MOTION ANALYSIS OFPULL SHOT, CUT SHOT AND SQUARE CUT SHOT IN CRICKET

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ABSTRACT

Each cricketer has a distinct style and technique that distinguishes his or her strokes from those of other players. The goal of this research was to look at the cut shot, square cut shot, and PULL shot in terms of kinematic characteristics. The current research was confined to angular kinematic variables (angle at elbow joint) and linear kinematic variables (centre of gravity), the height of the back lift (stance), the height of contact with the ball (execution), and the distance are all kinematic variables in between the feet. Slow motion also aids in comprehending the action of specific areas of the body as well as early or late reactions during ball anticipation. As a consequence, the findings for the cut shot, square cut shot, and PULL shot demonstrated that the movement was typically supportive of the coaching literature, resulting in the use of the term "coaching literature." At the stage of stance, the height of the centre of gravity - The height of the ball's centre of gravity at the instant of impact (Execution) - Angle at joint during execution (left elbow)- Height of back lift during execution- Path

KEYWORDS: Kinematics, center of gravity, cut shot; square cut shot, pull shot, angle at joints, evaluation of technique, ball contact, etc.

INTRODUCTION

Cricket was invented in the late 16th century in the south-east of England. In the 18th century, it became the country's national sport, and in the 19th and 20th centuries, it grew in popularity across the world. Several cricketing aficionados and professionals believe that batting talent surpasses bowling ability in 20-overs contests; nevertheless, we cannot make such a statement in 50-overs tournaments. As a result, one of the attempts has been made to study the performance of players in 20 and 50-over matches in order to determine if batting skill trumps bowling ability in both circumstances or not, where known international cricketers have gathered to assess.

The cricket squad consists of 11 players, including batters, bowlers, and all rounder. To increase the chances of success, the team should be well-balanced and diverse. In addition, the type of pitch, toss winning, and batting or bowling sequence may all affect success. Aside from it, the performance of batsmen, bowlers, and fielders is the most important aspect in determining the outcome of a match. As a result, one attempt has been made to assess the performance of players in 20 and 50 overmatches to conclude. If batting skill takes precedence over or if you have bowling talent in both scenarios where well-known international cricketers visit together to investigate. The cricket squad consists of 11 (eleven) players, including hitters, bowlers, and all rounder. To increase the likelihood of success, the team should be balanced and diverse. Furthermore, success may be determined by the type of pitch, the winning of the toss, and the sequencing of batting or bowling. Aside from it, the performance of the batsmen, bowlers, and fielders is the most important aspect in determining the outcome of a specific match.

Batsmen in cricket are expected to both score runs and protect their wickets. There are certain balls that can be attacked and others that must be protected. A batsman may have to make modifications when playing the stroke depending on the delivery and the field location. As the ball moves down and up the field, a batsman's stroke selection is dictated. Most typical cricket strokes include drives, cuts and glances as well as the more unusual pulls or sweeping actions. Switch hits, scoops and reverse sweeps are all frequent in modern cricket, as well. In cricket, simple statistical measures are used to evaluate the performance of players, whether they are bowlers or batsmen. The most commonly cited metrics are the aforementioned averages: run rate, strike rate, and runs per wicket.

Research is now underway to examine the performance of such a factor using a variety of statistical methods. Kimber and Hansford used a variety of statistical techniques to look at batsmen's batting averages. A mathematical model/method for comparing and choosing batters was provided by Barr and Kantor as an extension of this work. Again, the key to winning a certain game is to devise a strategy.' In limited-overs cricket games, Preston and Thomas propose an optimal batting approach. Bailey and Clark

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investigated the impact of numerous factors on the result of an ODI cricket match. Ledesma and Mora talked about how many factors to keep in exploratory factor analysis. Swartz et al. used a simulation approach to forecast the number of runs in certain one-day cricket matches. Van Staden presented a graphical way of comparing cricket players' batting and bowling performances. To establish the ideal batting orders for a match, Norman and Clarke used dynamic programming.

METHODOLOGY

Everywhere we look, we are surrounded with data, whether it's obtained physically or digitally. That said, in fact in a nutshell, data does not equate to knowledge. Data is a fantastic resource, however, it serves no purpose usage of it without the assistance of those qualified to do so Use the information to your advantage. Data analysis aids us in gaining access to the data and understanding issues. To conduct this study, researchers chose five Indian male trainees from a government coaching institution, D I Khan, New Rajender Nagar, New Delhi who had previously played interschool and district level cricket. Between the ages of 14 and 18 were represented. For each cut shot, PULL shot, and square-cut shot, we looked at how neatly and exactly the subject performed each shot execution. To determine the kinematic elements involved in playing these shots, only three shots were allowed for cinematographic examination of technique on video taken at 100 Hz/240 fps.

PROTOTYPE FOR EXPERIMENTAL FILMING

In order to identify the location of the recording, the D I Khan Cricket Academy in New Rajender Nagar used cemented cricket wicket. For each shot, the subject was instructed to strike the feed ball first before moving on to the next shot. The filming zone was set up with a video camera in frontal plane at a distance of 15 feet from the subject, which was positioned in the frontal plane. Following video recording, the ultimate location of each selected phase was determined on the screen using a trial and error process, and the movie was then placed on hold.

CUT SHOT (Stance)

Fig: 1

Figure 1 shows wide base of support while approaching for **CUT SHOT (Stance)**. The angle of joint is **154^0** (in this angle the player is able to hit the ball with more effectively with better result) COG of 74.24 cm is low and falling exactly within the base of support with torso bending forward and distributed on both the feet with a distance of 22.50 cm. The height of cricket bat back lift is 105.82 cm.

CUT SHOT (Execution)

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Fig: 2

Figure 2 shows wide base of support while approaching for **CUT SHOT (Execution)**. The angle of joint is **151^0** (in this angle the player is able to hit the ball with more effectively with better result) COG of 87.90 cm is low and falling exactly within the base of support and distributed on both the feet with a distance of 28.76 cm, which was found very comfortable for the player at the time of cut shot with a visual height of bat just in contact with ball 96.40 cm in the game of cricket.

SQUARE CUT (Stance)

Fig: 3

Figure 3 shows wide base of support while approaching for **SQUARE CUT (Stance)**. The angle of joint is **167^0** (in this angle the player is able to hit the ball with more effectively with better result) COG of 88.99 cm is low and falling exactly within the base of support with torso bending forward and distributed on both the feet with a distance of 20.50 cm, which was found very comfortable for the player at the time of cut shot with a height of back lift 114.66 cm.

SQUARE CUT SHOT (Execution)

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Fig: 4

Figure 4visualizes execution of shot with very low center of gravity to the base of support for **SQUARE CUT (Execution)**. The elbow is raised with relatively less angle at joint of $\mathbf{94^0}$ (in this angle the player is able to hit the ball with more effectively with better result). COG is l10.49 along with straight torso and falling exactly within the base of support and distributed on both the feet with a distance of 39.68 cm with flexed knee, which was found very comfortable for the player at the time of shot with a visual height of bat just in contact with ball 117.74 cm.

PULL SHOT (Stance)

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Fig: 5

Figure 5 shows wide base of support while approaching for **PULL SHOT(Stance)**. The angle of joint is **155^0** (in this angle the player is able to hit the ball with more effectively with better result) COG is 90.90 cm and falling exactly within the base of support with torso bending slightly forward and distributed on both the feet with a distance of 28.71 cm, which was found very comfortable for the player at the time of cut shot with a height of back lift 120.54 cm.

PULL SHOT (Execution)

Fig: 6

Figure 6visualizes execution of shot with very low center of gravity to the base of support for**PULL SHOT (Execution)**. The angle at joint of **151^0** (in this angle the player is able to hit the ball with more effectively with better result). COG is relatively high which is 99.72 cm falling near to front feet with rotation of upper body. The distance between the feet is increased to 59.83 cm (in order to increase the base of support) along with heel raise of trailing feet with flexed knee, which was found very comfortable for the player at the time of shot with a visual height of bat just in contact with ball 155.90 cm.

Table – 1: Data for Stance

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Cut Shot				Square Shot				Pull Shot			
Angle of Joint (Elbow) (Deg)	**COG (cm)**	**Ht. Back lift (cm)**	**Dt. B/w foot (cm)**	**Angle of Joint (Elbow) (Deg)**	**COG (cm)**	**Ht. Back lift (cm)**	**Dt. B/w foot (cm)**	**Angle of Joint (Elbow) (Deg)**	**COG (cm)**	**Ht. Back lift (cm)**	**Dt. B/w foot (cm)**
154	74.24	105.82	22.50	167	88.99	114.66	20.50	155	90.90	120.54	28.71
151	72.21	100.20	20.65	161	87.19	113.58	21.48	151	88.84	121	29.64
150	74.51	101.45	23.14	163	88.35	110.24	21.39	153	86.13	120.47	29.49
149	71.59	98.35	22.10	158	84.35	112.88	20.54	157	90.65	119.36	30.66
138	70.28	99.47	26.11	159	85.45	100.45	22.35	149	89.34	118.65	31.47

Graph 1

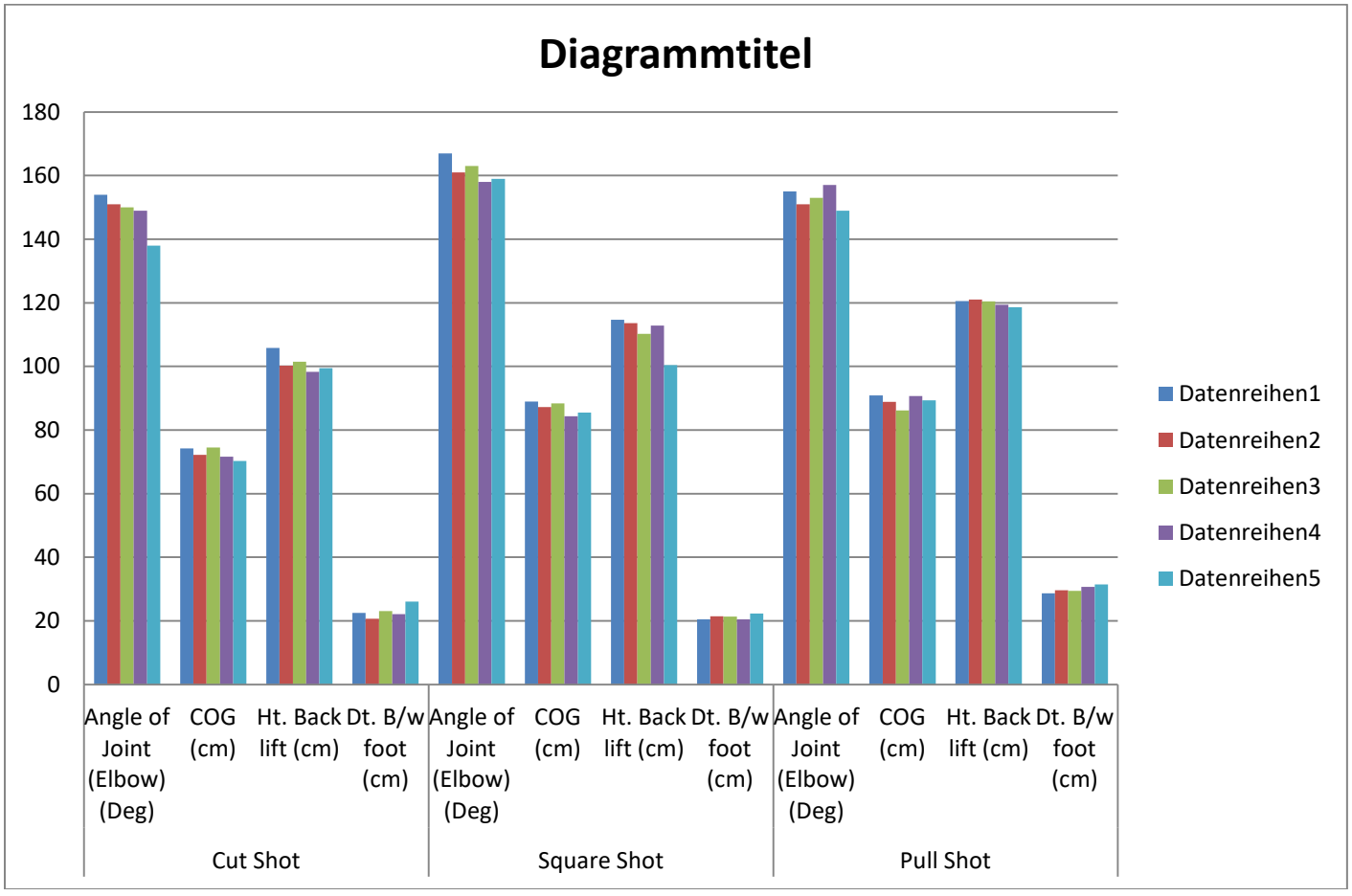

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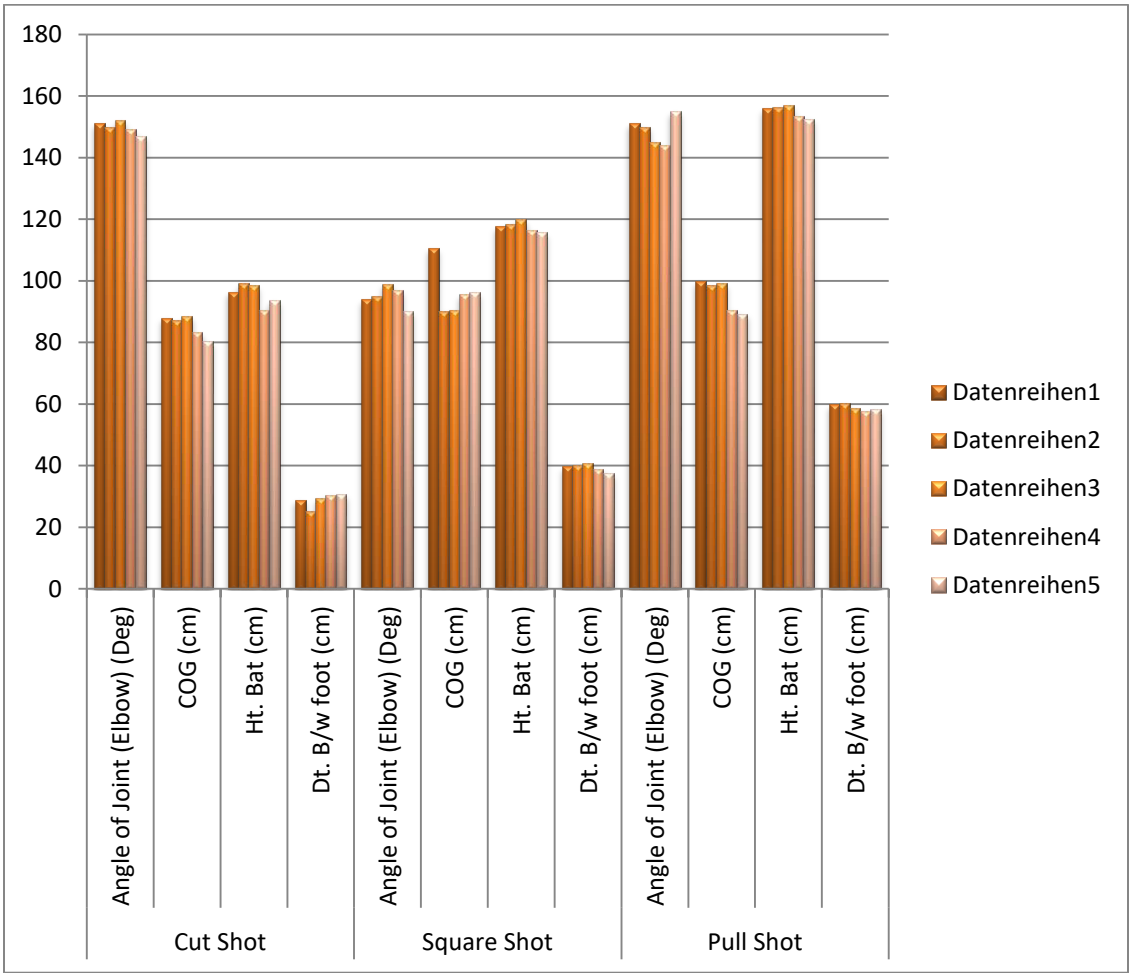
Table – 2: Data for Execution

Cut Shot				Square Shot				Pull Shot			
Angle of Joint (Elbow) (Deg)	**COG (cm)**	**Ht. Bat (cm)**	**Dt. B/w foot (cm)**	**Angle of Joint (Elbow) (Deg)**	**COG (cm)**	**Ht. Bat (cm)**	**Dt. B/w foot (cm)**	**Angle of Joint (Elbow) (Deg)**	**COG (cm)**	**Ht. Bat (cm)**	**Dt. B/w foot (cm)**
151	87.90	96.40	28.76	94	110.49	117.74	39.68	151	99.72	155.90	59.83
150	87.15	99.25	25.12	95	90.16	118.43	40.15	150	98.46	156.17	60.11
152	88.36	98.45	29.45	99	90.46	119.98	40.61	145	99.12	156.94	58.47
149	83.14	90.55	30.47	97	95.49	116.48	38.97	144	90.47	153.47	57.61
147	80.24	93.65	30.61	90	96.18	115.67	37.58	155	89.23	152.49	58.34

Graph 2



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CONCLUSION

Following conclusions were drawn based on the analysis and within the parameters of the current study.

1. The centre of gravity in Figs. 1, 2, 3, 4, and 5 was lying between the feet (inside the base of support), as a consequence, the batsman had significantly better stability, which helped him both before hitting the ball and during the execution of the movement itself. In addition, the back lift provides potential energy that is converted to kinetic energy during the execution of the lift. The angle at the elbow joint may vary depending on the height of the batsman or the amount of back lift, but it generally falls within the same range for each specific shot to be completed.
2. In Figs. 6, 7 and 8, the centre of gravity lifts somewhat as a result of the ball being raised above the waist level for the cut shot and pull shot, respectively. Though
   The centre of gravity is still located between the two, However, in a pull shot, the base of support moves. as a result of upper body rotation, towards the front feet
   as well as the pivoting of trailing feet Both of the shots are successful. The consequences of an expanded elbow (a greater angle at the elbow) The elbow joint is referred to as the ulnar joint. The point at which the ball makes contact with the ground called in addition to that, a higher.
3. By lunging forward and extending the base of support in Figures 9&10, the stride or distance between the feet is increased raising the level of equilibrium. The angle formed by the elbow joint is similar to that of stance, however there are several difference, elbow should be raised and oriented differently.
4. The distinction between the strokes lies in the location of the ball's impact or contact with the bat.
5. shot with a square cut When the ball moves away from the theoretical mid line of stumps and towards the off side, it was struck.
6. The follow through of the bat moving forward and upward was used to accomplish the square cut stroke.
7. Square cut shots are made by keeping the bat's face down while in contact with the ball, preventing it from flying off or becoming airborne.
8. Using a cut shot, the ball is struck with a slice cut or spin, but does not fly off the bat because of the bat's lateral movement and minor tilt from the edge.
9. To draw the elevated ball and lift it slightly higher with a PULL shot, the bat face can be open or straight.
10. There was considerable agreement amongst the coaching literature in terms of movement for cut shot, square cut shot, and PULL shot, which led to At the time of stance, the height of the centre of gravity height at which the ball makes contact with the player's centre of gravity (Execution) When executing a cut shot or PULL shot in cricket, kinematic factors such as the angle at which the left elbow is positioned, the height of back lift, and the distance between the feet all play an important part in achieving the best possible results.

RECOMMENDATION

The current research might help in the following ways:

1. The physical education instructor, coaches, and players will find this tool useful in evaluating hitting performance.
2. Assist coaches in identifying technical flaws when teaching freshmen cut shot, PULL shot, and square cut shot technique.
3. Based on this research, a mathematical model of these shots might be created.
4. This research might be expanded to include additional factors in other games and sports.
5. A similar study might be undertaken on other age groups, skill levels, and genders.
6. This research may be helpful in knowing the variation in style of different players with same shots.
7. A similar research might be undertaken with different shots and styles.

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