

# Investigating the relationships between technique parameters and ball release speed in female fast bowling

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**Background:** Previous research has investigated the influence of different technique parameters on ball release speed in fast bowling primarily using male bowlers. Worthington et al.<sup>1</sup> identified four technique variables as being the best predictors of ball speed: run-up, front knee at ball release, shoulder angle at front foot contact, and thoracic flexion from front foot flat until ball release. Unfortunately, little is known on the best predictors of ball release speed in female fast bowlers.

**Aims:** To investigate the relationships between female fast bowling technique and ball release speed.

**Methods:** Eighteen elite female fast bowlers each bowled six maximum ball speed deliveries of a good length in an indoor practice facility. An 18 camera Vicon Motion Analysis system was used to collect three dimensional kinematic data. Forty-seven 14 mm retro-reflective markers were attached to the subject and an additional marker was attached to the ball in order to calculate ball speed. All marker trajectories were filtered using a fourth-order low pass Butterworth filter with a cut-off frequency of 30 Hz. The best three trials were averaged and eleven kinematic parameters were determined for each trial. The effect of interactions between the fast bowling technique parameters and ball release speed were investigated using stepwise linear regression with the requirement for the inclusion of a variable being  $P < 0.10$ .

**Results:** Good between-trial repeatability was found for all the technique parameters, where the within-subject sum of squares for the eleven individually calculated parameters ranged from 1 – 10% (mean 5%) of the between-subject sum of squares. Consequently, the three trials were averaged for each parameter to provide representative data for each bowler. The highest percentage of variation in ball release speed was explained using three technique variables: run-up speed, knee angle at ball release and shoulder angle at front foot contact, explaining 74.1% of the observed variation in ball release speed. The fastest bowlers had a faster run-up, greater flexion of the knee at ball release and an earlier onset of upper arm circumduction.

**Discussion and Conclusions:** The results of this investigation suggest the variation in ball speed observed among the elite female fast bowlers can be explained well using three technique parameters: run-up speed, knee angle at ball release and shoulder angle at front foot contact (74.1% of the variation). These three parameters were also found to be included within the best predictors of ball release speed in the study by Worthington et al.<sup>1</sup>. The predictive equations in both studies suggest that an increase in run-up speed is associated with an increase in ball release speed. Worthington et al.<sup>1</sup> however, found that a delay to the onset of arm circumduction and a straighter front knee at ball release were related with faster ball release speeds rather than the opposite found in this study. It is proposed that this difference is caused by the differential in strength and technique between male and female bowlers, which caused the front knee to collapse in the majority of the female fast bowlers used within this study.

## References:

1. Worthington, P.J., King, M.A., & Ranson, C.A. JAB, 29(1), 78-84.