

## Kinematic Variability in Three Types of Softball Windmill Pitches

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**PURPOSE:** Softball pitchers have numerous types of pitches in their arsenal, but previous researchers have focused primarily on the fastball technique. The purpose of this study was to assess kinematic variability for the fastball, change-up, and screwball pitches. **METHODS:** Five female NCAA Division II softball pitchers participated in the study. Participants performed five pitches for each of the following pitch types: fastball, change-up, and screwball. The velocity of the ball was computed from videos of the pitches using Logger Pro software. The three best attempts (for each pitch type) based on velocity at release (VR) were used in the analysis. Differences between measures were tested for statistical significance using ANOVA (criterion of  $p = 0.05$ ). **RESULTS:** Figure 1 shows that pitchers achieved the largest VR values using the fastball ( $26.2 \pm 1.4$  m/s) and screwball ( $25.1 \pm 1.5$  m/s), while the smallest VR values were obtained using the change-up ( $18.7 \pm 1.6$  m/s). The fastball and screwball VR values were not significantly different from each other, but VR values for both fastball and screwball were significantly larger than the change-up technique. Figure 2 shows the ball velocity from the start of the windmill motion until ball release (for all attempts by a typical subject). Ball velocity values are similar for all pitch types until the very end of the pitching motion, when fastball and screwball ball velocity values become nearly 40% larger than the change-up. **CONCLUSION:** The results of this project indicate that for a small sample of NCAA Division II softball pitchers, kinematic variability within a given type of pitch is minimal. Future studies should use a larger sample and explore other pitch types such as the curveball and riseball.

