CAN SMART PHONES BE USED TO DETERMINE KEY TECHNIQUE FACTORS FOR BOWLING FAST

Mark A. King, Hamish Bull, Jon P. Knight
School of Sport, Exercise and Health Sciences, Loughborough University, UK
Email: M.A.King@lboro.ac.uk

Summary

In 2024 the England and Wales Cricket Board (ECB) released its seven key technique factors for bowling fast (run-up speed, front arm position, heel strike, chest drive, delayed bowling arm, braced front leg and wrist flick [1]). These factors were based on research done in biomechanics laboratories with marker-based motion capture systems [2, 3]. Cricketers / coaches do not typically have access to biomechanics facilities / equipment, but the majority have smart phones that might be good enough to give meaningful information on bowling actions. Thirteen fast bowlers were recorded indoors from a side-on camera position using a specialist video camera and a smart phone. Body landmarks were manually digitised and the seven technique factors calculated. Ball speed and six of the seven key technique factors were determined with a useful level of accuracy, but the wrist flick could not be confidently determined.

Introduction

The ECB recognises that a fast bowler's technique is critical to high levels of performance and is looking to encourage the seven key technique factors that have been associated with bowling fast (Figure 1, [1]) based on research done in biomechanics laboratories [2, 3].

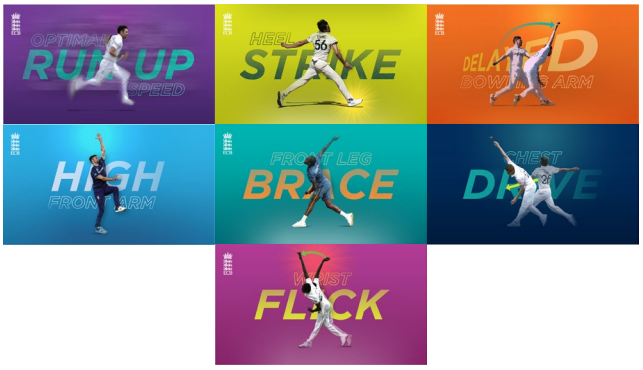

Figure 1: ECB seven technique factors for bowling fast [1].

This study investigates whether smart phones can give meaningful information on fast bowling techniques.

Methods

Thirteen University Centres of Cricketing Excellence (UCCE) fast bowlers (seven female and six male) were recruited and recorded indoors from a side-on position using a specialist video camera (Panasonic Lumix DMC FZ200; 100 Hz HD with minimal exposure time) and a smart phone (iPhone 11 Pro Max; 60 Hz HD) set-up on tripods. One delivery from each player was manually digitised for both camera recordings. The seven technique factors and ball speed were calculated for each recording with distances scaled using the known distance between the bowling and popping crease in the plane of the motion. Run-up speed was calculated over the flight phase before back foot contact using constant acceleration equations, ball speed was calculated from the ball centre locations in flight using constant acceleration equations and the planar angles (Figure 1) were calculated from the digitised joint centres. Heteroscedasticity and proportional bias checks were conducted before a paired t-test was run between the Lumix and iPhone calculated outputs.

Results and discussion

There was a varying level of agreement between the two estimates of ball speed and each of the seven technique factors. There were no statistical differences for run-up, front arm angle, arm delay, braced front leg, and differences for ball speed, heel strike, chest drive. The associated RMSD's were ball speed 1.7 mph, run-up speed 1.2 km/h, front arm angle 5°, heel strike 7°, chest drive 3°, arm delay 6° and braced front leg 3°. Combining these results suggested that all measures could be meaningfully determined from smart phone recordings. The one exception was the wrist flick (RMSD 20°), which was very difficult to see from either video recordings. To confidently observe wrist flick would require a zoomed in camera indoors.

The smart phone was straight forward to set-up with just the frame rate to be specified, while for the specialist video camera there was the requirement to also focus the camera and set an appropriate exposure time. The convenience of the smart phone was very helpful but indoors there can be a tendency for low light conditions and the lack of control of the exposure time can result in slightly blurred images for fast moving objects due to automatic exposure times. The phone used in this study was relatively old and with better smart phone cameras now available one would expect that the results would be even better. Despite this the level of agreement was such that it was clear that smart phones can be used to provide useful information for cricket fast bowling.

Conclusions

Smart phones can be used to determine the majority of the key technique factors for bowling fast.

References

[1] ECB (2024). How to Bowl Fast | England Explains https://www.ecb.co.uk/video/4069609/how-to-bowl-fast--england-explains.
[2] Worthington et al. (2013). J. of Appl. Biom. **29**, 78-84.
[3] Felton et al. (2020). J. of Sport Sci. **38**, 2054-2062.