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MODELING THE ANGLE-SPECIFIC ISOKINETIC BILATERAL DIFERENCES IN ADOLESCENT MALE BASKETBALL PLAYERS

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Introduction: Injuries impair player´s performance and, consequently, team performance. In many cases injuries related to training load and concerning appropriate physical fitness and muscle development might be preventable. In this regards, isokinetic assessment has been used for prevention, rehabilitation, and detection of potential injuries, particularly muscle imbalances. On other hand, bilateral and agonist/antagonist relationships are based on a single moment of force (peak torque). However, it more likely to have a better understanding of muscle considering moments of force observed across the range of motion, rather than data reduction to a single parameter. Generalized additive multilevel model (gamm) allows to explore on-the-fly the trends of non-liner isokinetic strength across the range of observation, allowing for variation between limbs within individuals, hence accounting for realistic hierarchical data structure. **Objective:** To illustrate the use gamm to describe joint-angle-specific bilateral differences in curves of force, using isokinetic concentric knee extension as an example. **Methods:** We considered data from 30 healthy male basketball players aged 15.0 (1.4) years [stature: 180.0 (11.1) cm; body mass: 71.2 (14.9) kg]. Players were engaged in formal basketball training and competition [5.9 (2.4) years], with experience in strength training for at least one year. Concentric muscular actions of knee extension at an angular velocity of $60°{\cdot}s^{-1}$ were extracted from maximum voluntary actions in a calibrated isokinetic dynamometer (Biodex System 3, Shirley, NY, USA) to describe joint-angle-specific production of force, and to compare differences between right and left leg across 90° joint range. We used Bayesian methods to estimate gamm. **Results:** There was substantial variation between limbs within players, indicating bilateral differences in the initial rate of moments of force development and angle of maximum moment of force attainment. Visual inspections allowed to identify the trend of bilateral differences in the shape of the joint-angle-specific curves. On average, the largest bilateral difference between limbs moment of force production remained until about 50° of extension. After, force production tended to even. Posterior predictive checks and visual inspections of trace-plots indicate that the model were appropriate to model the isokinetic data. **Conclusions:** In this study we were able to adopted gamm to describe joint-angle-specific bilateral differences in force curves for concentric extension of knee, using all of the available truly isokinetic data within the range. The method can be useful to examine bilateral strength variability, monitoring individual patterns of strength development. Conditional on the data, it is possible interpret the implications for performance and injuries given the observed trends of bilateral differences across the range of motion observed.

Keywords: Muscle Strength, Leg Injuries, Youth Sports.