



ANALYSIS OF SHOULDER ALIGNMENT TO ASSESS PACE BOWLING ACTION : A PILOT STUDY

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ABSTRACT

The purpose of the study was to evaluate the shoulder alignment to assess the pace bowling action from transverse plane. In this study seven (07) pace bowlers, (22.14±0.50 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 overhead video camera was mounted on a gantry, at a distance of 12 foot and aligned to have an optical axis of 90° with the ground to analyze the shoulder alignment at back foot landing, front foot landing and shoulder counter rotation. The shoulder alignment of the pace bowlers were used to categorize the bowling action.

The result of the study shows that from the shoulder alignment point of view at back foot landing two bowlers were found front on action as the shoulder alignment was found 262° & 246° and the rest five bowlers were found as semi open bowling action as the mean shoulder alignment was found 227.6°. While analyzed as per shoulder counter rotation three bowlers were found mixed action and 4 were found non mixed action. It was concluded that the four out of seven bowlers were categorized as Semi open bowling action and rest three bowlers were classified as mixed action and this action may predispose a cricket fast bowler to lumbar vertebral stress injury.

KEYWORDS: Shoulder Alignment, Pace Bowling Action, Shoulder counter rotation Cricket.

INTRODUCTION

Pace bowling is an activity which produces high ball velocities at release through generating a variety of forces and torques in the body to accomplish these ball velocities at delivery. Bowlers undergo a huge amount of twisting, bending, rotation, flexion and extension over a short period with the added necessity of accommodating the ground reaction forces generated that may increase the possibility for a medium pacer to occur injuries (McGrath et al., 1996).

In cricket pace bowling action can be classified as side-on, front-on, semi-front-on or mixed depending on the orientation of the shoulder, hip axes and back foot alignment during delivery. Bowlers who use the side-on and front-on techniques are not at as much risk of injury as those who use the mixed technique. The semi-front-on action is a new method that is based on the same principles as the two 'safe actions', where the alignment of the shoulders and hips are in the same direction. The mixed action features a realignment of the shoulders in the transverse plane during the delivery stride, which causes an increase in lumbar spine axial rotation, extension- flexion and lateral flexion. A combination of these factors has been linked to an increased incidence of radiological features in the thoracolumbar spine, including spondylolysis, intervertebral disc degeneration and spondylolisthesis (Foster et al., 1989; Elliott et al., 1992; Burnett et al., 1996; Glazier et al.2000).

Under the circumstances, it was deemed reasonable to undertake the study on Indian pace bowlers to assess their bowling action that would make all concerned aware of the need to nurture and protect our pace bowlers through their formative years, and may be warmly welcomed by a significant number of coaches in India. For feasibility of the study it would be delimited to Interuniversity level pace bowlers of West Bengal.

On these influencing factors, no research has been attempted to establish to analyze the shoulder alignment and classification of pace bowling action of the cricketers in West Bengal. The purpose of this study was to analyze the shoulder alignment in pace bowling technique from transverse plane.

MATERIALS & METHODS

Selection of Subjects

Seven (07) male active pace bowlers were selected for the study; all of them were played at National University level Tournaments. All of the subjects were right-handed bowlers. The age of the subjects was 22.8 ± 4.2 years. Their mean height was 171 ± 6 cm.

Collection and analysis of Data

Videography took place in an outdoor cricket pitch. One overhead Sony HRD-PJ260VE Digital HD Video camera mounted on a gantry, directly above at a distance of 12 foot where the bowler released the ball and aligned to have an optical axis of 90° with the Ground. Each participant was permitted to use as much run-up as required, bowled six maximum velocity deliveries at a target area located on the good length spot of the cricket pitch. For the possession of kinematic data, the subject's Shoulder Alignment was recorded by Kinovea – 8.24 software to

analyze the bowling technique.

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.

Calculation of Shoulder Alignment

The alignment of the shoulders 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).

Analytical Procedure

Descriptive Statistics was applied in order to assess the shoulder alignment and classification of bowling action of the subjects.

Results

The results of the study on shoulder alignment and classification of bowling action are depicted in the following table no I.

**TABLE I
DESCRIPTIVE STATISTICS OF THE SHOULDER ALIGNMENT,
SHOULDER COUNTER ROTATION AND CLASSIFICATION OF
BOWLING ACTION AT FRONT FOOT AND BACK FOOT IMPACT
DURING BOWLING**

Subject	Shoulder Alignment at BFC (Degrees)	Classification Criteria of Bowling action (Degrees)	Shoulder Alignment at FFC (Degrees)	Shoulder Counter Rotation (Degrees)	Classification Criteria of Bowling action (Degrees)
A	262°	Front on	213°	49°	Mixed
B	225°	Semi open	198°	27°	Semi open
C	216°	Semi open	191°	25°	Semi open
D	246°	Front on	203°	43°	Mixed
E	234°	Semi open	212°	22°	Semi open
F	237°	Semi open	206°	31°	Mixed
G	226°	Semi open	209°	17°	Semi open
Mean	235.14		204.57	30.57	
SD	15.25		7.93	11.51	

*Where FFC and BFC denotes front foot contact and back foot contact during bowling.

FINDINGS

Table no- 1 shows the mean shoulder alignment at BFC of the fast bowlers was 235.14°. Following BFC, there was a counter rotation of the shoulders to a mean minimum shoulder alignment of 204.57°, a reduction that is similar to the findings of (Portus et al., 2004; Foster et al., 1989; Elliott et al., 1992). Two bowlers were found front on action as the shoulder alignment were 262° and 246° and five bowlers were categorized as semi open bowlers as the mean shoulder alignment was found 227.6° at back foot contact. While analyzed as per shoulder counter rotation three bowlers were found mixed action and four were found Semi open action. In this study no bowlers were found having side-on action.

DISCUSSION

In the present study the researchers have classified bowlers on two categories on the basis of Shoulder Alignment at BFC and shoulder counter rotation from transverse plane. However when analyzed as per the Shoulder Alignment at BFC two bowlers were found Front on and both of them having mixed action at the shoulder counter rotation as classification criteria of Portus et al. 2004. But as per Shoulder Alignment at BFC five bowlers was categorized as semi open bowlers as the mean shoulder alignment was found 227.6° and out of five bowlers four were found non mixed action but only one bowler was found as mixed action at the shoulder counter rotation as classification criteria of Portus et al. 2004. The pace bowlers tended to adopt a relatively side-on alignment of the shoulders just prior to FFC. As per the the most recent action classification system by Portus et al. 2004 in the present study the front-on classification appears redundant as two out of seven bowlers who had a front-on shoulder alignment at BFC had SCR greater than 30° were therefore classified as 'mixed' and other bowlers were classified as semi front on or semi open which is relatively new and was advocated as a safe technique (Portus et al., 2004). In this action the shoulder segment angle lies between the front-on and side-on actions. Similar to both the side-on and front-on actions, there is little to no counter-rotation of the shoulders. It is described as "shoulder segment angle from 210 to 240 at back foot contact, a hip-shoulder separation angle less than 30at back foot contact, and, shoulder counter-rotation less than 30" (Portus et al., 2004).

Where mixed action is the combination of both the front-on and side-on bowling actions, therefore the exact technique can vary. For instance, when the back foot makes contact, the hips and lower limb can adopt an orientation consistent with a side-on action whereas the shoulders face front-on to the batter, but the opposite of this can also occur. The mixed action is defined as any action with "a hip-shoulder separation angle equal to or greater than 30at back foot contact, or, shoulder counter-rotation equal to or greater than 30" (Portus et al., 2004).

The result of the study is in consonance with Portus et al., 2004; Ferdinands et al., 2010; Ranson et al., 2008; Bartlett et al., 1996; Bartlett, 2003; B. Elliott, et al., 2002.

CONCLUSION

Within the limitation of the study it may be concluded that the four out of seven bowlers were categorized as Semi open bowling action and rest three bowlers were classified as mixed action and this action may predispose a cricket fast bowler to lumbar vertebral stress injury. These data indicate that the technique of pace bowlers who use a mixed action should be assessed and retraining provided to reduce the risk of lumbar spine injury.

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