

# THE EFFECTS OF LOCALISED QUADRICEPS FATIGUE ON BOWLING PERFORMANCE IN FEMALE COUNTY CRICKETERS

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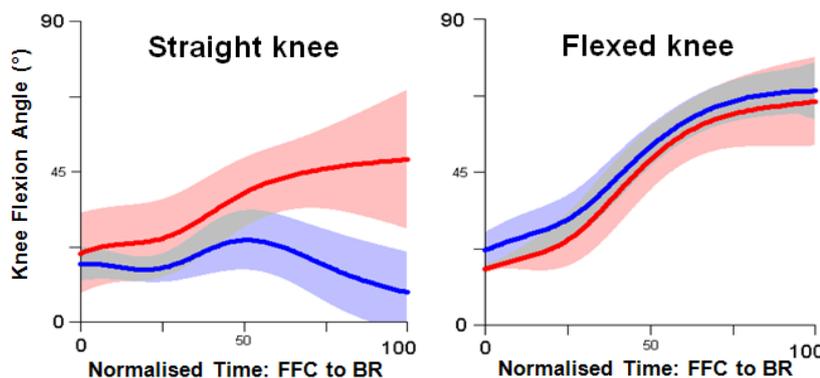
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**KEY WORDS:** Cricket, Bowling, Knee Angle, Fatigue, Technique.

**INTRODUCTION:** Several studies in cricket bowling indicate that a more extended front knee at ball release contributes to increased ball release speed but reported correlation coefficients vary from 0.34 to 0.52. Portus et al. (2000) found an 8-over spell had no significant effect on knee angle or ball release speed. This study manipulated knee angle by fatiguing the quadriceps to explore its relationship with ball release speed and technique.

**METHOD:** Five female medium-fast bowlers (aged  $16 \pm 1.3$  yrs) bowled 24 deliveries whilst their movement was tracked opto-electronically using 44 retro-reflective markers (Qualisys, Sweden). The ball was tracked with retro-reflective tape on one hemisphere and ball release was determined from ball velocity. Subsequently, a fatigue protocol was administered to the quadriceps of the front leg using an isokinetic dynamometer (LIDO, Loredan Biomedical Inc., USA). Once quadriceps torque decreased to  $<30\%$  MVC, 4 more deliveries were bowled. A whole-body biomechanical model was constructed following a static calibration in Visual 3D (C-Motion, USA) and non-parametric correlation analysis was undertaken in SPSS.

**RESULTS & DISCUSSION:** When grouped according to knee angle at ball release; two bowlers had a straight front leg at ball release whereas the three others had a more flexed knee (Fig. 1). This technique influenced their response to fatigue and subsequent ball release speeds. Pre-fatigue there was a significant negative correlation between knee flexion angle and ball release speed ( $r = -0.66$ ,  $P < 0.01$ ). This supported the trend shown in Portus et al. (2000) that bowlers with straighter legs have higher ball release speeds. Post-fatigue however there was no correlation ( $r = -0.21$ ,  $P = 0.40$ ) as bowlers with straighter legs were more greatly affected by quadriceps fatigue. Their ball release speed decreased by  $1.95 \text{ ms}^{-1}$ , which was  $0.55 \text{ ms}^{-1}$  more than the flexed knee group. In comparison to the fatigue induced in Portus et al. (2000), quadriceps fatigue led to reductions in ball speed in both techniques.



**Figure 1. Knee flexion angles from front foot contact (FFC) to ball release (BR). Quadriceps fatigue caused bowlers with straighter legs at ball release (blue) to increase knee flexion post-fatigue (red).**

**CONCLUSION:** This study found that minimal knee flexion during the delivery stride was beneficial to achieving maximal ball release speed. The effect of quadriceps fatigue on knee flexion and ball release speed was dependent on the bowler's knee angle at ball release. Female fast / medium bowlers should endeavour to reduce knee flexion in the delivery stride and ensure sufficient quadriceps endurance to maximise and maintain ball release speed.

## REFERENCE:

Portus, M.R., Sinclair, P.J., Burke, S.T. et al. (2000). Cricket fast bowling performance and the influence of selected physical factors during an 8-over spell. *Journal of Sports Sciences*, 18, 999-1011.