



KINEMATIC ANALYSIS OF COVER DRIVE SHOT AND FORWARD DEFENSE STROKE IN CRICKET

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ABSTRACT

Some people are born sports players and some aren't and no amount of science will turn a clumsy person into a world-class athlete. Many sporting stars understand instinctively how to be the best in their field—and that built-in understanding, gained through years of practice by trial and error, can achieve the same or better results as a theoretical, scientific approach and by totally different means by understanding few kinematics variables for better performance with utilizing less energy or effort in any field of sports so right from the existence of physical education and sports, all the individuals are always interested in enhancing their performance hence today, physical education teachers, coaches and physical trainers are concerned with helping individuals to learn how to move efficiently and effectively. Biomechanics is a sub-discipline of physical education which further has kinematic as one of its branch. The primary purpose of sports biomechanics is to evaluate a living organism's motion as well as its application of force. It applies the laws of mechanics and physics to study the bodily movements and the causes of movement both internally and externally. The purpose of this study was to investigate the cover drive shot and forward defense stroke in young cricketers with the help of selected kinematic variables. This study may be helpful to the coaches and trainees to understand the weakness or flaws in the technique by watching the cinematographic analysis of cover drive shot and forward defense stroke. The present study was delimited to angular kinematic variable (angle at knee, trunk & elbow joint), linear kinematic variable (center of gravity), and height of back lift. The slow motion effect also adds grace to the knowledge of movement of various body parts and help to understand early or late reaction during anticipation of ball or shot. The video was shot in two planes in slow motion format at 240 fps.

Keywords: Kinematics, center of gravity, cover drive, angle at joints, evaluation of technique, Balance, ball contact, etc.

INTRODUCTION

Proper understanding of biomechanics relating to sports has the greatest implication on sports performance, rehabilitation and injury prevention along with sports mastery. As per the techniques are concerned related to cover drive and forward defense shot Woolmer and his team (2008) had suggested to the budding and advance cricketers as well to understand the importance of the stroke play and drive that how timing of power plays significant role in terms of grip dynamic, during forward defense stroke in cricket is missing to very extent. Whereas the forward defense is one of the most commonly used shots in cricketing field, where the batsman's prime objective is to play a forward defense shot purposely is to block the ball than to score runs, and in case of the cover drive in cricket is the act of stroking the ball through the covers with well-timed wristwork and conventional movement of the front foot toward in the line of the pitch of a delivery expected at or outside the off stump, by controlling his CG or by shifting his line of CG towards the pitching of the ball carefully, so keeping all in this mind the kinematics of these two movement can be effectively used, the batsman must analyze for better use of the Height of CG at the stance, along with his angles as well. Proper understanding of biomechanics in relating to any of the sports has the greatest implication on better execution in performing the technique to avoid any type of injuries.



METHODOLOGY

The purpose of this study was to investigate the cover drive shot and forward defense stroke in young cricketers with the help of selected kinematic variables. This study may be helpful to the coaches and trainees to understand the weakness or flaws in the technique by watching the cinematographic analysis of cover drive shot and forward defense. The slow motion effect also adds grace to the knowledge of movement of various body parts and help to understand early or late reaction during anticipation of ball or shot. The subjects for study were 07 Indian cricket trainees. The study was delimited to the following variable:

- Height of center of gravity at the time of stance
- Height of center of gravity at the time of contact with ball (Execution)
- 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

The camera was set to register the cover drive shot and defense stroke forehand at 240fps. The subjects were photographed at the moment of stance and execution of cover drive and forward defense in frontal plane. From the photographic sequence the data for various variables was calculated at selected moments.

Seven male Indian trainees of DDA Sports Complex, Rohini were selected as the subject for the present study; these cricketers have played at inter school, district and Delhi zonal level. The age was between 14 to 18 years. The analysis of each subject for cover drive shot and forward defense stroke was on the basis of how cleanly and precisely he executes the technique. Only five shots were allowed to each subject. for cinematographic analysis of technique video was filmed at 100 Hz/240 fps establish the kinematic factors involved in playing these strokes.

The recording was determined on cemented cricket wicket at DDA Sports Complex, Rohini, Delhi). The subject was asked to hit the fed ball first for cover drive shot and then for forward defense stroke alternately. The filming zone was set up with video camera placed in frontal plane at a distance of 15 feet from the subject. After video recording final position of each selected phase was obtained on the screen by trial and error method and kept in pause.

Finding and Results

TABLE 1
 VARIABLES OF SUBJECTS (COVER DRIVE SHOT)

COG (Stance) (cm)	COG (Execution) (cm)	Angle at Joints (degree)				Height of Back Lift (cm)	Distance between feet (cm)
		Right Knee	Left Knee	Trunk	Left Elbow		
97.49	54.45	1480	1070	1510	1610	153.00	87.20
97.23	53.32	1470	1060	1480	1620	150.00	88.11
87.11	57.65	1450	1040	1550	1590	149.26	80.00
90.25	56.14	1430	1000	1540	1550	161.42	82.15
93.98	56.86	1470	1100	1470	1560	155.21	83.98
99.10	58.64	1400	1130	1440	1490	162.45	88.77
92.29	51.12	1410	980	1540	1630	154.78	83.44

The table gives the picture of, the different variables selected for the subjects in forward defense stroke, at the stance –COG in centimeters-Execution movement of COG in Centimeters, Angle of joints in degree-



i.e. Right knee, Left knee, Trunk and Left elbow, and the height of the back lift of the bat before striking the ball and the distance between the feet of the subject,

TABLE 2
VARIABLES OF SUBJECTS (FORWARD DEFENSE STROKE)

COG (Stance) (cm)	COG (Execution) (cm)	Angle at Joints (degree)				Height of Back Lift (cm)	Distance between feet (cm)
		Right knee	Left knee	Trunk	Left elbow		
97.49	70	1570	930	1620	650	133.76	110
97.23	71	1580	910	1610	610	132	109.23
87.11	65	1450	900	1520	620	123.32	100.58
90.25	69	1570	940	1600	600	120.21	104.49
93.98	70	1520	930	1590	680	135.89	106.74
99.10	72	1600	950	1580	590	131.99	112.42
92.29	68	1590	890	1550	600	121.09	105.20

The table gives the picture of, the different variables selected for the subjects in forward defense stroke, at the stance –COG in centimeters-Execution movement of COG in Centimeters, Angle of joints in degree- i.e. Right knee, Left knee, Trunk and Left elbow, and the height of the back lift of the bat before striking the ball and the distance between the feet of the subject,



Figure-1- showing- Forward Defense Stroke

Figure-2- showing- Back lift

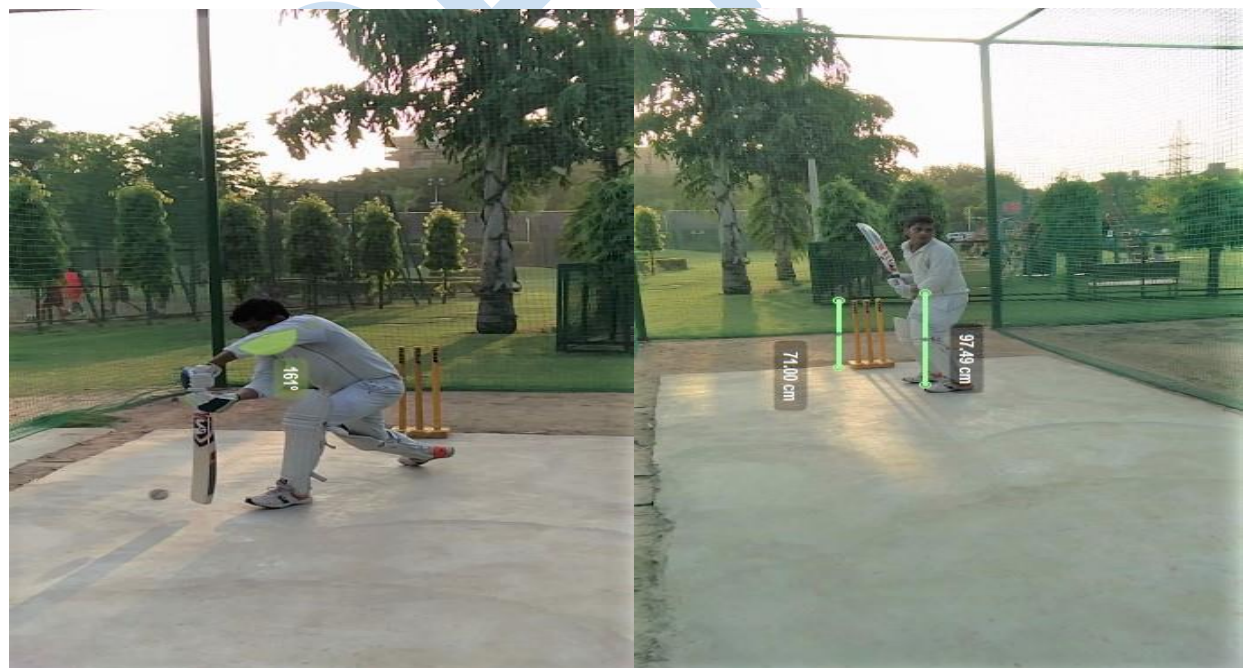


Figure-3- showing- Forward Defense Stroke

Figure-4- showing- Back lift



Figure-5- showing- Forward Defense Stroke



Figure-6- showing- Forward defense



Figure-7- showing- Forward Defense Stroke



Figure-8- showing- Forward defense



CONCLUSION

Based on the analysis and within the delimitation of present study following conclusion were drawn :-

- In both strokes (Fig. 1 & 6) the center of gravity falling between the feet (with in the base of support) as a result the bats man certainly had more stability, which helps him before hitting the ball even at the time of execution of the movement, so in case of figure-1 & 6 the subject by increasing the stability of the body by lowering its center of gravity or increasing the width of its base, finally, the center of gravity will remain in the same height just after hitting the ball in neutral equilibrium, as a result it will change the position without falling over for getting more advantage in case of tilted body.
- In both the strokes (Fig 1 & 5) the stride or distance between the feet is increased by lunging forward and increasing the base of support, thus increasing equilibrium,
- The difference between the strokes is where the ball is hit or on contact with bat.
- In Cover drive shot the ball was hit when it comes away from the virtual mid line of stumps, towards off side.
- The Cover drive shot was executed with a follow through of bat swinging forward and upward.
- The forward defense stroke was similar but difference lies in stopping the ball instead of hitting it hard.
- In Defense shot the left elbow is locked after contact with ball whereas cover drive shot is completed with a follow through.
- In both the strokes the face of bat is downward while in contact with ball otherwise ball will fly off or airborne.

Results for the cover drive shot revealed 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 Height of center of gravity at the time of stance- Height of center of gravity at the time of contact with ball (Execution)- 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 plays 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.

REFERENCES

- Savage, T. N and Portus, M. R., "A Kinematic Analysis of Fast Bowling Techniques Used by Elite Female Cricketers" Samue,l J. Callaghan, Matthew D. Jeffriess, Robert G. Lockie, "The Kinematic Variations between Batsmen znd Fast Bowlers When Completing a Quick Single In Cricket"
- Callaghan S. J, Lockie R.G, & Jeffriess M. D (2014), "The Acceleration Kinematics of Cricket-Specific Starts when Completing a Quick Single". *Sports Technology*, 7(1-2), 39-51.
- Fosang, A., & Baker, R. (2006). A Method For Comparing Manual Muscle Strength Measurements With Joint Moments During Walking. *Gait And Posture*, 24, 406-411.
- Hinrichs R. N. (1992). "Case Studies of Asymmetrical Arm Action In Running". *International Journal of Sport Biomechanics*, 8, 111-128.
- Houghton, L. A. (2010). Running Between The Wickets In Cricket: What Is The Fastest Technique? *International Journal of Sports Science And Coaching*, 5(1), 101-107o
- Hurriion P. D, Dyson R, & Hale T (2000). "Simultaneous Measurement Of Back And Front Foot Ground Reaction Forces During The Same Delivery Stride Of The Fast-Medium Bowler". *Journal Of Sports Sciences*, 18, 993-997.
- Petersen, C. A., Pyne, D. B., Portus, M. R., & Dawson, B. (2008). Analysis Of Twenty/20 Cricket Performance During The 2008 Indian Premier League. *International Journal Of Performance Analysis Of Sport*, 8(3), 63-69.
- Webster J & Roberts J (2011). "Determining the effects of cricket leg guards on running performance". *Journal of Sports Sciences*, 29, 749-760.