



# KINEMATIC ANALYSIS OF FRONT FOOT ON-DRIVE AT EXECUTION PHASE IN CRICKET

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## ABSTRACT

**Introduction-**The study was conducted in order to the kinematical analysis of Front Foot On-Drive at execution phase in cricket .Twenty randomly selected male students aged 19 to 28 years and who have participated in the C.K.Naidu Trophy from U.P Team, Players of Combined University Camp and the players of Under 22 national Cricket Championship were selected as subjects for this study. **Method/methodology-**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. Siliconcoach Pro 7 Software was used in order to obtain the values of selected angular kinematics variables ankle, knee, elbow, hip, shoulder and wrist joint and height of centre of gravity from develop stick figures feature. The data was analyzed by use of descriptive statistics.**Results & Discussion-** The results have shown the values of descriptive statistics of selected angular kinematics variables at execution phase in Front Foot On-Drive the mean, median and mode for selected angular kinematic variables were nearly equal.

**Key Words:-Kinematical analysis, High speed videography, Siliconcoach pro 7 , Front Foot On-Drive.**

## 1. Introduction

Biomechanics is an applied form of mechanics and consequently the methods used to investigate it must be derived from those of mechanics. However, bio-mechanics have not developed in the wake of mechanics, but as a bordering science in other scientific disciplines such as anatomy, physiology and technique of sports.(Gerald Hochmuth, 1984)

Kinematics is the branch of biomechanics that is concerned with describing the motion of the bodies. It deals with such things that how far a body moves, how fast it moves and how consistently it moves.( Hay, )

The best method 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 the biomechanical research involved from a simple form of recording motion to a sophisticated means of computer analysis of motor efficiency. Over the year, new technique in filming and timing having been perfected to aid the research in achieving time measurement of both simple and complex locomotion pattern.

The Front Foot On-Drive drive stroke is played to a half-volley, pitching on or just outside the leg stump. Lead with head and front shoulder onto line of ball. Dip front shoulder while taking a shorter stride than for other drives. Head close to shoulder and top hand in control all the time.

## Objective of the Study

The objective of the study was to assess the variation in angle of selected joint of body parts and centre of gravity of Front Foot On-Drive at execution phase.

## 2. Methodology

### Subjects

Twenty male cricket players aged between 19 to 28 years were selected for the purpose of this study. These subjects participated in the C.K.Naidu Trophy from U.P Team, Players of Combine University Camp and the players of Under 22 national Cricket Championship were selected as subjects for this study.

The study includes the following selected kinematical variables for analyzing the execution phase of Front Foot On-Drive in cricket.

#### Angular Kinematics

- a) Angles of ankle
- b) Angles of knee
- c) Angles of elbow
- d) Angles of hip joint.
- e) Angles of shoulder
- f) Angles of wrist

### Filming protocol

For the kinematical 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-1 was 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.

### Statistical Technique

To analysis data, descriptive statistic was used for the Kinematic Analysis of Front Foot On-Drive at Execution Phase in Cricket.

### Result and Findings

The descriptive statistics of angular kinematics variables of Front Foot On-Drive in execution phase are presented in Table-1.



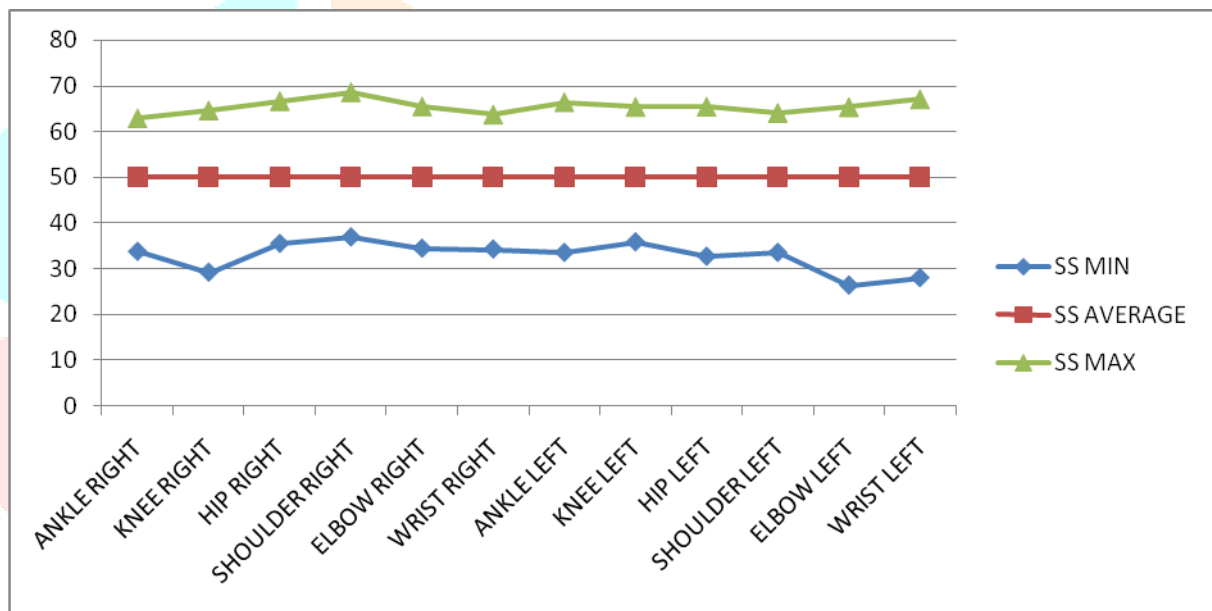
**Fig.– 1: Front Foot On-Drive in execution phase**

Angles drawn 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.

Table No: 1

## Descriptive Analysis Of front foot-On Drive At Execution Phase in Cricket

Angle	N	Range	Minimum	Maximum	Mean	Std. Deviation
Right Ankle	20	12	80	92	86.70	4.13076
Right Knee	20	13	100	113	107.65	3.67459
Right Hip	20	13	109	122	115.05	4.18613
Right Shoulder	20	12	108	120	112.95	3.80408
Right Elbow	20	33	80	113	96.55	10.66956
Right Wrist	20	13	145	158	151.95	4.43046
Left Ankle	20	40	67	107	87.05	12.19782
Left Knee	20	12	160	172	165.75	4.07657
Left Hip	20	12	140	152	146.35	3.67459
Left Shoulder	20	10	130	140	135.40	3.28313
Left Elbow	20	25	141	166	156.20	6.42036
Left Wrist	20	24	143	167	156.55	6.15138



The mean, standard deviation and range of angular kinematics variables of front foot on- drive in execution are presented in Table-1 and Figure-1.

The mean, standard deviation and range of angles for angular kinematics for different variables in degree are as follows: Right Ankle Joint ( $86.7 \pm 4.13$ ), range of angle is 12, Right Knee Joint ( $107.65 \pm 3.67$ ), range of angle is 13, Right Hip Joint ( $115.05 \pm 4.18$ ), range of angle is 13, Right Shoulder Joint ( $112.95 \pm 3.80$ ), range of angle is 12, Right Elbow Joint ( $107.6 \pm 4.72$ ), range of angle is 15, Right Wrist Joint ( $151.95 \pm 4.43$ ), range of angle is 13, Left Ankle Joint ( $97.7 \pm 3.93$ ), range of angle is 12, Left Knee Joint ( $165.75 \pm 4.07$ ), range of angle is 21, Left Hip Joint ( $146.35 \pm 3.67$ ), range of angle is 12, Left Shoulder Joint ( $135.4 \pm 3.28$ ), range of angle is 10, Left Elbow Joint ( $157.5 \pm 3.60$ ), range of angle is 15, Left Wrist Joint ( $156.55 \pm 3.56$ ), range of angle is 12.

The descriptive statistics for angular kinematic variables of execution phase in front foot on-drive which reveals that the mean, median and mode for all biomechanical variables were nearly equal. Multiple mode existed for right ankle, right knee, right hip, right shoulder, right elbow, right wrist, left ankle, left knee, left shoulder and left wrist. The value of skewness was -1.024, skewness results revealed that skewness value of all the variables were not found significant this show more data fluctuation in all these variables. The value of kurtosis was -1.984, Kurtosis results revealed that kurtosis value of all the variables were not found significant this show more data fluctuation in all these variables.

### Conclusion:

The front foot on drive is played by taking only a small step on the leg side, and opening up the right hip ( $142.45 \pm 3.57$ ). The ball is struck over the instep, and the foot must point towards the off side.

An on-drive from the line of the off stump using the orthodox technique of pointing the front foot towards mid-on, the lifting and turning of the rear foot as this is supposed to open up the hips, and there for the shoulders ( $60.95 \pm 3.44$ ) ( $81.1 \pm 3.53$ ), causing the batsman to pull the bat across the line of the ball towards the leg side. If a correct closed hip position alignment is maintained during the early stages of the lateral shift, and the weight transferred over a bent from knee ( $162.6 \pm 3.78$ ) with the foot pointing to the off side, this anatomically constrains the action of the hips is prevented. Keeping the rear foot solidly pegged to the ground throughout the entire stroke the weight cannot be optimally transferred into the stroke and it is more difficult to maintain a good head position behind the ball.

The results have shown the values of descriptive statistics of selected angular kinematics variables at downswing and impact phase in front foot on-drive the mean, median and mode for selected angular kinematic variables were nearly equal. Multiple modes existed for right ankle ( $94.3 \pm 3.04$ ), right hip ( $139.5 \pm 3.85$ ), right shoulder ( $66.9 \pm 2.84$ ), right elbow ( $114.4 \pm 4.84$ ), right wrist ( $153.05 \pm 3.33$ ), left ankle ( $107.15 \pm 5$ ), left knee ( $165 \pm 5.04$ ), left hip ( $132.1 \pm 4.58$ ), left wrist ( $159.65 \pm 4.20$ ). The result of skewness and kurtosis were not found significant in downswing and impact phase.

### Recommendations

Based on the conclusions drawn in this study the following recommendations have been made.

1. A study may be undertaken with large number of variables and subjects such as different angles as the factors contributing to performance of batting skills.
2. Similar study can also be conducted on female cricket players.
3. Similar study can also be conducted on different level cricket players.
4. A different batting skill may be taken in to consideration for such analysis.
5. Bowling skills and fielding skills can be also analyzed with such equipments.

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