KINEMATICAL ANALYSIS OF FEMALE BASKETBALL PLAYERS IN 3 POINT SHOT (A Scientific Sports Engineering Study)

Birendra jhajharia*

Upendra pandey**

Mandeep Singh***

ABSTRACT

Ten female basketball players of CSJM University, Kanpur, were selected as subjected for the study. The videos as obtained by the use of digital videography were analyzed (the best trial) by Siliconcoach pro 7 software. Only one selected frame was analyzed. Selected variables were as Ankle joint, Knee joint, Hip joint, Shoulder joint, Elbow joint, Wrist joint, Angle of release, Height of release, Velocity of ball and Standing height of players. The scores of the subjects in 3 point shot were used as the criterion variable in the study. To determine the degree of relationship between selected Kinematic variables with the performance in 3 point shot Pearson's product Moment Correlation Method was used.

The results have that the value of coefficient of correlation. In case of Knee joint, Hip joint, Elbow joint, Wrist joint, Angle of release, height of release, velocity of ball and standing height of players showed insignificant and incase of Ankle joint and Shoulder joint (right) showed significant relationship with the performance of subjects of coefficient of correlation for 8 degree of freedom is 0.632.

Keywords: *Kinematic, velocity.*

* Assistant Professor, LNUPE, Gwalior.

** Lecturer, C.S.J.M.U, Kanpur.

*** Physical Director, Department of Higher Education, Jammu & Kashmir.

INTRODUCTION

Biomechanics may be defined as the science, which investigates the internal and external forces acting on a human body and the effects produced by these forces. In the last several decades, biomechanics has demonstrated considerable growth evolving from an exercise in the filming of human movement to an applied science with a powerful array of measurement and modeling techniques. The simple descriptive approach which was characteristic of early work has been superseded by attempts to explain the mechanisms underlying movement. Consequently, biomechanics has emerged as an important area of scientific investigation in a variety of disciplines. Included among these are automobile safety, biomedical engineering, ergonomics, exercise science, orthopedic surgery, physical rehabilitation, and sport.

Cinematography is the technique most frequently used in sport biomechanics research for obtaining a record of human movement. These film records are quantitatively analysed to obtain linear and angular displacement time data for total body or segmental movements. Typically, the basic displacement time functions of a motion do not provide sufficient information to describe fully the activity thus; these data are further treated mathematically to determine the respective velocity and acceleration functions.

The role of cinematography in biomechanical research involved from a simple form of recording motion to a sophisticated means of computer analysis of motor efficiency. Over the years, new techniques in filming and timing having been perfected to aid the research in achieving accurate time measurements of both simple and complex locomotion patterns .

OBJECTIVE

The purpose of this study was to measure the relationship of selected bio-mechanical variable to the performance in 3 point shot.

METHODOLOGY

The study was delimited to female basketball players of C.S.J.M. University, Kanpur. The study was further delimited to the 10 subject belonging to the age group 17 to 23 years. The subjects were right handed shooters.

The scores of the subjects in 3 point shot were used as the criterion variable in the study. The performances of the subjects were assessed by three judges however elements related to the accuracy of shooting were also added. Used in three-point scale. Three point awarded in correct action and basket scored. Two points awarded in correct action but not scored. One point awarded in touches the ring or board.

Siliconcoach pro 7 software was used for biomechanical analysis of 3 point shot in

basketball. A Casio Exilim F-1 High Speed Camera, which was positioned at 7.90m from the subject at height of 1.50mts. from the subject on an extension of free throw line. Camera was also set for capturing 300 fps. The subjects were made to take two Shots only. The linear and angular kinematical variables of the body were calculated at moment execution.

The videos as obtained by the use of digital videography were analyzed (the best trial) by siliconcoach pro 7 software. Only one selected frame was analyzed. Selected variables were as under. Were represented by the angles at selected joints as Ankle joint, Knee joint, Hip joint, Shoulder joint, Elbow joint, Wrist joint, Angle of release, height of release, velocity of ball and standing height of players.

The data was analyzed by use of person's product moment correlation. The level of significance chosen to test the hypothesis was 0.05.

Table – 1 clearly indicates that there exists a significant relationship between 3 point shooting performance and Ankle & Shoulder (right) as the correlation coefficient values were found higher than the tabulated value. At .05 level of significance.

On the other hand, there exists an insignificant relationship between 3 point shooting performance and Knee (right), Hip (right), Elbow (right), Wrist (right), Angle of release, height of release, Velocity of ball release and standing height of player as the correlation coefficient values were found lower than the tabulated value. At .05 level of significance.

Table- 1: Correlation between Dependent variable (3 point shooting performance) and Independent variables (selected kinematic variable) at moment execution

Independent Variables	Coefficient of Correlation (r)
Ankle joint (right)	0.731*
Knee joint (right)	0.037
Hip joint (right)	-0.416
Shoulder joint (right)	0.675*
Elbow joint (right)	0.227
Wrist joint (right)	-0.148
Angle of release	0.403
Height of ball release	-0.240
Velocity of ball release	0.170
Standing height of the player	0.218

*** Significant at .05 level**

r.05 (8) = .444

DISCUSSION OF FINDING

The statistical findings point out that there is significant relationship of 3 point shot performance with ankle joint and shoulder joint in basketball. It is also evident from the statistical findings that for Knee joint, Hip joint, Wrist joint, elbow joint, height of ball release, Angle of ball release, velocity of ball release and standing height of players no significant relationship was observed.

It signifies the contribution of both joints for the best execution of 3 point shot. This may be attributed to the fact that in execution of shooting skill the main role is of shoulder movement because at the This It may be because of the fact that the shooting ability basically depends on the explosive strength of shoulder muscles and angle of release movement is essential for each player to maintain accuracy in shooting. Secondly for the purpose of 3 point shot the player has to jump up and balance his body in surface so, that he can release accurately and this movement is dependent on the ankle joint.

It may be done to the fact that any skill execution in basketball is not solely depending on one joint movement, it is the combination of movement at different joint.

The result of the study were also in agreement with the works of Hudson and Hudron who stated that during release the players pushes the ball in the forward and upward direction by

shifting his centre of gravity in the forward direction. Which result in more inclination of torso towards the direction of release.

REFERENCES

1. Loye Anni C., A kinematic analysis of three champions performing the volleyball spike, **Completed Research in Health, Physical Education and Recreation** (1999).
2. *Forthomme Benedicte, Croisier Jean-Louis, Ciccarone Guido, Crielaard Jean-Michel, and Cloes Marc,* ***"Factors Correlated With Volleyball Spike Velocity",*** *2007*
3. Robert Bushman Ben, "Analysis of the speed and height of the overhead flat Volleyball serve" **Completed Reasearch in Health, Physical Education and Recreation** (1979).
4. Huong Chanfu, Liu Ging Chan and Sheu Tai Yen, **Kinematic Analysis of the Volleyball back row jump spike**, National Taiwan Normal University, Taiepei, Taiwan, www.sportsscience.com, 2006.
5. Higgins Charles Roger, "Analysis of selected mechanical factors that contribute to the vertical jumping height of four basketball players", **Dissertation Abstracts International** 32 (June 1970).
6. GiatsisG, Kollias I; et.al, Biomechanical differences in elite beach-volleyball players in vertical squat jump on rigid and sand surface**, Journal of Sports Biomechanics.** 2004 Jan; 3(1).
7. Chenfu Huong, A biomechanical analysis of Volleyball Block Jumps, **Dissertation Abstracts International** 54 : 8 (Feb 1994).
8. Harold Smith S., "The relationship of Volleyball playing ability to scores achieved in the sargant vertical jump", **Completed Research in Health Physical Education and Recreation** 11 (1969).
9. Tellez Tom, The Jumping Events, **Track and Field Quarterly Review** (Winter 1989).
10. Kouvelioti Vasiliki, Stavropoulos Nikolaos, Kellis Eleftherios, Biomechanical Analysis Of Shooting In Basketball: Relating Research With Training Practice, **Journal of Inquiries in Sport & Physical Education**;(2006, vol. 4).