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A study on front foot placement and its effect on bowling action in cricket

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Abstract
The purpose of the study was to find the influence of front foot placement on bowling action during delivery stride in cricket. In this study four (04) pace bowlers, (22.25±0.47 years) of Inter University level were tested using a two-dimensional (2-D) motion analysis system. The subjects were attached with 14 markers and asked to bowl six deliveries at a good length spot. One Sunco Digital Video Camera 120(fps) camera was mounted on a gantry, at a height of 12 foot from the ground and aligned to have an optical axis of 90° with the ground to analyze the bowling action. The shoulder alignment of the pace bowlers were used to categorize the bowling action. The angle of front foot placement were taken during the back foot contact, delivery stride and release phase. To assess the influence of front foot placement on bowling action descriptive statistics was used with graphical representation. The result of the study shows that at back foot contact (BFC) the bowlers have a displacement of front foot towards on side but at the time of delivery stride the placement of front foot displaced 11.54 cm towards offside which makes the bowlers more front on which causes a great shoulder hip counter rotation and the bowlers tends to move into mixed on action.

Keywords: Front Foot placement, Bowling Action, Shoulder Counter Rotation

Introduction
In cricket the majority of the coaching manuscripts are based on texts of similar nature, statements of former and elite players or subjective evidence. Maximum scientific research to date into the biomechanics of pace bowling in men's cricket has however been carried out on the technique of fast or fast-medium bowling. In pace bowling the most technical phase of the bowling action is the delivery stride which is outlined according to three key events: the back foot strike, front foot strike and ball release (Bartlett *et al*., 1996) [2]. As the delivery stride proceeds, the front foot strikes the ground. The area of this analysis in the delivery stride is the alignment of the back and front foot. Where it is recommended that the back foot, front foot and the wickets at the batsmen's end will be in a straight line. But a range of average displacements for the front foot relative to the back foot varied from 3.2 cm to the offside to 10.9 cm to the on-side. Any displacement to the off-side suggests a more front-on action and any displacement to the on-side illustrates a more side-on action conducted, a study where the results showed only 20% of the bowlers who had an average displacement of 10.9 cm to the on-side were side-on bowlers. Limited research has been conducted to establish the direction of front foot placement during the delivery stride (Bartlett *et al*., 1995) [10]. Based on this line of this commitment the investigator was keen and became interested to study the influence of front foot placement on bowling action during delivery stride in cricket.

Methodology
Subjects
Four (04) Interuniversity cricket players were selected from Visva-Bharati University who represented the university for last 4 years were selected for the study. At the time of testing all the subjects were bowling without being restricted by injury and all were "match fit"

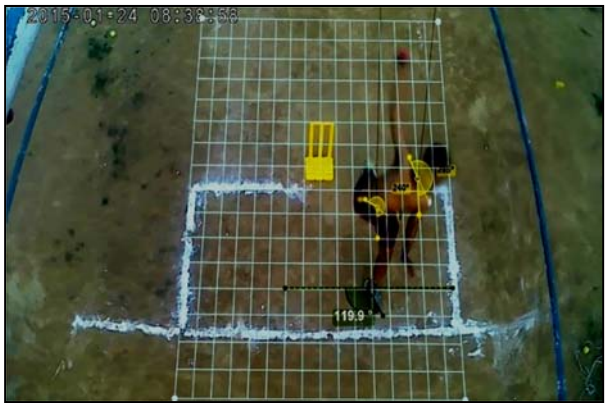
Collection and analysis of Data

The subjects were attached with 14 markers and asked to bowl six deliveries at a good length spot. One Sunco Digital Video Camera 120(fps) camera was mounted on a gantry, at a height of 12 foot from the ground and aligned to have an optical axis of 90° with the ground to analyze the bowling action. From each bowler, the six trials that had the smallest number of occluded markers and scored highly on the accuracy target by landing on a good line and length were selected for analysis. For the purpose of the study the selected kinematic variables were front foot angle, shoulder alignment, hip alignment, shoulder hip separation angle and shoulder counter rotation

Calculation of Shoulder Alignment

To evaluate the bowling action the shoulders alignment was measured at back-foot impact, front-foot impact was calculated for the fastest delivery from each participant. Markers were affixed to the following body land marks: Acromion process (left and right), seventh cervical vertebrae, xiphoid process and suprasternal notch. In the Transverse Plane Shoulder Alignment was calculated by creating a line-of-best-fit between the acromion processes from the overhead camera view using Kinovea software (8.25 Version).

All transverse plane angular measures were relative to the pitch alignment in the direction of bowling measured in an anti-clockwise direction. Therefore, shoulder alignment during back foot impact if found >240°; if < 210° and within 210° to 240° then the bowlers will be classified as Front on, Side on and semi open respectively and if the counter rotation was ≥30° will be classified as mixed action (Portus *et al*., 2004) [7].



Analytical Procedure

Descriptive statistic (Mean, SD) was applied in order to assess the influence of front foot placement on bowling action of the subjects.

Results & Discussion

Table 1: Descriptive statistics of kinematic variables of front foot displacement, shoulder alignment, hip alignment and shoulder hip separation angle

Bowling Phase	Foot Displacement (CM)	Shoulder Alignment (Degree)	Hip Alignment (Degree)	Shoulder Hip Separation Angle (Degree)	Shoulder Counter Rotation (Degree)
BFC	1.8±0.46	258.5±3.12	259.75±2.49	3.25±1.65	51.25
Delivery Stride	11.54±1.86	207.25±4.75	231.75±6.38	22.75±4.32	

Discussion of findings

The table no. I shows the mean values of various kinematic variables at different phases of bowling i.e. Back Foot Contact (BFC) and Delivery Stride. During back foot contact (BFC) the mean foot displacement was 1.8 cm and the mean shoulder alignment and hip alignment were 258.5 degree and 259.75 degree respectively where the shoulder hip separation angle was 3.25 degree. At this phase the bowling action is considered as front on action at maximum shoulder alignment (Portus *et al*., 2004) [7]. The result also shows that during delivery stride at minimum shoulder alignment the front foot displaced up to 11.54 cm to the off-side which advocates a more front-on action as a result shoulder counter rotation shows 51.25 degree which illustrates a mixed action and may lead to lumber stress injury. Shoulder counter-rotation is the predominant factor in lower back injury. It is a rapid realignment of the shoulders from a relatively front-on position at back foot contact (BFC) in the delivery stride to a more side-on position before front foot contact (FFC). The term is derived from the shoulders rotating away from the batter before they rotate towards the batter to release the ball (Portus, Marc R. *et al*, 2004) [7].

As the front foot opens towards the off side the bowler's momentum is still directed towards third man or second slip. At the moment of back foot impact the bowler is unable to redirect his momentum towards target and the front leg ends up going away from the body. This creates a tremendous amount of lateral flexion of the lower back. As a result the torso starts to fall away in order to allow the bowling arm to redirect towards the target.

The result of the study is in agreement with Where they states that any displacement to the off-side suggests a more front-on action and any displacement to the on-side illustrates a more side-on action.

Conclusion

From the findings it can be concluded that during delivery stride extreme displacement of front foot towards offside makes the bowlers more front on by rapid realignment the shoulders from a relatively front-on position and tends to move into mixed on action.

Reference

1. Elliott B, Wallis R, Sakurai S. The Measurement of Shoulder Alignment in Cricket Fast Bowling. Journal of Sports Sciences. 2002, 20:507-510.
2. Bartlett R, Stockill N, Elliott B, Burnett A. The biomechanics of fast bowling in men's cricket: a review. Journal of Sports Sciences. 1996; 14:403-424.
3. Burden A, Bartlett R. A kinematic investigation of elite fast and fast medium cricket bowlers. In M. Nosek, D. Sojka, W. Morrison, and P. Susanka (eds.), Proceedings

of the Vlllth International Symposium of the Society of Biomechanics in Sports. 1990, 41-46.
4. Craig Salter W, Peter J, Sinclair Marc Portus R. The associations between fast bowling technique and ball release speed: A pilot study of the within-bowler and between-bowler approaches. Journal of Sports Sciences. 2007, 1279-1285.
5. Thiagarajan KA, Tvisha Parikh. Anees Sayed Cricket Biomechanics Analysis of Skilled and Ameteur Fast Bowling Technique. Journal of Postgraduate Medicine, Education and Research. 2015, 173-181.
6. Liebenberg JN. Kinetics at front foot contact of cricket bowling during a 10- over spell. UNLV/Dissertation/Professional/Papers/Capstones, 2010, 348.
7. Portus Marc R *et al*. Technique factors related to ball release speed and trunk injuries in high performance Cricket fast bowlers. Journal Sports Biomechanics. 2004; 3:2.
8. Peter Worthington J, Mark King A. Relationships between Fast Bowling Technique and Ball Release Speed in Cricket. Journal of Applied Biomechanics; 2007: 29(1):78-84.
9. Portus MR, Sinclair PJ, Burke ST, Moore DJ, Farhart P J. Cricket fast bowling performance and technique and the influence of selected physical factors during an 8-over spell. J Sports Sci. 2000; 18(12):999-1011.
10. Prague Consport, Burnett A, Elliott B, Marshall R. The effect of a 12-over spell on fast bowling technique in cricket. Journal of Sports Sciences. 1995; 13:329-341.
11. Davies R, du Randt R, Venter D. Cricket: nature and incidence of fast bowling injuries at an elite, junior level and associated risk factors. S Afr J Sports Med. 2008; 20:115-118.