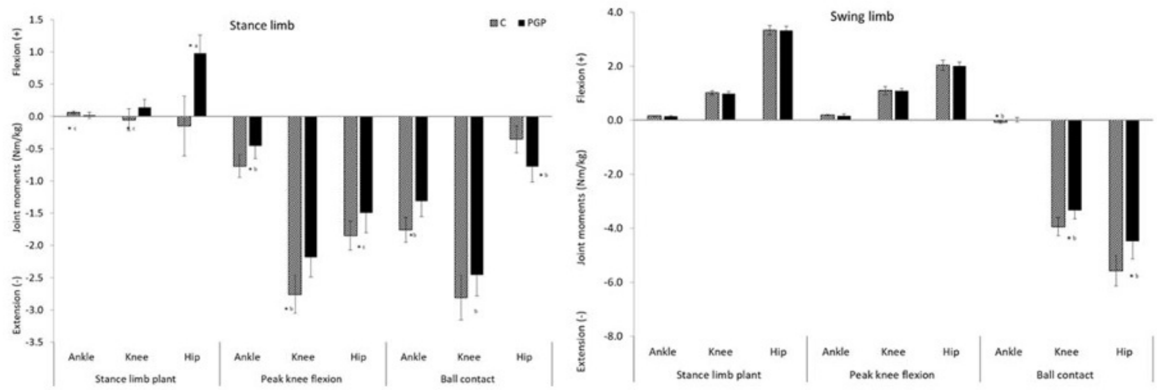

Figure 1. Graphs of joint moments of the limbs during the phases of the kick for C (black) and PGP (gray) groups. * indicates P<0.05. [a] indicate D>0.8, [b] indicate 0.5>D>0.8, and [c] indicate D<0.5

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Using Isokinetic Strength Assessment to Predict Performance and Prevent Injuries in Indian Cricket Fast Bowlers

Sai A. Krishna, Thiagarajan K. Alwar, Rajendran Ramasamy, Sakthi Vinayagam, Arumugam Sivaraman. *Centre for Sports Science, Chennai, India.*

(No relationships reported)

Cricket is the most commonly played & followed sport in India. It demands a high level of performance from the fast bowler. The fast bowling action involves a run up, leap and landing onto the lower limbs, followed by ball release. The large ground reaction forces generated during landing put fast bowlers at high risk of lower limb and lumbar spine injury. Precise dynamic coordination of lower body segments is needed to absorb these forces and transfer the energy via the core to the upper limb to propel the ball at faster speeds. Thus, knowledge of lower quadrant strength can be very useful for injury prevention and better performance in fast bowlers. Dynamic Knee Strength in the front limb is critical during the leap phase of bowling for optimal performance. There is a lack of literature in this subject in Indian fast bowlers despite the popularity of the sport.

PURPOSE: To evaluate the Isokinetic knee strength, determine the relevant asymmetries and strength imbalances & their relationship with performance and injury risk in Cricket Fast Bowlers.

METHODS: 42 male Indian State Level fast bowlers underwent Isokinetic knee strength testing. Quadriceps concentric (Qconc), Quadriceps eccentric (Qecc), Hamstring concentric (Hconc) & Hamstring eccentric (Hecc) Peak Torques normalized to body weight (PT/BW) were obtained. Bilateral Strength Asymmetries (BSA) and Dynamic Control Ratios (Hamstring DCR= Hecc/Qconc & Quadriceps DCR=Qecc/Hconc) were evaluated. Vertical Jump Height (VJ) & Standing Broad Jump (SBJ) distance were used as indicators of jump performance. Descriptive statistical analysis of data & Pearson correlation was done to obtain relationship between Isokinetic parameters & jump performance.

RESULTS: A significant correlation was found between Qconc Strength and VJ (r=0.67, p=0.04) & SBJ (r=0.39, p=0.04). 67% of bowlers had significant Qecc strength asymmetry. 40% had poor Hamstrings DCR & 19% had poor Quadriceps DCR on the front limb.

CONCLUSION: A significant proportion of fast bowlers have unfavorable strength asymmetry & DCR and thus are at risk of injury. Improving Dynamic Knee Strength through plyometric training could help optimize performance and reduce injury risk.

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Biceps and Triceps Contribute to Pitching Performance in College Baseball

Marie R. Acosta[1], J. Mark Van Ness[1], William P. Lydon[1], Brian G. Graham[1], Alexis C. King[2], Courtney D. Jensen[1]. [1]*University of The Pacific, Stockton, CA.* [2]*University of Illinois at Urbana-Champaign, Champaign, IL.*

(No relationships reported)

Training for pitching traditionally focuses on core and leg work, but there may be justification for isolated arm muscle training to enhance performance.

PURPOSE: To evaluate the influence of biceps and triceps function during pitching.

METHODS: Pitchers (n=10) from a Division-1 collegiate team were recruited. Throwing mechanics and isolated arm movements were assessed using Proteus technology (Boston Biomotion Inc). A single set of biceps and triceps movements (with 12 and 10 lbs respective resistance) and biomechanical assessment of a throwing movement were collected. All movements completed on Proteus result in seven variables: power, explosiveness, braking, consistency, endurance, velocity, and range of motion (ROM). Pearson correlation coefficients were employed to analyze relationships between the Proteus variables for biceps curls and triceps extensions, throw mechanics, and statistics from in-game performances from the 2017 season.

RESULTS: The strongest relationship among all comparisons was biceps curl endurance and ERA (r=-0.959; p=0.001). The biceps curl ROM was also weakly related to throw power (r=0.429; p=0.076). Throw endurance corresponded with positive trends for biceps curl power (r=0.419; p=0.089), explosiveness (r=0.452; p=0.060), velocity (r=0.417; p=0.085), and ROM (r=0.429; p=0.075). A strong positive relationship was observed between throw endurance and biceps curl braking (r=0.535; p=0.022) and a positive trend between biceps curl ROM and throw velocity (r=0.429; p=0.075). Triceps extensions corresponded closely with throwing mechanics and in-game statistics; trends were found between triceps explosiveness and strikeouts per nine innings (r=0.728; p=0.064) and Proteus throw velocity (r=0.462; p=0.053). Throw endurance was related to triceps extension braking (r=0.496; p=0.037) and it displayed a trend with triceps extension endurance (r=0.435; p=0.071).

CONCLUSIONS: New technology permits advanced biomechanical analysis of baseball pitching. Preliminary testing reveals the importance of arm conditioning for a pitcher's ability to maintain power output. As more players are tested, we may further our understanding of the role of biceps and triceps function in throwing mechanics.

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Biomechanical Predictors of Fastball Velocity in Collegiate Pitching

Samson J. Abernathy[1], William P. Lydon[1], J. Mark VanNess[1], J.P. Wong[1], Alexis C. King[2], Courtney D. Jensen[1]. [1]*University of the Pacific, Stockton, CA.* [2]*University of Illinois at Urbana-Champaign, Champaign, IL.*

(No relationships reported)

Recent pitching analyses indicate development programs should emphasize ball speed to optimize performance on the mound. Proper training is likely to increase velocity, but pitch delivery involves complex motions in all cardinal planes. Until recently, accurate analyses were encumbered by technological limitations. For example, isokinetic torque assessment measures fundamentally different phenomena from isotonic pitch delivery. New technology permits more accurate analysis.

PURPOSE: To evaluate kinematic predictors of fastball velocity in collegiate pitchers.
METHODS: We tested all pitchers (n=10) from a private D1 baseball team in the West Coast Conference. Velocity was recorded as the mean speed of the three fastest in-game pitches. We used Proteus (Boston Biomotion, USA) to conduct three-dimensional isotonic assessments of pitching form, dominant and non-dominant core rotation, dominant arm internal and external shoulder rotation, and anterior flexion and extension of the dominant shoulder. Proteus software calculated power, explosiveness, velocity, and endurance. Non-mechanical predictors of fastball velocity were class year, height, weight, and limb lengths. Simple linear regressions quantified mechanical predictors of fastball velocity and the effect of fastball velocity on in-game pitching performance.
RESULTS: Pitchers with a higher fastball speed had more appearances (r=0.763; p=0.028), pitched more innings (r=0.715; p=0.046), had more wins per appearance (r=0.524; p=0.183), and more total strikeouts in the season (r=0.829; p=0.011) but not per appearance (r=0.566; p=0.143) or per inning (r=0.074; p=0.861). Anthropometric variables were unrelated to fastball velocity. Internal rotation explosiveness (p=0.031) and endurance (p=0.030) of the dominant arm predicted fastball velocity. For each additional point of endurance, fastball speed increased 0.7 mph (p=0.030); for each additional 10 points of explosiveness, fastball velocity increased 0.4 mph (p=0.031). There was a positive relationship associated with explosiveness in straight-arm anterior shoulder raises (r=0.898; p=0.015); trends were found in the non-dominant arm.
CONCLUSION: Increased fastball velocity may be facilitated by training internal shoulder rotation and shoulder flexion.

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Match Acceleration and Deceleration Patterns in Female Collegiate Soccer Players

Jessica L. Trapp, Matthew F. Moran, Julie K. Nolan, Alicja B. Stannard. *Sacred Heart University, Fairfield, CT.*
Email: jessica.trapp15@gmail.com

(No relationships reported)

Non-contact anterior cruciate ligament (ACL) sprains are becoming increasingly problematic for athletes, especially females. Running performance factors like acceleration and deceleration are often underestimated when examining fatigue in soccer players, but may be useful for prophylactic training to counter dysfunctional lower body mechanics under fatigued conditions. Currently no study exists that characterizes these factors in match play in female collegiate soccer players.
PURPOSE: To describe match acceleration and deceleration patterns in female collegiate soccer players and compare positional influence.
METHODS: 24 female NCAA Division I soccer players (11 defenders, 5 midfielders, 8 strikers) underwent global positioning system (GPS, 10Hz) monitoring throughout a 16-game competitive season. A custom written Matlab script processed GPS data and computed the amount of low (<1 m/s2, <-1m/s2) and high (>2 m/s2, <-2 m/s2) acceleration-efforts (AE) and deceleration-efforts (DE), distance covered per effort, and starting speed of efforts. A Kruskal-Wallis H test and two separate paired t-tests were used to compare variables by position and by halves of matches, respectively. A significance level of p< .05 was used for all analyses.
RESULTS: Strikers performed significantly more high-intensity AE (1st half: 0.97 efforts/min; 2nd half: 1.07 efforts/min) and DE (1st half: 1.15 efforts/min; 2nd half: 1.24 efforts/min) when compared to defenders (AE: 0.76 efforts/min; 0.75 efforts/min; DE: 0.90 efforts/min; 0.87 efforts/min) (p = 0.00, p = 0.00, p = 0.00, p = 0.00) and midfielders (AE: 0.73 efforts/min; 0.86 efforts/min; DE: 0.91 efforts/min; 0.80 efforts/min) (p = 0.00, p = 0.00, p = 0.00, p = 0.00). Significant decreases occurred in the second half across all matches in distance covered in low-intensity AE (1.9 ± 0.2 m, p = .01) and low-intensity DE (0.9 ± 0.1 m, p = .01), and starting speed in low-intensity AE (6.9 ± 0.3 m/s, p = .01) and DE (3.9 ± 0.2 m/s, p = 0.00).
CONCLUSION: Strikers performed more high-intensity AE and DE than other positions, and may be at greater risk of lower body injury. Transient decreases in AE and DE occurred between halves of match play, and may relate to an increased risk of lower body injury in female soccer players.
TOPICAL GROUP #103
TOPICAL GROUP #402
TOPICAL GROUP #404

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The Kick Motion Analysis Of Adolescent Male Soccer Player With Osgood-schlatter Disease

Seira Takei[1], Michio Tojima[2], Shuji Taketomi[1], Suguru Torii[3]. *[1]Graduate School of Medicine, The University of Tokyo, Tokyo, Japan. [2]Tokyo International University, Saitama, Japan. [3]Waseda University, Saitama, Japan.*
Email: saranaga0330@hotmail.com

(No relationships reported)

Osgood-Schlatter disease(OSD) is an epiphyseal disease of tibial tubercle by repeated traction of patellar tendon, especially on epiphyseal or apophyseal stage. OSD is associated with sports that involve kicking, and running, but none have analyzed the kick motion of adolescent soccer players who experienced the OSD.
PURPOSE: The purpose of this study was to compare the kick motion in adolescent soccer players with and without OSD using three-dimensional motion analysis system.
METHODS: We recruited 112 adolescent soccer players (13 ± 1 years old) All players went through the medical examination including the ultrasonography of tibial tubercle, and the muscle tightness test of lower limbs. We included only whose tibial tubercle stage was epiphyseal or apophyseal stage for this study and made two groups: presence of OSD on kicking leg (OSD group; n = 10) and absence of OSD or any other injuries (NP group; n = 30).
We measured real-time kick motion using a three-dimensional motion analysis system (Qualisys track manager, Qualisys AB., Sweden). We placed 65 spherical markers on each anatomical landmark and calculated the angle of the lumbar spine, pelvis, hips, knees and ankles . We collected data for the following six events of kicking leg: foot contact (FC), toe off (TO), max hip extension (HE), max knee flexion (KF), ball impact (BI), and max hip flexion (HF). We used unpaired t-test to compare all the factors we measured between OSD group and NP group.
RESULTS: The anthropometric index, muscle tightness, ball speed of OSD group were not different from NP group. In HE, the supporting leg's ankle flexion angle in OSD group was smaller in OSD group(14.9±3.7 vs. 18.9±5.0 °, p=0.024). In KF ,the hip abduction angle of the kicking leg was smaller(24.5±5.9 vs. 28.6±5.1 °, p=0.041)in OSD group. In HF, the lateral bending angle of pelvis toward the supporting side was significantly smaller in OSD group (-2.6±16.4 vs. 7.4±11.3 °, p=0.037) In HF, supporting leg's ankle was more dorsal flexion(0.4±14.9 vs. -14.1±14.5 °, p=0.010), more valgus(26.3±12.4 vs. 11.5±11.1 °, p=0.001)compared to NP group.
CONCLUSION: OSD group had smaller dorsal flexion angle of supporting leg before and after BI. They also had smaller hip abduction angle of kicking leg before BI, and lateral bending angle of pelvis toward the supporting leg side was smaller after BI.

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Relationship Between Core Endurance and the Landing Error Scoring System in Youth Soccer Players

Brooke A. Smith[1], Stephanie M. Trigsted[2], Michelle C. Boling[3], Frank S. Barnett[4], Jason Bailey[5], Anh-Dung Nguyen[1]. *[1]High Point University, High Point, NC. [2]University of Wisconsin Madison, Madison, WI. [3]University of North Florida, Jacksonville, FL. [4]Utah Jazz, Salt Lake City, UT. [5]North Carolina FC, Cary, NC.*
Email: bsmith2@highpoint.edu

(No relationships reported)

Lower extremity injuries in youth soccer players continue to rise and have been related to poor landing mechanics. Identifying modifiable factors that influence at-risk landing mechanics is crucial toward the development of effective injury prevention programs. Dynamic core stability is needed to control lower extremity motion and decrease the risk of lower extremity injury. However, there is limited research that has examined the relationship between core stability and landing mechanics in youth athletes. Furthermore, understanding this relationship using screening methods that are readily accessible to clinicians is necessary as participation and injuries in youth soccer programs continue to increase.
PURPOSE: To investigate the relationship between core endurance and the Landing Error Scoring System (LESS).