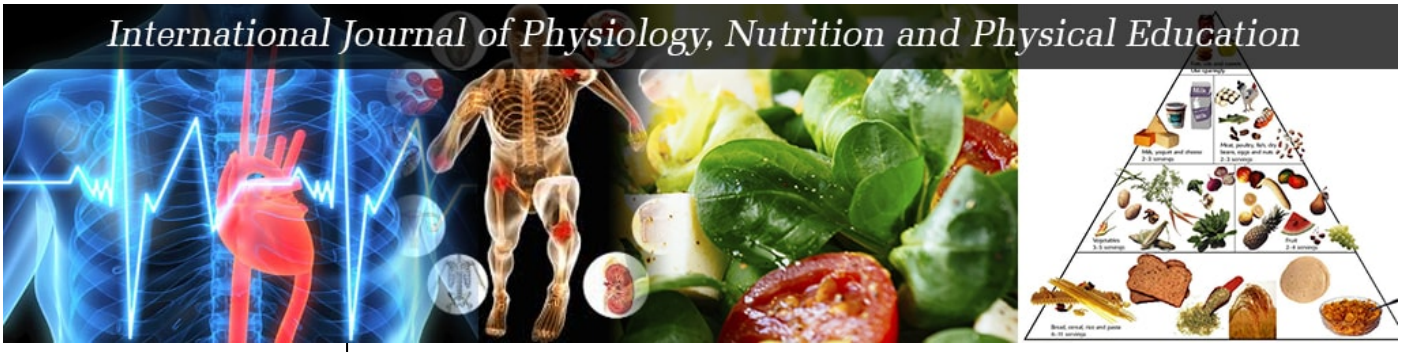

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Dr. Avijeet Mondal
Assistant Professor, Saltora Netaji Centenary College, Saltora, Bankura, West Bengal, India

Dr. Jyostnasis Ghosh
Assistant Professor, Barrackpore Rastraguru Surendranath College, Barrackpore, Kolkata, West Bengal, India

Corresponding Author:
Dr. Avijeet Mondal
Assistant Professor, Saltora Netaji Centenary College, Saltora, Bankura, West Bengal, India

Relationship of specific kinematic variables with the performance of front foot on-drive in cricket

Dr. Avijeet Mondal and Dr. Jyostnasis Ghosh

Abstract
The study was concluded in order to determine the relationship between selected biomechanical variables with the performance of forward on-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 were selected as subjected for the study. The help of digital photography was used to film the subjects is sagital & frontal plane of Square cut. Joint point method was used in order to obtain the values of selected angular kinematics variables from develop stick figures. The performance in forward on-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. To determine the degree of relationship between selected biomechanical variables with the performance in forward on-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 (Right), Knee joint (right), elbow joint (right), knee joint (left), Elbow joint (right) & shoulder joint (left) variables. In case of shoulder joint(right),elbow joint(right),wrist joint(right), ankle (left), knee joint (left),hip joint (left),shoulder joint (left),elbow joint (left) & wrist joint (left) and height of C.G. showed insignificant relationship with the performance of subjects in forward on-drive. 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 hip joint (right), shoulder joint (right), wrist joint (right), ankle (left), hip joint (left), shoulder joint (left), elbow joint (left) & wrist joint (left). Change from one individual to another according to his Anthropometric measurement. I.e. his height, leg length, arm length.

Keywords: Biomechanics, forward on-drive, siliconcoach motion analysis

Introduction
Science and technology also plays an important role in the field of education where most of the research studies are possible only with the help of sophisticated equipments. Nowadays we cannot think of education without science and technology. Technology has given us all the opening in the field of education. For developing new trends and theories science plays an important role.
In a nutshell we can say that education without science and technology in the 21st century is unthinkable and will not be able to make a true impact on man's life.
Physical education and sports, being an integral part of education, have also experienced the impact of scientific advancements. Sportsmen today are able to give outstanding performances because of involvement of new scientifically substantiated training methods and means of execution of sports gear and equipments, as well as other components and conditions of the system of sports training.
Improved performance is the result of meticulous application of sports sciences. The sports sciences in turn have taken their substance and methodology from various basic sciences. For many years, research in sports was being undertaken within these basic sciences. But with the advancement of knowledge today, the new specialization and micro specilisations have taken a respectable position.

As a matter of fact, research in this field now-a-days embraces knowledge from various disciplines of human sciences. The human biologist is interested in studying morphology and motor learning in sports: the physiologist, the functioning of various parts of human body.

The name Cricket, for instance, seems likely to have derived from the anglo saxon term for a staff, "cricee", and the game itself probably had its pre runners in two more primitive sports involving bowling and hitting the ball, or object. In Scotland, at the end of the 17th century, they played "cat and dog" which was apparently all about one person throwing a block of wood towards a hole in the ground and another – armed with a club - doing his best to keep it out. Slightly earlier, and in the north of England, a game called "stoolball" was popular, involving a bowler, a stool for a wicket and a "batsman" using his hand. Organized cricket grew more common in the early eighteenth century, by which time two stumps were used instead of the original idea of just one.

In thirteenth century pass-time cricket were called "hand-in and hand-out". The game as is understood and played today has its origin in the south-eastern part of England. Various claims have been made regarding the first mention of Cricket and its earliest pictorial illustration. According to an expert of sports from Oxford, the game was played in Kent as early as 1300. The first preserved cricket score and earliest code of laws date back to 1744. Nevertheless, it was not until the second half of the seventeenth century that Cricket became a generally adopted sport. It gained popularity among the higher classes, the noble and wealthy, in the following century.

Objectives: The purpose of this study was find out the relationship between selected biomechanical variables with the performance of forward on-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 forward on-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. 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 batting to perform the skill and the best trial was used for analysis. On the basis of the video recording, the scholar marks 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 & 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.

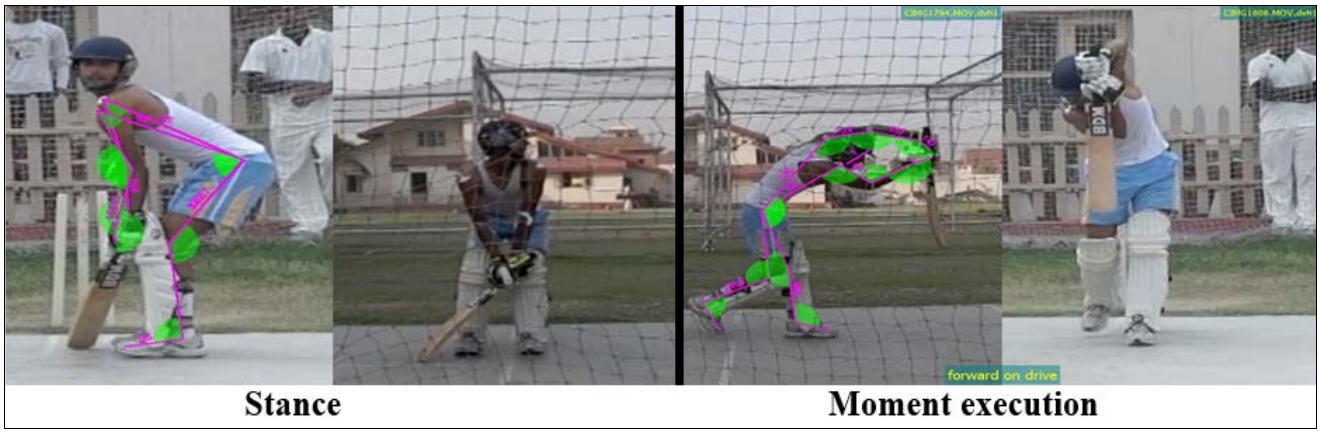

Fig 1: Forward On-Drive

Statistical Procedure:

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 correlations and regression equation for testing the hypothesis the level of significance was set at 0.05 level of significance.

Result and Discussion

Table 1: Correlation between Dependent Variable (Forward on-drive performance) and Independent Variables (selected kinematic variables at moment stance)

Independent Variables	Correlation coefficient
Ankle Joint (right)	.586(*)
Knee joint (right)	.512(*)
Hip joint (right)	-.095
Shoulder joint (right)	.051
Elbow joint (right)	.497(*)
Wrist joint (right)	.431
Ankle joint (left)	.294
Knee joint (left)	.517(*)
Hip joint (left)	.411
Shoulder joint (left)	.060
Elbow joint (left)	.122
Wrist joint (left)	.139

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

Table - 1 clearly indicates that there exists a significant relationship between (Forward on-drive performance at moment stance) and ankle joint (right), Knee joint (right), elbow joint (right) & knee 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 Forward on-drive performance and hip joint (right), shoulder joint (right), wrist joint (right), ankle (left), hip joint (left), shoulder 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 1(A): Joint contribution Independent Variables (selected angular kinematic variables at (moment stance) in predicting Dependent Variable (Forward on-drive performance)

Criterion Variable	Independent Variables	Coefficient of Multiple Correlation
Forward defence performance	Ankle Joint (right)	.745
	Knee joint (right)	
	Elbow joint (right)	
	Knee joint (left)	

* Significant at.05 level.
r.05 (15) =

Table- 1(A) indicates that significant relationship was found between criterion variable (Forward on-drive performance) and independent variables and ankle joint(right), Knee joint(right),elbow joint(right) & knee joint(left) as coefficient of multiple correlations was found significant which is higher than the tabulated value.

Multiple regression analysis

Y =-42.110+.165X1+.049X2-.117X3+.118X4

Where,

Y = Estimation of Forward on-drive at moment satance
X_1 = Ankle Joint (right)
X2= Knee joint (right)
X3= Elbow joint (right)
X4= Knee joint (left)

Table 2: Correlation between Dependent Variable (Forward on-drive performance) and Independent Variable (selected linear kinematic variable) at moment Stance

Independent Variable	Correlation coefficient
Height of Centre of Gravity	-.133

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

Table - 2 clearly indicates that there exists an insignificant relationship between Forward on-drive performance and height of center 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 0ff-drive performance and linear kinematic variables at moment stance and there multiple correlation and regression aggression were not formulated.

Table 3: Correlation between Dependent Variable (Forward on-drive performance) and Independent Variables (selected kinematic variables at moment execution)

Independent Variables	Correlation coefficient
Ankle Joint (right)	.139
Knee joint (right)	-.141
Hip joint (right)	.112
Shoulder joint (right)	.141
Elbow joint (right)	.488(*)
Wrist joint (right)	.068
Ankle joint (left)	.050
Knee joint (left)	-.169
Hip joint (left)	.082
Shoulder joint (left)	.561(*)
Elbow joint (left)	-.159
Wrist joint (left)	-.380

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

Table - 3 clearly indicates that there exists a significant relationship between Forward on-drive performance and elbow 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 Forward on-drive performance and ankle (right), knee joint (right),hip joint (right),shoulder joint (right),wrist joine (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 (Forward on-drive performance)

Criterion Variable	Independent Variables	Coefficient of Multiple Correlation
Forward on-drive performance	Elbow joint (right)	.588
	Shoulder joint (left)	

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

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

Multiple regression analysis

Y = -30.778+.195X1+.299X2

Where,
Y = Estimation of backfoot defence at moment stance
X_1 = Elbow joint (right)
X2= Shoulder joint (left)

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

Independent Variable	Correlation coefficient
Height of Centre of Gravity	-.155

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

Table - 4 clearly indicates that there exists an insignificant relationship between Forward on-drive performance and height of center 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 0n-drive performance and linear kinematic variables at moment execution and there multiple correlation and regression aggression were not formulated.

Conclusion:

1. Ankle joint (right), Knee joint (right), elbow joint (right) & knee joint (left) have positive contribution on the performance of forward on-drive at moment stance.
2. The other selected kinematic variables such as hip joint (right), shoulder joint (right),wrist joint (right), ankle (left), hip joint (left), shoulder joint (left), elbow joint (left) & wrist joint (left) and height of C.G. do not have significant relationship with the performance of forward on-drive at moment stance.
3. Elbow joint (right) & shoulder joint (left) have positive contribution on the performance of forward on-drive at moment execution.
4. The other selected kinematic variables such as ankle (right), knee joint (right), hip joint (right), shoulder joint (right), wrist joint (right), ankle (left), knee joint (left), hip joint (left), elbow joint (left) & wrist joint (left) and height of C.G. do not have significant relationship with the performance of forward on-drive at moment execution.

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