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Biomechanical Predictors of Fastball Velocity in Collegiate Pitching

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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.