specific needs-based IPP can effectively improve landing technique and reduce injury risk over one season. Athletes at a higher risk of injury at PRE saw greater improvements at POST and may represent a key population to target for interventions. Future research should evaluate the impact of team-specific approaches on long-term injury prevention compliance and adherence.

2656 Board #179 June 3, 11:00 AM - 12:30 PM

Common Jump Force Profiles of College Athletes Differ by Sport, Gender, and Performance

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Attempts have been made to characterize force profiles during a countermovement jump (CMJ) among athletes to explain performance differences due to gender, sport and experience. While useful, these approaches have emphasized discrete force variables thereby ignoring potentially valuable information contained in the remainder of the force-time signature. Applying methods such as principal component analysis (PCA) may better differentiate force profiles and provide additional insights into jump performance.
PURPOSE: To define common force profiles among collegiate athletes, and determine if differences exist between gender, sport and resulting jump height.
METHODS: Division 1 collegiate athletes (n= 152 females, 334 males) from eight sports (basketball, football, golf, ice hockey, soccer, softball, volleyball, and wrestling) participated. Vertical ground reaction forces were recorded (800 Hz) for each athlete's maximal effort CMJ, and analyzed over the entire push-off phase. Force-time plots were normalized to peak force and jump duration prior to the statistical analyses. PCA was paired with a k-means clustering algorithm to determine relevant force-time plot groupings. Force profile distribution across gender and sports were explored using Chi-square.
RESULTS: The first four principal components accounted for 85.7% of the variance in the data set. Thus, a four cluster solution was calculated defining four force profile clusters. Cluster 2 jumps (n=120; shape = extended force plateau) were associated with higher jump heights than the other clusters ($p<.001$, mean differences = 10.6 to 15.5%). Females most commonly exhibited cluster 3 (bimodal with even peaks) and cluster 4 (bimodal with larger second peak) force profiles ($p<.001$), while males were evenly distributed between clusters 2-4 with fewer cluster 1 profiles (distinct peak near take off). Specific clusters were more common among certain sports [all $p<.047$: basketball (cluster 3), football (cluster 2), ice hockey (clusters 3 and 4)].
CONCLUSIONS: Using a CMJ data set involving a variety of collegiate athletes, four distinct force profiles emerged with different profiles preferred by different sports and genders. One profile showed a marked advantage in jump height. The advantage of this force-time profile requires further study.