

Relationship of Selected Biomechanical Variables With The Performance of Cover Drive Shot in Cricket Players

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Abstract: This study aims to analyze the relationships between biomechanical variables selected to cover cricket shot performance. For study purposes, researchers specifically selected five female senior cricketers from M.P. aged 18 to 25 years old. The technique of covering drive shots with the hitting behavior of selected subjects was scored using specific criteria (a scoring system). It is split into two components. The 1st foot position and her 2nd execution (contact) each consist of a maximum of 10 points. The angles of the selected joints were recorded at the closest angles. Based on a series of photographs obtained from videography, scholar created stick diagrams from which selected kinematic variables were calculated. Different angles of the whole body were determined by the Kinovea software. The Pearson's product-moment correlation coefficient was used to find the relationship of selected kinematic variables to the cover drive shot technique in cricket. Foot placement during cover shots was found to be significantly correlated with running performance on cover shots at a significant level of 0.05, as well as left knee angle, right hip angle, and left elbow angle.

Keywords: Biomechanics, kinetics, cover drive shot, technique.

I. INTRODUCTION

Sports biomechanics analyzes sports movements in detail to minimize the risk of injury and improve athletic performance. Sports and exercise biomechanics include the scientific disciplines dealing with the analysis of the dynamics of human movement (J. Hall, 2019). It is concerned with the description, detailed analysis, and evaluation of human movements during sports activities (P and Khan, 2012). Mechanics is a branch of physics that is concerned with the description of motion/movement and how forces create motion/movement. Biomechanics is historically divided into the regions of kinematics and kinetics. Kinematics is a department of mechanics that offers with the geometry of item motion. Include displacements, velocities, and accelerations without thinking about the forces that create motion (J. Hall, 2019).

According to Knudson, human motion performance can be improved in a number of ways. Effective movement includes anatomical factors, neuromuscular skills, physiological skills, and psychological/cognitive skills. Biomechanics is essentially the science of movement technique and is usually most commonly used in sports where technique is the dominant factor over body structure and physiological ability (Knudson, 2007).

Cricket could be a game played between two groups of 11 players. The batting group tries to score, and the other group tries to capture and anticipate it. A run is scored by a cautious player tossing a ball over the boundary and hitting a batting player, or by two batsmen moving back and forward between their two wickets. (Cricket - Simple English Wikipedia, the free encyclopedia, 2022).

A cricket cover drive is the act of sweeping the ball through cover with well-timed wristwork and conventional forefoot movements, heading into the pitch for delivery aimed on or off the stumps. (The cover-drive kings, n.d.) A cover drive is considered one of the most graceful shots that can be played in the sport. (Hogg, n.d.).

Biomechanics is an essential part of sport today. In simple terms it enhances the technique of a player in an efficient manner. The focus of this sports biomechanics literature review on cricket is to better understand the methods applied to enhance performance, avoid injuries, and assured the game's legality.

II. Methodology

For this study, 05 Senior State level Cricket Players from M.P., ages ranging between 18 to 25 years will be selected by using a convenient purposive sampling technique. The training age of the subjects will be of minimum 6 years. Subjects will provide written, voluntary, informed consent before participation. All may be regular players with efficient skill levels. The purpose of the research was explained to all the subjects and subjects were motivated to put their best during each trial. The following variables of pull shot technique were selected for the purpose of this study: -

A. Angular kinematic variables- angles at:

1. Ankle Joint
2. Knee Joint
3. Hip Joint
4. Shoulder Joint
5. Elbow Joint
6. Wrist Joint

For the purpose of present study, the technique of cover drive shot in batting performance of each selected subjects was recorded on the basis of certain criteria (point system). It was divided into 2 components; 1. Back-lift & Placement of foot 2. Downswing & Impact (contact), each consist of maximum 10 points. The angles at selected joints were recorded to the nearest degree.

A criterion for Subjective Judgment: -

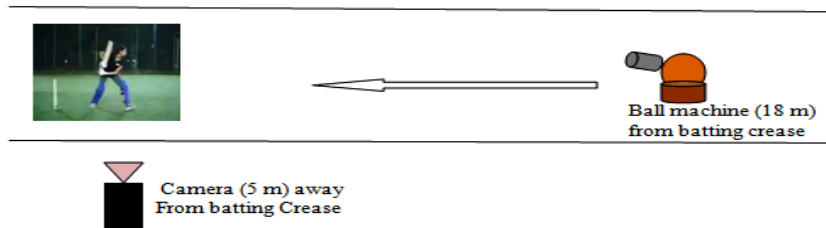
Subject Name	Back lift & Placement of the foot (phase I) (10 points)			Downswing & Impact (Contact) (phase II) (10 points)		
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
Trials						

Technique of the subjects

Technique of the subjects on cover drive shot in batting was collected on the basis of the judge evaluation. The averages of three judges on the selected trial were considered as the final points obtained by each batsman.

Filming protocol

CANON-70D with the frequency of 30 frames per second was placed on the sagittal plane. The distance of the camera from the subject was 5 meters away and the height of the lens was 1.15 meters from the ground. Only two moments was selected for the analysis i.e. placement of the foot and execution. On the basis of sequence photographs obtained from the videography, the scholar developed stick figures from which selected biomechanical variables was calculated. The stick figures will be developed by using joint point method. The subjects performed the technique three times and the best trail was used for the analysis. The center of gravity of each subject, at two moments (i) Placement of the Foot and (ii) execution will be located by using kinovea software.



Procedure for Measuring Selected Angular Kinematics:

The selected kinematic variables such as angles at the right ankle joint, right knee joint, right hip joint, right shoulder joint, right elbow joint, and angle at right wrist joint were obtained by measuring with the help of Kinovea software.



Figure 1
Angles at various joint at placement of foot



Figure 2
Angles at various joint at execution

III. STATISTICAL TECHNIQUE

The relationship of selected biomechanical variables with the technique of cricket players in cover drive shot will be calculated by using Pearson’s Product Moment Correlation. For testing the hypothesis the level of significance will be set at 0.05 levels.

Table 2: Correlation between the angular kinematic variables and performance of the cover drive shot

Angular Kinematic	Placement of the Foot		Execution (contact)	
	Mean ± Std	r	Mean ± Std	r
Right ankle angle (°)	134.80 ± 28.46	.764	127.60 ± 25.75	.584

Left ankle angle (°)	116 ± 8.51	-.561	110.20 ± 15.30	-.647
Right knee angle (°)	163.40 ± 12.42	.755	147.40 ± 12.07	-.181
Left knee angle (°)	152.60 ± 8.44	-.970**	121.40 ± 5.50	-.802
Right hip angle (°)	160.80 ± 4.66	.115	170.80 ± 6.98	.897*
Left hip angle (°)	110.80 ± 10.33	.110	107 ± 7.48	-.299
Right shoulder angle (°)	42.40 ± 17.70	.074	35 ± 18.77	-.417
Left shoulder angle (°)	34.40 ± 22.88	-.086	89 ± 13.62	-.698
Right elbow angle (°)	92.40 ± 27.55	.785	101 ± 13.27	.021
Left elbow angle (°)	111.20 ± 13.18	-.041	106 ± 28.50	.902*
Right wrist angle (°)	140.40 ± 27.76	.779	154.40 ± 18.86	-.293
Left wrist angle (°)	144.40 ± 29.36	.574	132.60 ± 25.19	.797

** Significant value of r at .01 level with 3 df (2-tailed) = 0.959

* Significant value of r at .05 level with 3 df (2-tailed) = 0.878

IV. DISCUSSION & CONCLUSION

The present study examined the relationship of selected biomechanical variables with the performance of cricket players in cover drive shots are assessed using correlation analysis and measure of the strength of a linear association between two variables. The results of this study demonstrate that several important angular kinematic variables that show association with the performance of cover drive shots of female players in cricket.

The results of this analysis demonstrate that the placement of the foot in cover drive shot performance is significantly correlated with the angle at the left knee. Thus, angle at left knee joint showed negative correlation with performance it means that if angle at left knee joint increases than the performance of cover drive shot decreases.

Angle at the right hip & angle at the left elbow is significantly correlated with the performance of execution in cover drive shot. Thus it may conclude that angle at right hip and angle at left elbow joint showed positive correlation with performance it means that if the angle at right hip and left elbow joint increases than the performance of cover dive shot also increases.

The above results are supported by different studies are (Yadav and Pal, 2018) suggested that the movement and stroke pattern were generally supportive of the coaching literature with the forward defensive stroke forming the basis of the drive, hence the angle at various joints during execution (Right knee, left knee, trunk, left elbow)- Height of back lift during execution- Distance between the feet during execution, would certainly play an effective role, in case of cover drive shot and forward defense stroke in cricket, after giving the priorities to these kinematic variables, one can achieve the highest performance with less effort. A significant result may also be obtained by increasing the sample size or by using the sophisticated equipment's. Some other causes of insignificant result of selected kinematic variables at moment of placement of feet in pull shot may be due to the different patterns adopted by the batsmen during judgment of ball in technique of pull shot. Further Arm moment is not purely in sagittal plane due to which, measured arm angle through 2D analysis might not be accurate.

Variables showed an insignificant relationship in the angular kinematics of placement of foot and execution in cover drive shot i.e. angle at right & left ankle, angle at right & left hip, angle at left shoulder, angle at right & left elbow, angle at right & left wrist and center of gravity are also contributing to performance but doesn't significant due to the low correlation, less sample size and lack of sophisticated equipment. Similar kind of study is conducted by many other researchers and found insignificant relationship, thander (2019) dhake (2017)), kumar (2017), Bagchi (2012).

On the whole, the low value of coefficient of correlation shown by the variables does not mean that these variables are not contributing to the technique of subjects in pull shot. They do contribute but the insignificant value of coefficient of correlation of these variables with the technique may be due to small sample size and non-availability of sophisticated equipment's. Since, the results of selected kinematic variables to the technique of subjects in pull shot and showed insignificant relationship.

REFERENCES

- [1] ESPNcricinfo. n.d. *The cover-drive kings*. [online] Available at: <<https://www.espnricinfo.com/story/the-cover-drive-kings-209481>> [Accessed 30 June 2022].
- [2] Hogg, N., n.d. [online] Groups.google.com. Available at: <<https://groups.google.com/g/rec.sport.cricket/c/mO4KcqrIzA4>> [Accessed 30 June 2022].
- [3] J. Hall, S., 2019. *What Is Biomechanics? / Basic Biomechanics, 8e / AccessPhysiotherapy / McGraw Hill Medical*. [online] Accessphysiotherapy.mhmedical.com. Available at: <<https://accessphysiotherapy.mhmedical.com/content.aspx?bookid=2433§ionid=191508967>> [Accessed 30 June 2022].
- [4] Knudson, D., 2007. *Fundamentals of Biomechanics*. [online] Google Books. Available at: <https://books.google.com/books/about/Fundamentals_of_Biomechanics.html?id=js2P_8lR2wC> [Accessed 30 June 2022].
- [5] Kumar, P., 2017. *Relationship of selected kinematic variables with the performance of cricket players in cover drive shot Uttarakhand under-19 team*. [online] Kheljournal.com. Available at: <<https://www.kheljournal.com/archives/2017/vol4issue4/PartD/4-4-27-977.pdf>> [Accessed 30 June 2022].
- [6] P, B. and Khan, 2012. *Clinical Sports Medicine*. [online] Scirp.org. Available at: <<https://www.scirp.org/reference/ReferencesPapers.aspx?ReferenceID=2103914>> [Accessed 30 June 2022].

- [7] Wikipedia. 2022. *Cricket - Simple English Wikipedia, the free encyclopedia*. [online] Available at: <<https://simple.wikipedia.org/w/index.php?title=Cricket&oldid=8269109>> [Accessed 30 June 2022].
- [8] Wikipedia contributors. (2022, March 8). Cover drive (cricket). In *Wikipedia, The Free Encyclopedia*. Retrieved 07:09, June 30, 2022, from [https://en.wikipedia.org/w/index.php?title=Cover_drive_\(cricket\)&oldid=1075866335](https://en.wikipedia.org/w/index.php?title=Cover_drive_(cricket)&oldid=1075866335)