Vol II Issue XII Jan 2013
Impact Factor : 0.2105
ISSN No : 2230-7850

Monthly Multidisciplinary
Research Journal

Indian Streams Research Journal

IMPACT FACTOR : 0.2105

Welcome to ISRJ

RNI MAHMUL/2011/38595 **ISSN No.2230-7850**

Indian Streams Research Journal is a multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be double - blind peer reviewed referred by members of the editorial Board readers will include investigator in universities, research institutes government and industry with research interest in the general subjects.

International Advisory Board

Editorial Board

Address:-Ashok Yakkaldevi 258/34, Raviwar Peth, Solapur - 413 005 Maharashtra, India
Cell : 9595 359 435, Ph No: 02172372010 Email: ayisrj@yahoo.in Website: www.isrj.net

Indian Streams Research Journal
Volume 2, Issue.12,Jan. 2013
ISSN:-2230-7850
Available online at www.isrj.net
ORIGINAL ARTICLE

BIOMECHANICAL ANALYSIS OF SIDE-ARM AND OVER-HEAD THROWING IN CRICKET

IKRAM HUSSAIN AND MOHD. ARSHAD BARI

Department of Physical Health and Sports Education,Aligarh Muslim University, Aligarh, (U.P.), India.

Abstract:

The purpose of this study is to analyze the kinematic variables of different throwing techniques in cricket (ball velocity, accuracy, and segmental linear and angular variables). For the purpose of the study ten male intervarsity cricket players were selected as the subjects. Thrower performed side-arm and over-head throwing techniques with 1120 approach angle at 450 throwing angle of 10m distance. The mean age, height and body weight of the subjects were reported as 20.60 ± 2.91 years, 170.80 ± 4.02 cm and 60.80 ± 5.14 kg respectively. Canon Legria HF S10 Camcorder operating at 120 Hz used to record the movement. The identified clips were analyzed with the help of Silicon Coach Pro7 motion analysis software. The result of study revealed that there is significant difference existed between different throwing kinematics

KEYWORDS:

Kinematics, side-arm, over-head, and wind-up, late-cocking and acceleration.

INTRODUCTION

The game of cricket is believed to have been played in the organized form hundreds of years ago. Cricket was introduced to North America by the English colonies in the 17th century probably before it had even reached the north of England (Bowen., 1970). In the 18th century it started in other parts of the globe. It was introduced to the West Indies by colonists (Bowen., 1970), and to India by British East India Company mariners in the first half of the century (Altham.,1962). It commenced in Australia almost as soon as the colonization began in 1788. Afterwards, New Zealand and South Africa followed in the early 19th century (Altham.,1962).

Throwing is a fundamental movement skill that forms the cornerstone of many games (Elliott and Anderson., 1990 and Hussain & Bari, 2011) the development of this skill could be of paramount importance for some athletes. Not only appropriate physical movements are important in throwing, but proper breathing also plays an important role. There are different types of throws that a thrower must be able to execute accurately. There are numerous aspects of throwing, making it a complex skill to gain expertise in, such as ball velocity, ball movement, arm velocity, arm movement, distance, approach angle, target angle, etc. However these aspects have little effect if the thrower cannot aim their throws precisely. Throwing accuracy can be increased by improving the technique and practicing muscle memory (Ikram et. al., 2011) and (Simons et al., 2009). Like other sports, cricket is also mentally challenging; hence, mental and physical strengths improve the skill of the game.

The main of this study to find out best throwing techniques with 1120 approach angle at 450 throwing angle of 10m distance in respect to ball velocity and accuracy.

Title : BIOMECHANICAL ANALYSIS OF SIDE-ARM AND OVER-HEAD THROWING IN CRICKET Source:Indian Streams Research Journal [2230-7850] IKRAM HUSSAIN AND MOHD. ARSHAD BARI yr:2013 vol:2 iss:12

METHODOLOGY:

Ten participants, male cricketer of University level volunteered to participate as subject in the study. They performed side-arm and over-head throws at maximum velocity toward 450 target/ stump situated at a distance 10 meters with 1120 approach angle. The averages of physical characteristics of the subjects were: 62.38 – 7.22 kg body weight, 168.07 – 6.68 cm height, 21.82 – 7.22 years. For the acquisition of kinematical data, two digital Canon Legaria SF-10 video recording cameras, operating at 1/2000 with a frame rate of 60 frames per second, were used to capture the whole procedure. The subject's throwing motion were recorded using Canon Legaria SF-10, 8.1 Mp video camera in a field setting. The camera was set-up on a rigid tripod and secured to the floor in the location at a distance of 10 meter from the point of throw. The camera was positioned perpendicular to the sagittal plane and parallel to the mediolateral axis (camera optical axes perpendicular on the sigittal plane) as their throwing arm giving approximately a 900 between their respective optical axes. The camera was also elevated to 95 cms and tilted down in order to get the image of the subject as large as possible while that all points of interested within an one frame.

The recorded video footages were downloaded, slashed and edited by using the downloaded version of STHVCD55 software. Digitization, smoothing and analysis were conducted using the Silicon Coach Pro7 motion analysis software. The kinematic variables selected were angles displacement, time, speed, velocity and number of frames were analysed with the help of the software. The numeral data of the variables were acquired by digitizing video data with the help of software (Silicon coach pro 7). Acquired data were subjected to statistical analysis independent t-test was used for the comparison of the kinematic parameters between different throwing techniques of cricket players. All statistical procedures were conducted using the SPSS 18.0 software at 0.05 level of confidant.

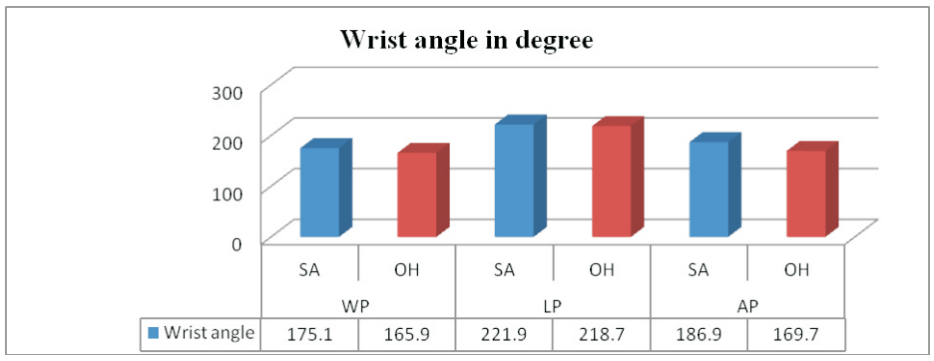
RESULTS:

Table: 1 kinematics differences between side-arm and over-head throwing techniques at wind-up, late-cocking and acceleration phase.

Variables	Phases	Groups	No.	Mean	SD (±)	df	Mean Difference	Calculated t
Wrist Angle	WP	SA	10	175.10	22.31	18	9.20	0.95
		OH	10	165.90	20.79			
	LP	SA	10	221.90	19.22	18	3.20	0.44
		OH	10	218.70	12.92			
	AP	SA	10	186.90	22.34	18	17.20	2.30*
		OH	10	169.70	7.76			

Tab $t_{0.05}(18)$ =2.10 *Significance at 0.05 levels.

The analysis of data table-1 that there is a significant difference of wrist angles exist between side-arm and over-head throwing techniques in their acceleration phase during cricket ball throws as obtain't' ratio is greater than the required 't' value of 2.10. Whereas insignificance differences of wrist angle exist between of side-arm and over-head throwing techniques in their wind-up and acceleration phase.



SA=Side-Arm OH= Over-Head
WP=Wind-Up Phase LP= Late Cocking Phase AP= Acceleration Phase

Table: 2 kinematics differences between side-arm and over-head throwing techniques at wind-up, late-cocking and acceleration phase.

Variables	Phases	Groups	No.	Mean	SD (±)	df	Mean Difference	Calculated t
Elbow Angle	WP	SA	10	165.30	12.83	18	3.50	0.70
		OH	10	168.82	9.37			
	LP	SA	10	35.50	10.72	18	24.70	3.62*
		OH	10	60.20	18.75			
	AP	SA	10	145.7	21.04	18	18.00	1.85
		OH	10	127.7	22.56			

Tab $t._{0.05}$ (18) =2.10 *Significance at 0.05 levels.

The analysis of data table-2 that there is a significant difference of elbow angles exist between side-arm and over-head throwing techniques in their late-cocking phase during cricket ball throws as obtain't' ratio is greater than the required 't' value of 2.10. Whereas insignificance differences of elbow angle exist between of side-arm and over-head throwing techniques in their wind-up and acceleration phase.

Graph 2. The elbow angles during different phases.

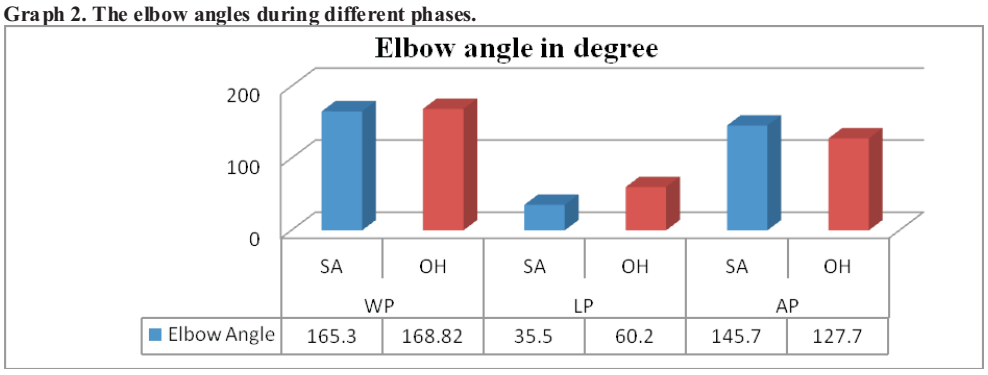


Table: 3 kinematics differences between side-arm and over-head throwing techniques at wind-up, late-cocking and acceleration phase.

Variables	Groups	Groups	No.	Mean	SD (±)	df	Mean Difference	Calculated t
Shoulder Angle	WP	SA	10	104.60	20.13	18	46.80	6.51*
		OH	10	57.80	10.53			
	LP	SA	10	52.50	22.38	18	7.90	0.84
		OH	10	60.40	19.41			
	AP	SA	10	57.70	13.65	18	69.30	9.04*
		OH	10	127.00	20.04			

Tab $t._{0.05}$ (18) =2.10 *Significance at 0.05 levels.

The analysis of data table-3 that there is a significant difference of shoulder angles exist between side-arm and over-head throwing techniques in their wind-up and acceleration phase during cricket ball throws as obtain't' ratio is greater than the required 't' value of 2.10. Whereas insignificance differences of shoulder angle exist between of side-arm and over-head throwing techniques in their late cocking phase.

Graph 3. The shoulder angles during different phases.

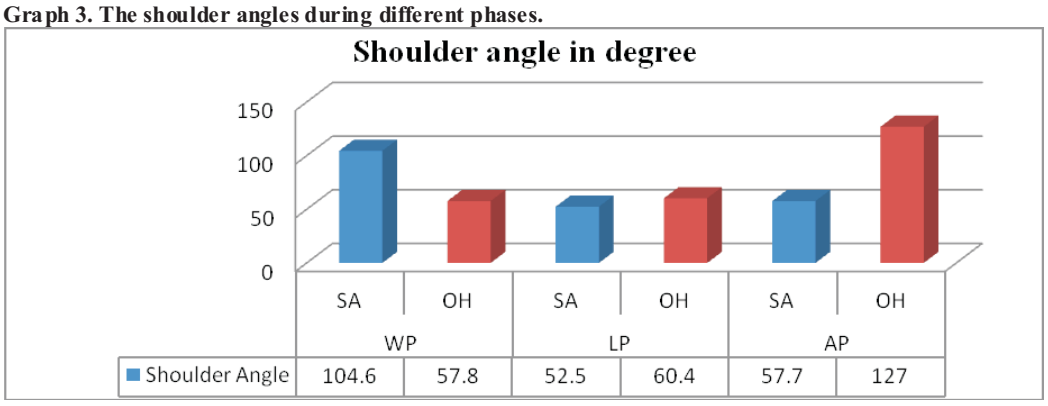


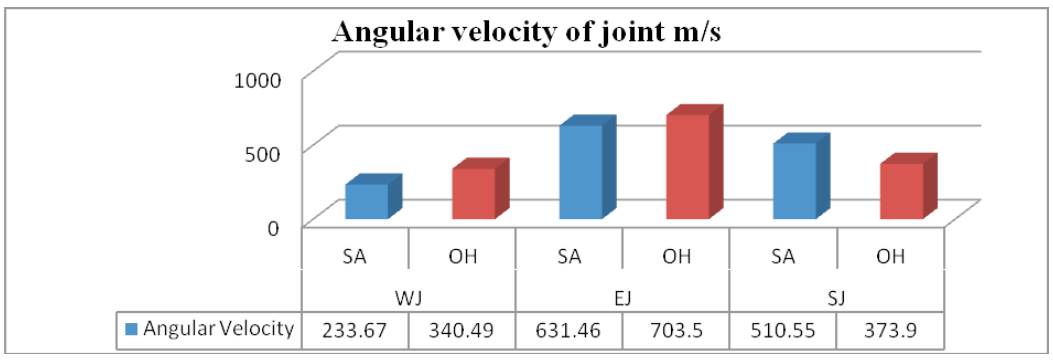
Table: 4 Angular kinematics differences between side-arm and over-head throwing techniques wind-up to late-cocking phase.

Variables	Groups	No.	Mean	SD (±)	df	Mean Difference	Calculated t
wrist joint	SA	10	233.67	151.88	18	106.82	1.46
	OH	10	340.49	175.17			
Elbow joint	SA	10	631.46	114.68	18	72.04	1.03
	OH	10	703.50	189.65			
Shoulder joint	SA	10	510.55	120.93	18	136.61	2.89*
	OH	10	373.90	87.72			

Tab $t._{0.05}$ (18) =2.10 *Significance at 0.05 levels.

The analysis of data table-4 that there is a significant differences exist between side-arm and overhead throwing techniques in their angular velocity of shoulder joint during wind-up to late cocking phase of cricket ball throwing as obtain' ratio is greater than the required 't' value of 2.10. Whereas insignificance differences exist in angular velocity of wrist and elbow joints between side-arm and over-head throwing techniques.

Graph 4. The Angular velocity during different phases.



WJ=Wrist Joint EJ=Elbow joint SJ= Shoulder Joint

Table: 5 Angular kinematics differences between side-arm and over-head throwing techniques at late-cocking to acceleration phase.

Variables	Groups	No.	Mean	SD (±)	df	Mean Difference	Calculated t
wrist joint	SA	10	254.35	177.77	18	338.46	2.94*
	OH	10	592.82	317.790			
Elbow joint	SA	10	825.63	262.82	18	48.49	0.27
	OH	10	874.12	501.45			
Shoulder joint	SA	10	812.71	248.39	18	1490.03	4.21*
	OH	10	230.27	1092.40			

Tab $t_{0.05}(18)$ =2.10 *Significance at 0.05 levels.

The analysis of data table-5 that there is a significant differences exist between side-arm and overhead throwing techniques in their angular velocity of wrist and shoulder joint during late cocking to acceleration phase of cricket ball throwing as obtain't' ratio is greater than the required 't' value of 2.10. Whereas insignificance differences exist in angular velocity of elbow joints between side-arm and over-head throwing techniques

Graph 5. The Angular velocity during different phases.

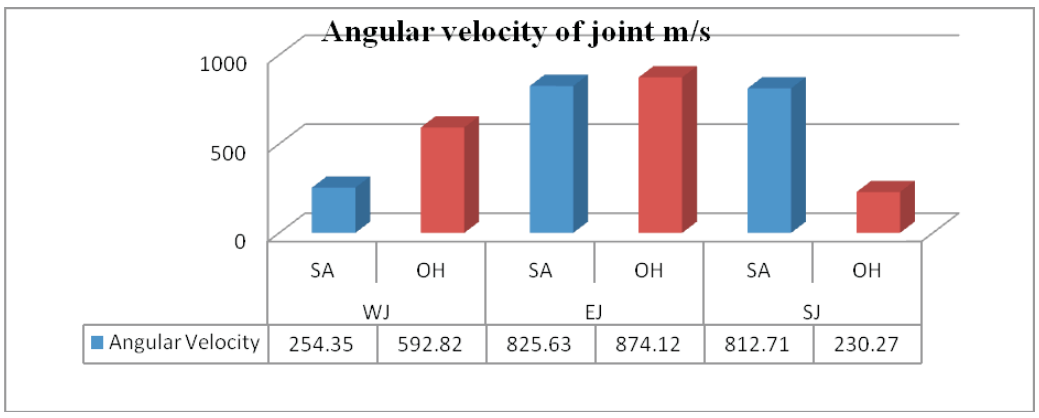


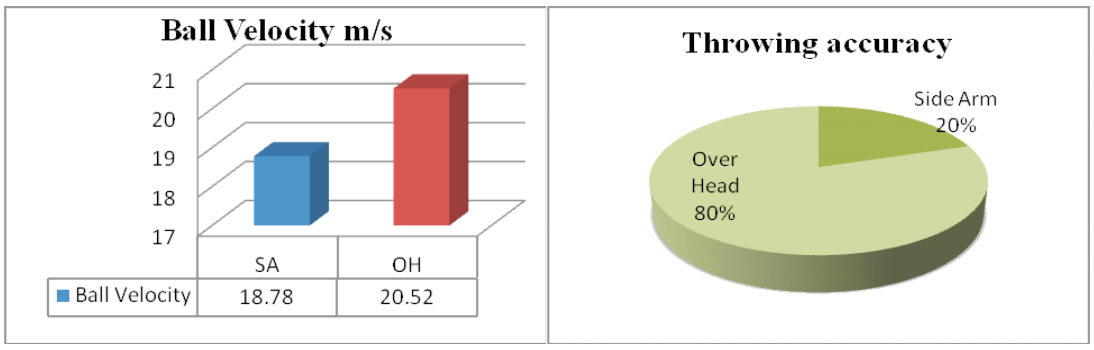
Table: 6 Ball velocity and accuracy differences between side-arm and over-head throwing techniques.

Variables	Groups	No.	Mean	SD (±)	df	Mean Difference	Calculated t
Ball Velocity	SA	10	18.78	3.61	18	1.73	0.65
	OH	10	20.52	7.58			
Ball Accuracy	SA	10	0.10	0.32	18	0.30	1.56
	OH	10	0.40	0.52			

Tab $t_{0.05}(18)$ =2.10 *Significance at 0.05 levels.

The analysis of data table-5 that there is a insignificant differences exist between side-arm and overhead throwing techniques in their ball velocity and accuracy of cricket ball throwing as obtain't' ratio is less than the required 't' value of 2.10.

Graph 6. The ball velocity and accuracy different throwing techniques.



DISCUSSION:

One of the whole purposes of this study was to compare the side-arm and over-head throwing techniques to determine if there were any significant differences. Another purpose of this study was to find out the best throwing techniques side-arm and over-head throwing at 450 throwing angle 1120 approach angle of 10m distances in concern to achieving highest accuracy and velocity.

The result shows that the ball velocity and accuracy of sidearm and overhead throws with 450 throwing angle at 1120 approach angle of 10 m distances differ insignificantly. When the ball velocity was analyzed in term of joint angles of sidearm and overhead throws of wind-up, late-cocking and acceleration phase for wrist and elbow angle; 1120 approach angle at 450 throwing angles of 10 distance, maximum number of throws showed insignificant mean differences except shoulder joint angle. At the wind up phase or ball contact phase, the upper arm was also a experiencing horizontal adduction angular acceleration. The segment angularly moved in rotational direction, and it was just started to an extension angular movement. Some of the studies, the upper arm was in a position of adduction (150), horizontal abduction (200) and internal rotation (450) with the elbow joint at an angle (1200) (Hussain & Bari, 2011) and (Felter and Depena., 1986). The elbow joint reach its maximum flexion angle (900) approximately half way between the instant of stride foot contact and maximum external rotation, and then it began to extend (Felter and Depena., 1986). Present study showed that angular velocity of shoulder joint exist significant mean differences during both phases of throwing at with 1120 approach at 450 throwing angle of 10m distance. The angular velocities of wrist and elbow joints are a factor to cause variation in the ball velocity for side-arm and over-head throwing techniques.

CONCLUSION:

1120 approach angle at 450 throwing angles of 10m distance; the Over-Head throw was an answerable factor to achieving greater ball velocity as compared to Side-Arm throws.
1120 approach angle at 450 of 10m distance; the over-head throw was an answerable factor to achieving greater percentage of ball accuracy as compared to side-arm throws.

REFERENCES:

Atwater, A. E. (1979). Biomechanics of over arm throwing and of throwing injuries. In Exercise and Sports Science Reviews, Vol. -7: 43-85.
Best, R. J., Bartlett, R. M., & Morriss, C. J. (1993). A three-dimensional analysis of javelin throwing technique. Journal of Sports Sciences, vol. 11: 315-328.
Feltner, M. & Dapena, J. (1986). Dynamics of the shoulder and elbow joints of the throwing arm during a baseball pitch. International Journal of Sport Biomechanics, vol. 2 (4): 235-260.
Hussain, I., & Bari, M. A. (2011). Biomechanical Analysis of Cricket Ball Throwing Techniques. Journal of Education and Practice, Vol. 2, No 3.
Hussain, I., & Bari, M. A. (2011). Biomechanical Analysis of Overhead Throwing in Cricket. International Journal of Sports Science and Engineering, Vol. 5, No 3: 163-168.
Bowen, R. (1970). Cricket: A History of its Growth and Development, Eyre & Spottiswoode.
Altham, H. S. (1962). A History of Cricket, Vol. 1, (to 1914), George Allen & Unwin.
Elliott, B. & Anderson, G. (1990). Age-related differences in high performance over arm throwing patterns.

Journal of Human Movement Studies, vol. 18: 1-24.
Hussain, I., & Bari, M. A. (2011). Biomechanical Analysis of Cricket Ball Throwing Techniques. Journal of Education and Practice, Vol. 2, No 3.
Hussain, I., & Bari, M. A. (2011). Biomechanical Analysis of Overhead Throwing in Cricket. International Journal of Sports Science and Engineering, Vol. 5, No 3: 163-168.
Hussain, I., Bari, M. A., Khan, A., Mohammad, A. Ahmad A.(2011). Accuracy-Velocity Relationship and Physical Characteristics in Cricket Ball Throwing. International Journal of Sports Science and Engineering, Vol. 05, No. 01: 043-048.
Simons, J., Wilson, J., Wilson, G., & Theall, S. (2009). Challenges to cognitive bases for an especial motor skill at the regulation baseball pitching distance. Research Quarterly for Exercise and Sport. 80:3, 469 –480.