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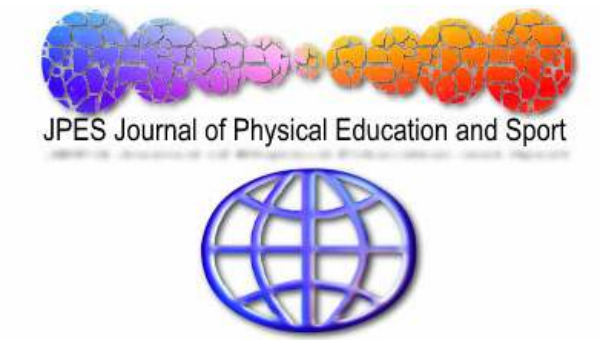

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ORIGINAL RESEARCH

RELATIONSHIP OF KINEMATIC VARIABLES WITH THE PERFORMANCE OF BASKETBALLPLAYERS IN LAY-UP SHOT

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Abstract:

The purpose of the study was to determine the relationship between selected kinematic variables and performance of lay-up shots. Five (N=5) male basketball players who represented Punjab Technical University, Jalandhar, were selected as subjects for the study. The help of digital photography was used to film the subjects in sagittal plane of lay-up shot. Joint point method was used in order to obtain the values of selected angular kinematic variables from developed stick figures. Height of center of Gravity was calculated by segmentation method. The performance in Lay –Up Shot was recorded by the scores in Lay –Up Shot, which was obtained by using a three point scale by the three judges. To determine the degree of relationship between selected kinematic variables with the performance in Layup Shot, Pearson's Product Moment Correlation Method was used. The results have shown the insignificant values of coefficient of correlation incase of all the selected kinematic variables and significant relationship between the height of center of gravity at the moment of release with the performance of the subjects in lay-up shots.

Keywords: *Kinematic analysis; Shooting; Lay-up Shot; Center of Gravity.*

INTRODUCTION

Shooting is the principal method used to score points in basketball and for this reason it is the most frequently used technical action (Hay 1994). [1] In basketball studies biomechanical research has focused on various aspects including basic shooting techniques (Brancazio 1981, Hay 1994) [2] differences in play between the sexes (Elliott and White 1989) [3] and the characteristics of players at different skill levels (Hudson 1985). [4] Some of these studies have also included analysis of the jump Shot under different conditions, as the variability in the performance of the shot is determined by a number of factors (Saenz and Ibanez 1995). [5] such as arm action (standard, hook and lay-up), previous technical action (dribble, reception fake) previous movement of the legs (stationary or running), final movement of the legs (with or without jump), body orientation, height and distance of the shot, and opposition. For example, Elliott and White (1989) [6], Walters *et al*. (1990) [7] Miller and Bartlett (1993) [8] and Satern (1993) [9] studied the effects of increased shooting distance in the jump shot, whilst Gabbard and Shea (1980) and Chase *et al*. (1994) [10] analyzed the effects of equipment modifications on children and jump shot performance. Of these influencing factors, no research has been attempted to establish the relationship of kinematic variables with the performance in lay-up shot and as a result this study was undertaken to measure the relationship of selected kinematic variables to the performance in lay-up shot. The

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study was delimited to five (N=05) male university players of eighteen to twenty five (18-25) years of age of Punjab Technical University, Jalandhar. The lay-up shot was recorded in one plane only. Selected linear and angular kinematic variables were:

Linear Kinematic Variables:

1. Height of Center of Gravity at moment of release

Angular Kinematic Variables:

2. Ankle joints
3. Knee joints
4. Hip joints
5. Shoulder joints
6. Elbow joints
7. Wrist joints

PROCEDURE

SELECTION OF SUBJECTS

The subjects for the present were five (N=05) male basketball players from D.A.V. Institute of Engineering and Technology, Jalandhar (Punjab), INDIA. All subjects ranged between the chronological age of 18-24 years and were right handed shooters who participated in the North-Zone Intervarsity Championship for the year 2008-2009 and represented Punjab Technical University, Jalandhar, Punjab. To determine the degree of relationship between selected kinematic variables with the performance in layup shot, Pearson's Product Moment Correlation Method was used.

Criterion Measure and Scores of Subjects on Lay-up shot

The scores of the subjects in lay-up shot were used as criterion measure in this study. The performances of the subjects were assessed by three judges. Two points were given if a basket was scored, one point if it touched the ring and zero point if it does not touch the board and ring.

Collection of Data and Filming Protocol

The data was collected with the help of digital photography, and the scores of the subjects in lay-up shot. Digital photography was employed for conducting kinematical analysis of the lay-up shot. The lay-up shots were filmed with a Nikon Model D-100, which was positioned at 7.05m from the subject at a height of 1.38m from the subject on an extension of restricted area line. Clear images were obtained. The subjects were made to take three lay-up shots only. The kinematical variables of the body were calculated at moment release. The authors developed stick figures on the photographs from which selected kinematical variables were calculated. The stick figures were developed by using Joint-point method.

Procedure for Location of Center of Gravity

The center of gravity of the body at the moment of release was determined by segmentation method. This method is used to find the distance of the center of gravity of a body from some arbitrarily chosen line. This was done from a photograph which provided information concerning (a) weights of various parts or segments of the player's body (arm, forearm, hand, thigh etc.) and (b) location of the center of gravity of these segments. The location of center of gravity of body segments is presented in table-1:

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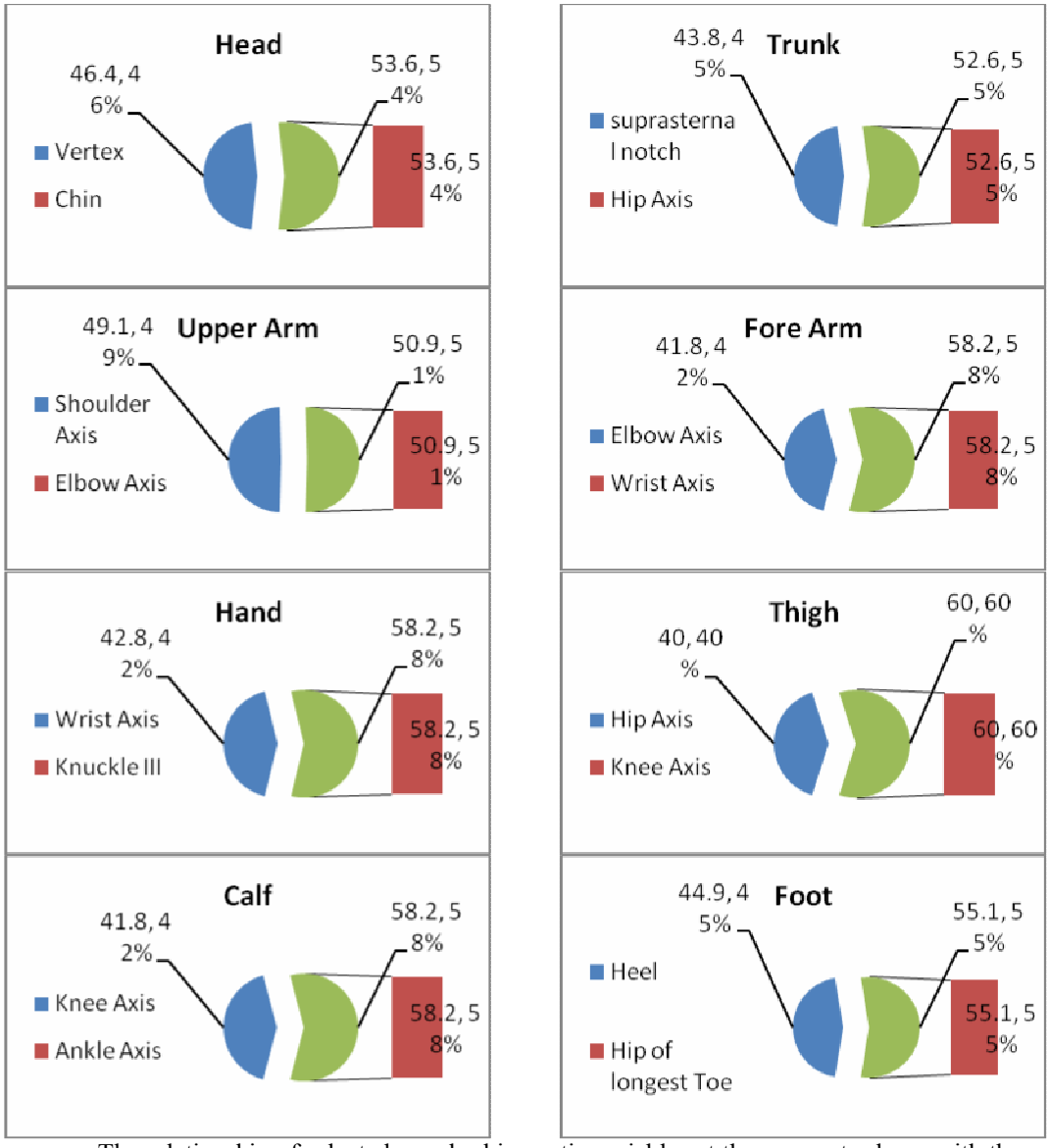
Table - 1
LOCATION OF CENTER OF GRAVITY OF BODY SEGMENTS

S.No.	Segment		Center of Gravity Location Expressed as Percentage of total Distance between Reference Points
1.	Head		46.4% to Vertex : 53.6% to chin-neck intersect
2.	Trunk		43.8% to suprasternal notch: 52.6.0% to hip axis
3.	Upper Arm		49.1% to shoulder axis : 50.9% to elbow axis
4.	Fore Arm		41.8% to elbow axis: 58.2% to wrist axis
5.	Hand		42.8% to wrist axis: 58.2.0% to knuckle III
6.	Thigh		40.0% to hip axis: 60.0% to knee axis
7.	Calf		41.8% to knee axis: 58.2% to ankle axis
8.	Foot		44.9% to heel: 55.1% to tip of longest toe

The graphical representation of location of center of gravity of body segments is presented in figure-1:

Figure-1
LOCATION OF CENTER OF GRAVITY OF BODY SEGMENTS



The relationship of selected angular kinematic variables at the moment release with the performance of subjects in lay-up shot is presented in table-2:

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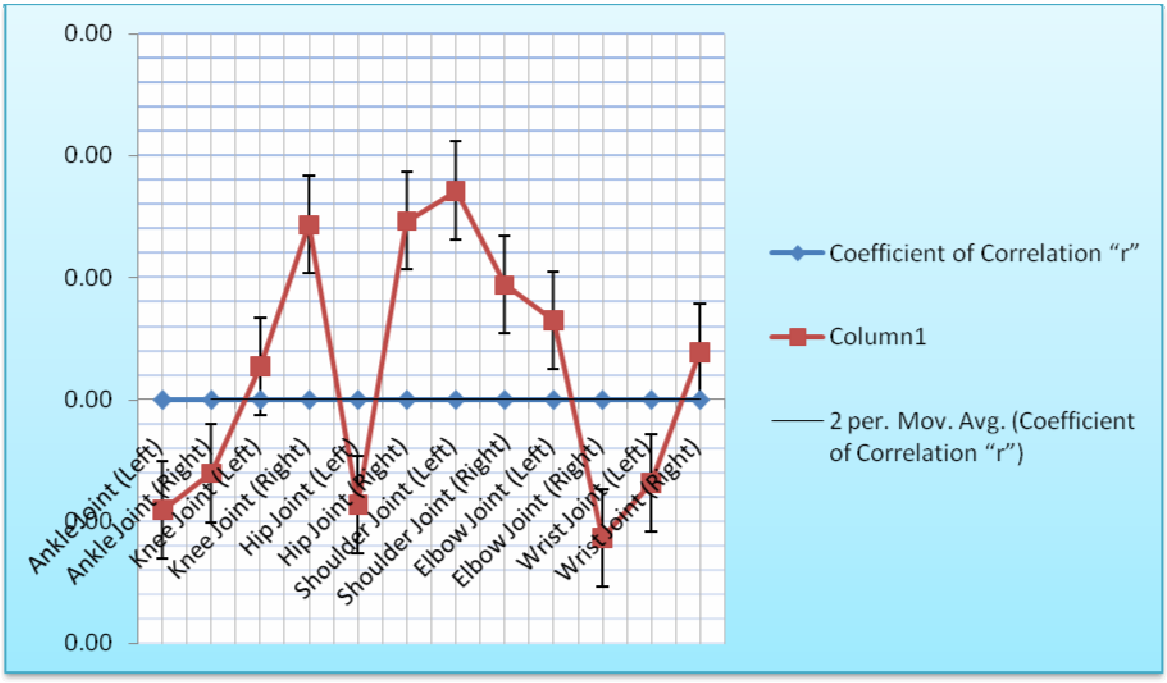
Table – 2
RELATIONSHIP OF SELECTED ANGULAR KINEMATIC VARIABLES AT THE MOMENT RELEASE WITH THE PERFORMANCE OF SUBJECTS IN LAY-UP SHOT (N = 5)

S.No.	Variables	Coefficient of Correlation "r"
1.	Ankle Joint (Left)	-0.45252
2.	Ankle Joint (Right)	-0.30336
3.	Knee Joint (Left)	0.13762
4.	Knee Joint (Right)	0.717931
5.	Hip Joint (Left)	-0.43063
6.	Hip Joint (Right)	0.732994
7.	Shoulder Joint (Left)	0.857392
8.	Shoulder Joint (Right)	0.470777
9.	Elbow Joint (Left)	0.325669
10.	Elbow Joint (Right)	-0.56928
11.	Wrist Joint (Left)	-0.34233
12.	Wrist Joint (Right)	0.194074

Since calculated value of r for all the selected angular kinematic variables is smaller than tabulated value of r (=0.878), we accept the null hypothesis. Thus correlation between angular kinematic variables at selected moment with the performance of the subjects in lay-up shots is insignificant at .05 level of significance. The graphical representation of relationship of selected angular kinematic variables at moment of release with the performance of subjects in lay-up shot is presented in figure-2:

Figure-2
RELATIONSHIP OF SELECTED ANGULAR KINEMATIC VARIABLES AT THE MOMENT RELEASE WITH THE PERFORMANCE OF SUBJECTS IN LAY-UP SHOT



The relationship of height of center of gravity at moment release with the performance of subjects in lay-up shots presented in table -3:

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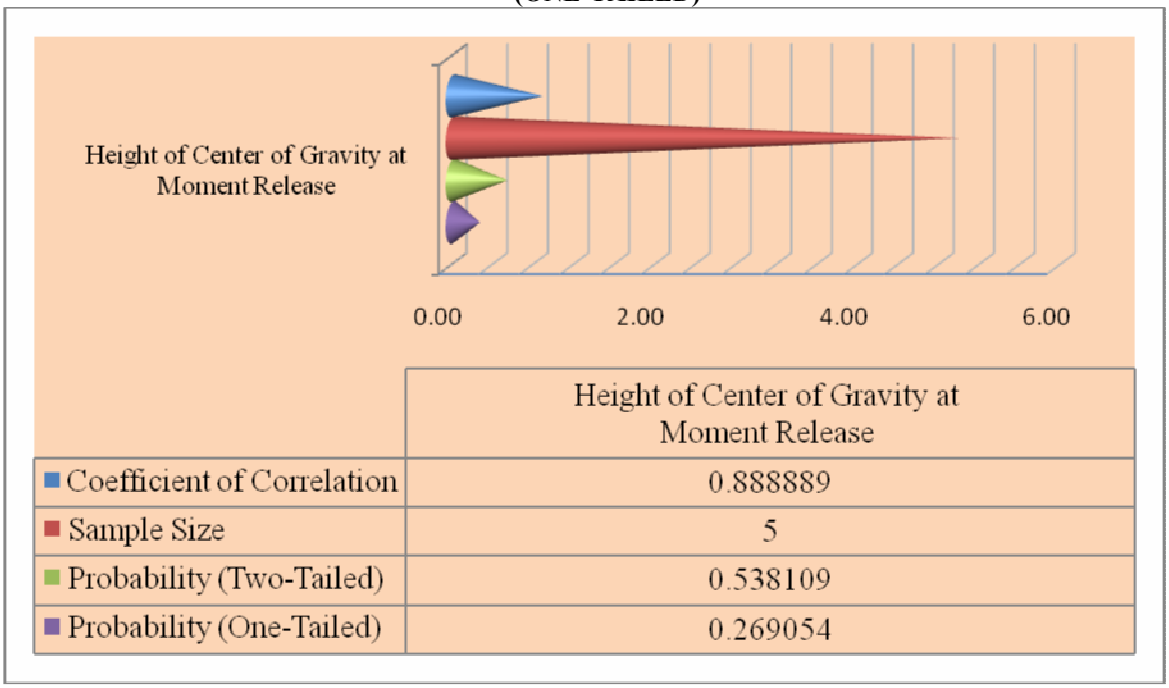
Table – 3
RELATIONSHIP OF HEIGHT OF CENTER OF GRAVITY AT MOMENT RELEASE WITH THE PERFORMANCE OF SUBJECTS IN LAY-UP SHOT (N = 5)

S.No.	Variables	Coefficient of Correlation
1.	Height of Center of Gravity at Moment Release	0.888

Since calculated value of r (=0.888889) is greater than tabulated value of r (=0.878), we reject the null hypothesis of no correlation between the height of center of .05 level of significance. The graphical representation of coefficient of correlation, sample size, probability (two tailed) and probability (one-tailed) is presented in figure-3:

Figure-3
COEFFICIENT OF CORRELATION, SAMPLE SIZE, PROBABILITY (TWO TAILED) AND PROBABILITY (ONE-TAILED)



	Height of Center of Gravity at Moment Release
Coefficient of Correlation	0.888889
Sample Size	5
Probability (Two-Tailed)	0.538109
Probability (One-Tailed)	0.269054

DISCUSSION OF FINDINGS

There is insignificant correlation between the selected angular kinematic variables at the moment release with the performance of subjects in lay-up shot. As calculated value of r for all the selected angular kinematic variables is smaller than tabulated value of r (0.878). We accept the null hypothesis of correlation between the selected angular kinematic variables at the moment release with the performance of subjects in lay-up shot at 0.05 level of significance. It is further stated that there is significant correlation between the height of center of gravity at moment release with the performance of the subjects in lay-up shots at 0.05 level of significance. This interpretation is supported by significant differences and trends in the biomechanical analysis. The differences in technical execution of the skill have implications for practice. It is likely that they lead to significantly different demands on the neuromuscular co-ordination requirements supported by the studies carried out by Mortimer (1951), Brancazio (1981), Hudson (1985), Satern (1988), Walters et al. (1990) and Miller and Bartlett (1996). The stick figures of the subject at movement release during the execution of lay-up shot is presented in figure-4:

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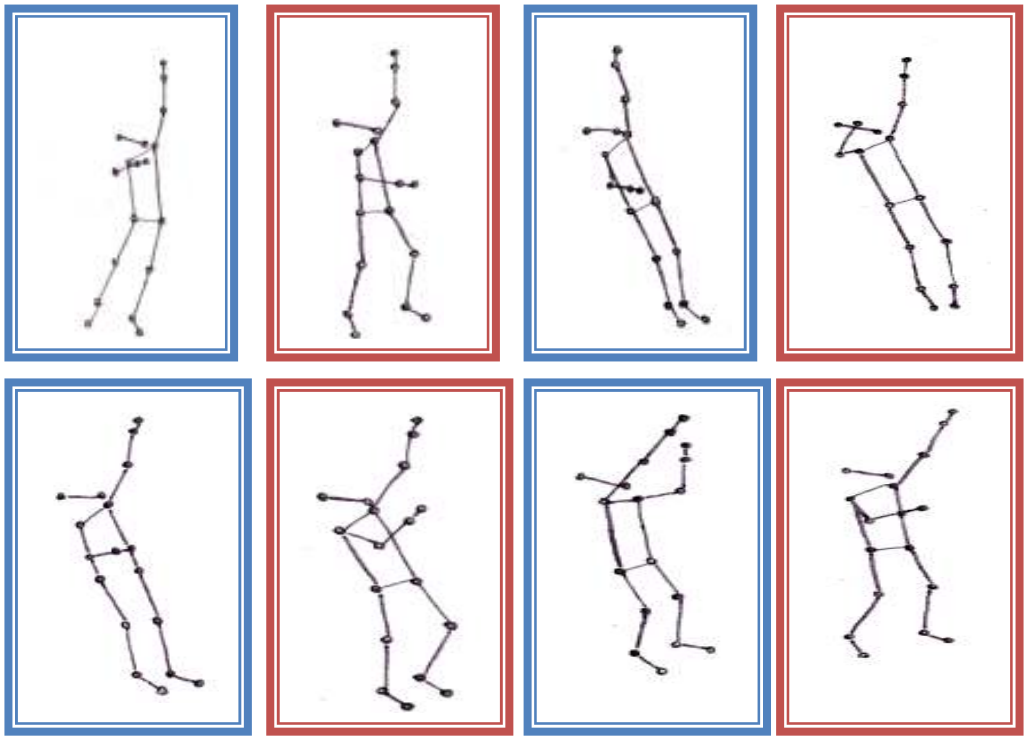
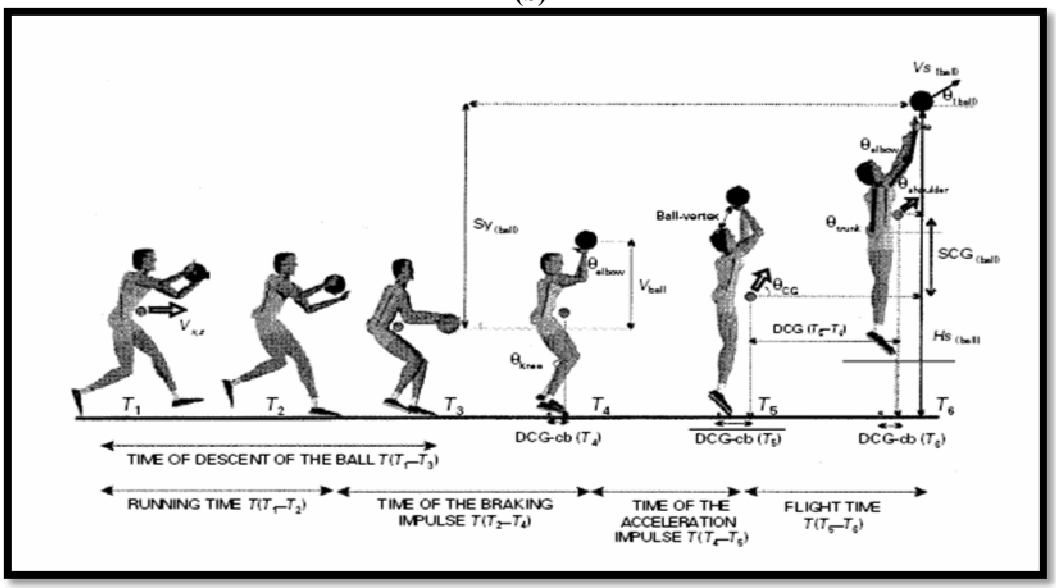
Figure-4 (a)
STICK FIGURES OF THE SUBJECTS AT MOMENT RELEASE DURING THE EXECUTION OF LAY-UP SHOT



(b)



STATISTICAL ANALYSIS

To determine the relationship between selected kinematic variables with the performance of subjects in lay-up shots and the relationship between the height of center of gravity at moment of release with the performance of the subjects in lay-up shots, the data was analyzed by using Pearson's Product Moment Correlation. The level of significance was 0.05.

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SUMMARY

The study was concluded in order to determine the relationship between selected kinematic variables with the performance of lay-up shots. Five male basketball players who represented Punjab Technical University, Jalandhar, were selected as subjects for the study. The help of digital photography was used to film the subjects in sagittal plane of lay-up shot. Joint point method was used in order to obtain the values of selected angular kinematic variables from developed stick figures. Height of center of gravity was calculated by segmentation method. The performance in lay-up shot was recorded by the scores in lay-up shot, which was obtained by using a three point scale by the three judges. To determine the degree of relationship between selected kinematic variables with the performance in lay-up shot. Pearson's product moment correlation method was used. The results have shown the insignificant values of coefficient of correlation incase of all the selected kinematic variables with the performance of subjects in lay-up shots and significant relationship between the height of center of gravity at moment release with the performance of the subjects in lay-up shots.

CONCLUSIONS`

1. There is insignificant correlation between the selected angular kinematic variables at the moment of release with the performance of subjects in lay-up shot.
2. There is significant correlation between the height of center of gravity at moment of release with the performance of the subjects in lay-up shots.

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