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Relationship of Selected Kinematic Variables With the Performance of Backfoot off-Drive in Cricket

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ABSTRACT

Aim: The study was concluded in order to determine the relationship between selected biomechanical variables with the performance of Backfoot off-drive in cricket. Material and Methods: Twenty male cricket players who had participated in the Inter-University Cricket tournament or any National level tournament were selected as subjects for this study were selected as subjected for the study. The help of digital photography was used to film the subjects is sagital & frontal plane of Backfoot off-drive. Joint point method was used in order to obtain the values of selected angular kinematics variables from develop stick figures. The performance in Backfoot off-drive was recorded on the basis of the three judge's evaluation the technique of the subjects on selected batting skills were collected. Ten points scale was used. For each batsman's the average of three judges was considered as the final score. It is hypothesized that there would be no significant relationship between linear & angular kinematic variables and the performance in Batting skills. Analysis of data: To determine the degree of relationship between selected biomechanical variables with the performance in Backfoot off-drive, Pearson's product Moment Correlation Method, Multiple correlation & regression equation was used. Results: The results have shown the significant values of coefficient of correlation in case of Ankle joint (Left) and Shoulder Joint (Left) selected biomechanical (kinematics) variables at moment stance. In case of shoulder joint (Right & Left) showed significant relationship with the performance of subjects in backfoot on-drive at moment execution. Since the researcher has calculated the relationship individually. This may be attributed to the fact that the angles at different joints mentioned in this study such as Knee joint, Ankle joint, Hip joint, Shoulder joint, Elbow joint, Wrist joint. Change from one individual to another according to his Anthropometric measurement. i.e. his height, leg length, arm length.

KEYWORDS : Biomechanics, Siliconcoach motion analysis, Forward defence

Introduction

In the controversy concerning the subject of biomechanics and in methodological questions. We are often warned of the danger of succumbing to mechanical determinism. There is indeed a great danger of proceeding in an undialectical manner in biomechanics, particularly in the field of track and field events. This occurs when from the aspects of mechanics, biomechanics have revealed the lowest and simplest dependencies in a problem of athletic movement and thus produced the prerequisites for understanding the higher and more complicated forms of movement before and further knowledge actually exists[1].

The role that sports biomechanics widely understood in the sports community and the demand of service increasing, researchers in sports biomechanics will have to consider carefully how much time they can devote to the provision of scientific services without impairing their performance as scholar researchers. To avoid the problems inherent in this situation, it may be necessary to develop programmes of study for the technicians in sports biomechanics, technicians who can provide the kind of services sought of sporting bodies[2].

The role of biomechanics in attaining high performance cannot be overlooked. Since it is the only scientific field which helps to identify the faults in performing technique very precisely. There are basically two methods by which motor skills can be analysed. They are the qualitative and quantitative methods, high speed movie film, for exactness has been used intensively to examine in great details of the movements of the body which occurs too fast for the human eye to detect. In many of the elite sport training and research institute around the world, force applied during high caliber sporting events, while the analysis tests have done much to improve our understanding of movement and the performance of elite athletes, the analysis tasks faced by the coach are predominantly qualitative in nature.

To identify a movement as an economic one, it is very essential to analyse the movement first, sometimes it is very difficult for a human eye to analyze all the movement of various body segments and joints at the same time, so, various instrument like Camera, Video Camera etc are used to analyze various movements.

The best methods to analyze or evaluate is called cinematography. This is a quantitative method which is very accurate but at the same time costly and time consuming. The role of cinematography in biomechanical research involved from a simple form of recording motion of motor efficiency. Over the years, new techniques in filming and timing have been perfected to aid the research in achieving accurate time measurement of both simple and complex locomotion patterns[3].

As we know that for improvement in techniques in any game and sport in techniques should be first mastered. For analysing the technique, it is very important techniques, which must be given due attention for its improvement. This study was undertaken to analyze the technique of Batting, so that these variables which might have contributed to the effectiveness of the technique could be identified.

Objectives

The purpose of this study was find out the relationship between selected biomechanical variables with the performance of *Backfoot off-drive* in cricket**.**

Methods

Twenty male cricket players who had participated in the Inter-University Cricket tournament or any National level tournament were selected as subjects for this study. Since the players had been trained for a considerable period of time, they were considered skilled and their technique was treated as stabilized. All the subjects were explained the purpose of the study and were requested to put in their best during each attempt.

The performance of *Backfoot off-drive* of each selected subject was taken as the criterion measure for the purpose of the present study. The skills performance of subjects was evaluated by subjective judgment by a panel of three judges. On the basis of the three judge's evaluation the technique of the subjects on selected batting skills were collected. Ten points scale was used. For each batsman's the average of three judges was considered as the final score. Judges are B.C.C.I. certified level "1" coach and giving their services to U.P.C.A. The performance of the subjects on selected batting skills were evaluated separately

For the biomechanical analysis of selected batting skills in cricket High speed videography technique was employed. The two Casio Exilim EX-F1 high speed camera used for this purpose. Performance of subjects was recorded in control and favourable conditions. The data were recorded from both planes i.e. Sagittal plane and frontal plane. Camera-1was placed perpendicular from the subject at a distance of 8.00 meters and was mount at 1.30 meters height. Camera -2 was placed perpendicular to camera-1 and in front of subject performing the skill at the distance or 24.00meters and mount at 2.00 meters. The frequency of camera was set 300 frames/second.

The subjects had given three trials for each selected variables of bat-

ting to perform the skill and the best trial was used for analysis.

On the basis of the video recording, the scholar mark various angular measurements, and distance measurements with the help of siliconcoach pro-7 motion analysis software. All the marking done over selected frame and stick figures were developed. Selected angular kinematic variables were; angle at ankle joints (Left and Right), Knee joints (Left and Right), Hip joints (Left and Right), shoulder joints(Left and Right), elbow joints (Left and Right) and wrist joints (Left and Right).

Angles drawn at moment stance and execution with the help of measuring tool of siliconcoach pro 7 motion analysis software. Joint the all marked points and the angle at selected joint was recorded in nearest degree. Calculating the height of C.G. by segmentation method.

Analysis of data

To find out the relationships of linear and angular kinematics variables and performance in selected batting skill were employed Pearson's .Product moment correlation, Multiple correlation and regression equation for testing the hypothesis the level of significance was set at 0.05 level of significance.

Findings

Table- 1

Correlation between Dependent Variable (*Backfoot off-drive performance*) and Independent Variables (selected kinematic variables at moment stance)

Independent Variables	Correlation coefficient
Ankle Joint (right)	-.114
Knee joint (right)	.020
Hip joint (right)	-.316
Shoulder joint (right)	.137
Elbow joint (right)	.360
Wrist joint (right)	.221
Ankle joint (left)	.259
Knee joint (left)	.236
Hip joint (left)	.157
Shoulder joint (left)	-.008
Elbow joint (left)	-.459(*)
Wrist joint (left)	.468(*)

* Significant at .05 level
r.05 (18) = .444

Table - 1 clearly indicates that there exists a significant relationship between **(Backfoot off-drive performance at moment stance)** *and elbow joint(left) & wrist joint(left)* as the correlation coefficient values were found higher than the tabulated value. at .05 level of significance.

On the other hand, there exists an insignificant relationship between **Backfoot off-drive performance** *and ankle joint(right), knee (right), Hip joint(right),shoulder joint(right),elbow joint(right),wrist joint(right), ankle (left), knee joint(left) & shoulder joint(left)* as the correlation coefficient values were found lower than the tabulated value. at .05 level of significance.

Table – 1(A)

Joint contribution Independent Variables (selected angular kinematic variables) in predicting Dependent Variable (Backfoot off-drive performance)

Criterion Variable	Independent Variables	Coefficient of Multiple Correlation
Backfoot off-drive performance	Elbow joint (left)	.485*
	Wrist joint (left)	

*** Significant at .05 level.**
r.05 (17) = .456

Table- 1(A) indicates that significant relationship was found between criterion variable (**Backfoot off-drive performance**) and independent variables elbow joint(left) & shoulder joint(left) as coefficient of multiple correlations was found significant which is higher than the tabulated value.

Multiple Regression Analysis

$Y = 71.224 + .206X_1 - .360X2$

Where,

Y = Estimation of *Backfoot off-drive performance* at moment stance
X_1 = Elbow joint (left)
X2= Wrist joint (left)

Table 2

Correlation between Dependent Variable (Backfoot off-drive performance) and Independent Variable (selected linear kinematic variable) at moment Stance

Independent Variable	Correlation coefficient
Height of Centre of Gravity	.110

*** Significant at .05 level**
r.05 (18) = .444

Table - 18 clearly indicates that there exists an insignificant relationship between Backfoot off-drive performance and height of centre of gravity as the correlation coefficient values were found lower than the tabulated value. at .05 level of significance.

Since no significance relationship was found between Forward defence performance and linear kinematic variables at moment stance and there multiple correlation and regression aggression were not formulated.

Table- 3

Correlation between Dependent Variable (*Backfoot off-drive performance***) and Independent Variables (selected kinematic variables at moment execution)**

Independent Variables	Correlation coefficient
Ankle Joint (right)	-.126
Knee joint (right)	-.415
Hip joint (right)	-.087
Shoulder joint (right)	-.508(*)
Elbow joint (right)	.402
Wrist joint (right)	.234
Ankle joint (left)	-.293
Knee joint (left)	-.164
Hip joint (left)	.315
Shoulder joint (left)	-.480(*)
Elbow joint (left)	.001
Wrist joint (left)	.018

*** Significant at .05 level**
r.05 (18) = .444

Table - 3 clearly indicates that there exists a significant relationship between **(Backfoot off-drive performance at moment stance)** *and shoulder joint(right) & shoulder joint(left)* as the correlation coefficient values were found higher than the tabulated value. at .05 level of significance.

On the other hand, there exists an insignificant relationship between **Backfoot off-drive performance** *and ankle joint(right), knee (right), Hip joint(right),elbow joint(right),wrist joint(right), ankle (left), knee joint(left),hip joint(left),elbow joint(left) & wrist joint(left)* as the correlation coefficient values were found lower than the tabulated value. at .05 level of significance.

Table – 3(A)
Joint contribution Independent Variables (selected angular kinematic variables) in predicting Dependent Variable (Backfoot off-drive performance)

Criterion Variable	Independent Variables	Coefficient of Multiple Correlation
Backfoot off-drive performance	Shoulder joint (right)	.600*
	Shoulder joint (left)	

*** Significant at .05 level.**
r.05 (17) = .456

Table- 3(A) indicates that significant relationship was found between criterion variable (**Backfoot off-drive performance**) and independent variables shoulder joint (right) & shoulder joint(left) as coefficient of multiple correlations was found significant which is higher than the tabulated value.

Multiple Regression Analysis
$Y = 39.380 - .324X_1 - .075X2$

Where,

Y = Estimation of *Backfoot off-drive performance* at moment execution

X_1 = Shoulder joint (right)
X2= Shoulder joint (left)

Table- 4
Correlation between Dependent Variable (Backfoot off-drive performance) and Independent Variable (selected linear kinematic variable) at moment Execution

Independent Variable	Correlation coefficient
Height of Centre of Gravity	.214

*** Significant at .05 level**
r.05 (18) = .444

Table - 4 clearly indicates that there exists an insignificant relationship between Backfoot off-drive performance and height of centre of gravity as the correlation coefficient values were found lower than the tabulated value. at .05 level of significance.

Since no significance relationship was found between *Backfoot off-drive* performance and linear kinematic variables at moment execution and there multiple correlation and regression aggression were not formulated.

Discussion of Findings
STANCE
The data reveals that there are two angular variables that have significant relationship were, angle of left elbow joint, and angle of left wrist joint at the moment stance in back foot off-drive performance. And other linear and angular variable such as, height of centre of gravity, angle of right ankle joint, right knee joint, right elbow joint, right hip joint, right wrist joint, right shoulder joint, and angle of left knee joint, left hip joint, left ankle joint, left shoulder joint shows insignificant at 0.05 level of significance. The value of multiple correlation and regression of the angle of left shoulder joint, and angle of left ankle joint at the moment stance found higher than the tabulated value. The other variables have shown insignificant so their multiple correlation and regression was not formulated. But this trend does not mean that angle of different joint at moment stance do not play any important role while executing of performing back foot off- drive.

EXECUTION
On the basis of the data the researcher comes to the conclusion that there were two angular variable, angle of shoulder joint right and angle of shoulder joint left shows significant relationship with the performance of back foot off-drive at moment execution the value of these two variable was higher than the tabulated value and even their multiple correlation also shows an significant relationship at 0.05 level of significance and other linear and angular variable such as angle of right ankle joint, right knee joint, right hip joint, right elbow joint, right wrist joint, left ankle joint, left knee joint, left hip joint, left elbow joint, left wrist joint and linear variable height of centre of gravity shows insignificant relationship their multiple correlation and regression clearly indicates an insignificant relationship with the performance of back foot off-drive at moment execution. The value signifies the contribution of both joints for the best execution of the skill

On the findings of the stance and execution phase the researcher tends to formulate the conclusion that at the execution phase the angle of right shoulder joint and left shoulder joint more directed towards the direction rather than the other joint and might be because of that the shoulder joint acted as a fulcrum (axis). But it does not mean that angle of different joint at moment execution do not play any important role while executing of performing the skill. Angle of left elbow joint and left wrist joint comes significant at the moment stance because the players use to stance to execute the skill from a certain gap in both legs, full length delivery of the ball and height according to the ratio of their height.

This might be attributed to the fact that the angle of different joint mentioned in this study such as right ankle joint, left ankle joint, right knee joint, left knee joint, right hip joint, left hip joint, right elbow joint, right wrist joint, and height of centre of gravity changes from one individual to another according to their anthropometric measurement, i.e. his/her height , his/her arm length, his/her leg length etc. It is also found that the other factors can also influence the performance in back foot Off- drive as like, motivation level, their previously learned skill, their used technique, the environmental condition, physiological and psychological condition these factors might be responsible for the insignificant relationship of the variable.

Conclusion
Elbow joint (Left), Wrist joint (Left), have positive contribution on the performance of backfoot off-drive at moment stance.

The other selected kinematic variables such as Ankle joint (Right & Left), Knee joint (Left & Right), Hip Joint (Left & Right) & Elbow Joint (Right), Wrist joint (Right), Shoulder joint (Left & Right), Wrist joint (Left) & Body Inclination and height of C.G. do not have significant relationship with the performance of backfoot off-drive performance at moment stance.

Shoulder joint (Right & left) has positive effect on the performance of backfoot off-drive performance at moment execution.

The other selected kinematic variables such as Ankle joint (Right), The *Knee joint (Right), Hip Joint (Right),* Elbow joint (Right) ,Wrist joint (Right), Ankle Joint (Left), Knee joint (Left), Hip joint (Left), Elbow joint (Left) &Wrist joint (Left), Body Inclination and height of C.G. do not have significant relationship with the performance of backfoot off-drive performance at moment execution.

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