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Relationship of Selected Anthropometric and Biomechanical Variables to the Technique of Front Foot on – Drive in Cricket

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Abstract: ***The purpose of the present study was to analysis the relationship of selected anthropometric and biomechanical variables to the technique of front foot On – Drive in cricket. A total of 6 male intervarsity level cricketers were selected from cricket match practice group of Lakshmibai National Institute of Physical Education by using consecutive sampling. The age of the subjects was ranged from 18 to 28 years (mean age = 20.71) and all were regular players with good level of skill. Videography method was used to biomechanically analysis the selected moments (i.e. 1.backlift, 2.footwork, 3.execution (contact) and 4.follow through) in front foot on drive. A total of eleven independent variables were selected. The anthropometric variables which were used in this study were standing height, arm length and leg length. The selected linear kinematic variables were Height of centre of gravity at Back-lift, Placement of the foot, Execution (contact) and Follow-Through. In Angular kinematic, variables such as angles at Knee joint, Hip joint, Shoulder joint and Elbow joint were selected for the present study. For the purpose of this study Pearson product moment correlation was used. The level of significance was set at 0.05. Result of this study reveal that accept angle at right elbow joint and C.G. at execution (contact) none of the variables were shown significant relationship with the technique of front foot on-drive.***

Keywords: Angles, Centre of Gravity, Anthropometry, Cricket, On – Drive

1. Introduction

Cricket is a major world sport in terms of participants, spectators and media. It is a bat and ball game, which includes a variety of skills. Of all cricket's skills, batting is the most glamorous. At the highest level of the game, scoring runs and not being dismissed will bring fame and glory of a kind that is possibly unique in the world of sports (Woolmer B., 2008). The drive is an elegant and graceful stroke and a delight to watch, especially if executed by proficient batsmen. The drive follows all the initial movements of a forward defensive stroke, but the difference here is that it is played in half volley or low full toss ball and the back lift becomes very high because the batsman would really like to smash the ball (Amarnath M., 1999).

The on drive is one of the more difficult front-foot strokes, played to a delivery pitched up on middle-or leg stump: many batsmen prefer not to commit to an attacking stroke with their wickets under threat, and opt for a defensive push instead. Indeed, very few international batsmen have made this their trademark shot, although Sachin Tendulkar is particular strong straight down the ground between the bowler and mid-on, an indication of his superb ability to judge length, and his perfect balance at the crease (Woolmer B., 2008).

Sports biomechanics is a quantitative based study and analysis of professional athletes and sports activities in general. It can simply be described as the physics of mechanics are applied in order to gain a greater understanding of athletic performance through mathematical modelling, computer simulation and measurement (Reddy R.V.S., 2002). Kinematic variables are involved in the description of the movement, independent of forces that cause that movement. They include linear and angular displacements, velocities, angles at different joints, center of gravity and accelerations. Taliep MS.(2007) has studied the position of the head and center of mass during the front foot off-drive in skilled and less-skilled cricket batsmen. The aim of this study was to compare selected kinematic variables of the front foot off-drive in skilled and less-skilled cricket batsmen. No significant differences were found between groups in the shoulder angle, bat angle or bat speed during the different phases of the stroke. There was a tendency for the less-skilled batsmen to have a larger hip angle at contact.

Anthropometric dimensions and morphological characteristics play an important role in determining the success of an athlete (Reco-Sanz, 1998; Wilmore &Costill, 1999; Keogh, 1999). Stretch (1987) has studied the Anthropometric profile of first-class cricketers and reported that the batsmen tended to be shorter and lighter, although possessing greater relative fat mass than the bowlers.

The purpose of the study was to analysis the relationship of selected anthropometric and biomechanical variables to the technique in Front Foot On-Drive.

2. Materials and Methods

2.1 Selection of the subjects

A total of six male intervarsity cricket players of 18 to 24 years were selected from cricket match practice of Lakshmibai National Institute of Physical Education by using consecutive sampling. As the subjects had been undergoing training for a considerable period, therefore, it is assumed that they possess a good level of technique of batting. The purpose of the research was explained to all the subjects and subjects were motivated to put their best during each trial.

2.2 Selection of variables

Eleven independent variables were selected for the purpose of this study. In Linear kinematic, variables such as Height of centre of gravity at Back-lift, Placement of the foot, Execution (contact) and Follow-Through were selected. In Angular kinematic, variables such as angles at Knee joint, Hip joint, Shoulder joint and Elbow joint were selected and in case of Anthropometric measurements variables such as Stature, Leg length and Arm length were selected for the present study.

2.3 Criterion Measures

For the purpose of present study, the technique of front foot on drive batting performance of each selected subjects was recorded on the basis of certain criteria (point system). Subjective judgment was used with the help of three judges. Marks were divided into 4 components {1.backlift, 2.footwork, 3.execution (contact) and 4.follow through}, each consist of maximum 5 points. The average score of the three judges on each moment were considered as the final points obtained by each batsmen in that particular stroke. The angles at selected joints were recorded to the nearest degree. The C.G. and Anthropometric measurement was measured nearest to the 1/10th of the centimeter.

2.4 Tools

Videography method was used to biomechanically analysis the selected moments (i.e. 1.backlift, 2.footwork, 3.execution (contact) and 4.follow through) in front foot on drive. Nikon D- 3100 with the frequency of 30 frames per second was placed on the sagittal plane. The distance of the camera from the subject was 5.50 meters away and the height of the lens was 1.29 meters from the ground. Dartfish software was used to measure the angles at different joints. Anthropometric measurement was taken with the help of stadiometer and measuring tape. Segmentation method was used to measure the center of gravity at different moments. Pearson's product moment correlation was used as a statistical technique for the present study and it is calculated with the help of Statistical Package for Social Science (SPSS) version 20.0.

3. Results

The statistical analysis of the data, collected on six male cricket players and the results of the study were presented in this section. Pearson's product moment correlation was used to find out the relationship of selected biomechanical and anthropometric variables with the technique of the subjects in front foot on-drive. The level of significance to check the relationship obtained by pearson's product moment correlation was set at 00.5. The score of each of the independent variables of angular and linear kinematic were correlated with the techniques of subjects in front foot on-drive. The relationship of selected biomechanical and anthropometric variables at selected moments with the technique of subject in front foot on-drive is presented in table 1.

Table 1: Relationship of Selected Angular Kinematics Variables at Selected Moments with the Performance in Front Foot On-Drive (N=6)

S. No	*Variables(angles)*	*Back-lift*	*Placement of the foot*	*Contact*	*Follow-through*
1	Shoulder joint (right)	-.698	.308	.342	.532
2	Shoulder joint (left)	-.114	-.278	-.371	-.031
3	Elbow joint (right)	.227	.158	.353	.843
4	Elbow joint (left)	.404	.298	.290	-.356
5	Hip joint (right)	-.101	-.157	-.104	.203
6	Hip joint (left)	.430	-.477	-.000	-.001
7	Knee joint (right)	.247	.089	-.583	-.529
8	Knee joint (left)	.386	.031	-.494	-.483

Significant, $r_{.05}$ (4) = 0.811
degree of freedom = 4

The results of above table clearly shows that accept the angle at right elbow joint (r=.843) none of the angular kinematic variable has shown any significant relationship (r=.811) with the technique in front foot on-drive at 0.05 level of significance.

Table 2: Relationship of Linear Kinematic Variables with the Performance of the Subject in Front Foot On-Drive (N=6)

S. No.	*Variables*	*Coefficient of correlation (r)*
1	Height of C.G. at the moment back-lift	.137
2	Height of C.G. at the moment placement of the foot	-.000
3	Height of C.G. at the moment contact	-.964*
4	Height of C.G. at the moment follow-through	-.480

Significant, r.05 (4) = .811
degree of freedom = 4

The above results in the table indicate that the linear kinematic variable of height of C.G. at moment contact with performance of subjects in Front Foot On-Drive has highly significant relationship while with other moments the relationship is insignificant.

Table 3: Relationship of Selected Anthropometric Variables with the Performance of the Subject in Front Foot On-Drive (N=6)

S.No.	*Variables*	*Coefficient of Correlation (r)*
1	Stature	-.116
2	Leg Length	-.049
3	Arm Length	-.092

Significant, $r_{.05}$ (4) = .811
degree of freedom = 4

Table indicates that the stature, leg length and arm length have insignificant relationship with the technique of subjects in Front Foot On-Drive.

4. Discussion

In case of selected biomechanical variables, none of the angular biomechanical variables has exhibited significant relationship with the technique of subjects in Front Foot On-Drive. However at the moment follow-through right elbow joint showed a high and significant relationship with the technique of subjects in Front Foot On-Drive.

In angular kinematic variables only one value of coefficient of correlation at selected moment was found significant but this trend does not mean that the angles at different joints at selected moments do not play any important role while executing Front Foot On-Drive. As in this study research scholar have ascertained the relationship, individually at selected joints of left and right side, there might be a significant relationship when we study their cumulative or the relationship between upper body joints and lower body joints with the technique of the subjects in the Front Foot On-Drive.

The relationship of selected linear kinematic variable (height of centre of gravity at selected moments) with the technique of the subjects at moment contact was found highly significant. However the centre of gravity at other selected moments showed insignificant relationship. As in the study the research scholar was only confined to the relationship of height of centre of gravity at selected moments with the Technique of the subjects in Front Foot On – Drive but some new results may be obtained by studying the path or displacement of centre of gravity at selected moments. The result may also differ by increasing the sample size. In case of selected anthropometric variables stature, leg length and arm length, showed insignificant relationship with the technique of subjects in Front Foot On-Drive.

5. Conclusion

On the whole, the low value of coefficient of correlation shown by the variables does not mean that these variables are not contributing or are not related to the technique of subjects in Front Foot On-Drive. It may be possible that the players have adopted their own style of playing or they do contribute but the insignificant value of coefficient of correlation of these variables with the technique may be due to small sample size or it may be due to the level of players. More research should be carried out in relation to biomechanical analysis of different batting techniques in elite level. Since, the results have shown only few significant relationships with selected biomechanical variables to the technique of subjects in Front Foot On-Drive and maximum of biomechanical and anthropometric variables showed insignificant relationship, so the hypothesis as stated earlier is rejected in those variables, while other variables (such as centre of gravity at moment contact and angle at right elbow joint at moment follow through) it is accepted.

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