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Analysis of set shot in basketball in relation with time to perform the course and displacement of center of gravity

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Abstract: The purpose of the study was to analysis of the technique of set shot while attempting free throws with the performance, in relation with time to perform the course and displacement of center of gravity. Sixty National level male basketball players of three different height groups i.e. Group I: 5'5'' to 5'8'',Group II: 5'9" to 6' and Group III: 6' 1" to 6'4",(20 in each group) were selected as subjects for the study. The data was obtained from two given positions (i) Moment of stance in set shot and (ii) Moment of release of ball in set shot. Total ten attempts were given and the successful shots marked as score out of ten as criterion measure of performance. Four Digital Video cameras Sony 2100 series were used in order to register the technique of set shot while attempting set shot. The films were analyzed by using standard motion analyzer. With regard to purpose of the study techniques of product moment correlation and analysis of variance were applied. In order to check the significance, level of significance was set at 0.05. It was found that there is significant relationship between the time to perform the course and the performance in set shot of different height group players in basketball and there is no significant relationship found between the displacement of center of gravity and the performance of set shot of different height group players in basketball and therefore, the selected variable puts no impact on the performance of set shot. It was also concluded that Time to perform the course had lowest impact (7%) in the performance. Further it was concluded that displacement of center of gravity was significantly different in first group (5'5'' to 5'8'') from the other two groups.

Keywords: Kinematical Analysis, Set Shot, Center of Gravity and Time to Perform the Course of Set Shot

1. Introduction

This study has been taken to analysis of the technique of set shot while attempting free throws with the performance, in relation with time to perform the course and displacement of center of gravity. Of all the animals, man has been the most successful in the constant struggle with the environment. Even though he cannot run as fast as quadriceps, swim as like dolphin, climb as like as apes or fly as birds do. He has been the only creature, able to defy the force of gravity and move into outer space. Now a day, sport has become an essential part of the life. Millions of fans follow different sports events all over the world with enthusiasm and devotion. People participates in sports and games for many reasons, some play for fun, pleasure, happiness, health and fitness while some play as professionalists. Human beings normally run, jump, throw, catch, kick, strike and perform a multitude of basic skills. They learn these first as general skills and latter in modified specified sports skills. Then they combine the skill into patterns of increasingly greater specificity and complexity. [1,3,4]

Ikai M. and Matsumoto Y. (2014) made scientific investigations on the principles underlying the various techniques used in Judo, first analyzed the techniques, and made observations on their kinematics, and further wished to synthesize by adding psychological and physiological investigations. It was found that in the Hiza- guruma velocity was the lowest with 1.95 m/s. Sciences of applied mechanism are fulfilling these demands of high technological knowledge for the enhancement of performance in the field of sports. Physical education reaching new heights and providing equal to expectations of the demand of this profession but still lot more is to be done. [2,5-9,15,16]

Kinematics is the geometry of motion, which includes displacement, velocity and acceleration without regard for

the forces acting on the body. Kinematics is the branch of biomechanics that is concerned with describing the motion of bodies. Thus kinematics deals with such things as how far a body moves, how fast it moves and how consistently it moves. It is not concerned at all with what causes a body to move in a way it does. Kinematics is essentially the descriptive geometry of motion with respect to time, ignoring the causes of motion and the concepts of mass, force, momentum and energy. However, the kinematics of a rigid body of finite mass may be analyzed if its mass is to be considered at one point. Kinematic analyses are important in understanding the mechanisms of athlete's injuries. [7,16,19]

The two most common shots that use the above described set up are the set shot and the *jump shot.* The set shot is taken from a standing position, with neither foot leaving the floor, typically used for free throws. The jump shot is taken while in mid-air, when the ball is released near the top of the jump. This provides much greater power and range, and it also allows the player to elevate over the defender. Failure to release the ball before the feet return to the ground is considered a traveling violation.[17] Another common shot is called the *layup*. This shot requires the player to be in motion toward the basket, and to 'lay' the ball 'up' and into the basket, typically off the backboard (the backboard-free, underhand version is called a finger roll). The most crowd-pleasing, and typically highest-percentage accuracy shot is the *slam dunk,* in which the player jumps very high, and throws the ball downward, straight through the hoop. Another shot that is becoming common is the "circus shot". The circus shot is a low-percentage shot that is flipped, heaved, scooped, or flung toward the hoop while the shooter is off-balance, airborne, falling down, and/or facing away from the basket.

2. Objectives of the Study

1. To find out the relational effect of Time to perform the course and Displacement of center of gravity with the performance in set shot.
2. To study the significance of difference in Time to perform the course and Displacement of center of gravity among three different height groups while performing set shot.
3. The study will be designed to prepare an ideal model for the skill of set shot in basketball in relation with Time to perform the course and Displacement of center of gravity of the shooter.

3. Methodology

Selection of subjects and collection of data:

Sixty National level male basketball players of three different height groups i.e.

Group I: 5'5" to 5'8"

Group II: 5'9" to 6'

Group III: 6' 1" to 6'4"

(20 in each group) were selected as subjects for the study. It was ascertained that subjects possess reasonable level of technique. Most of the selected subjects were senior national players and had performed in the National basketball championships.

The age of the subjects ranged between 18 to 30 years. The data was obtained with the help of two given positions of any successful attempt:

(a) Moment of stance in set shot.

(b) Moment of release of ball in set shot.

Criterion Measure:

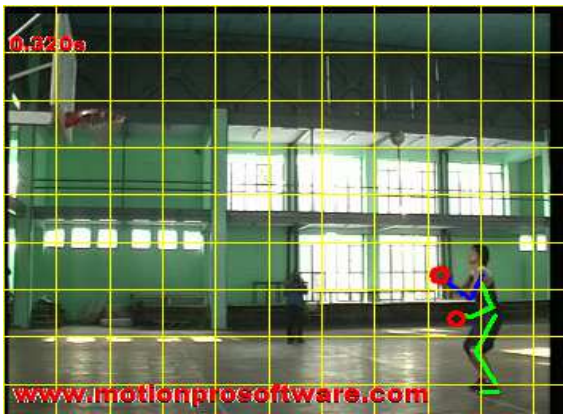
The criterion measure for this study was the performance of the subjects in set shot in basketball. Total of ten attempts were given to each subject and the successful shots marked as score out of ten. The performance of each trial was judged accurately and total score was recorded.

Analysis of film and collection of data:

Video graphic technique was used in this study. The Videos were recorded and analyzed by using standard motion analyzer software (Motion Pro-Advanced Coach Edition). Only two selected moments were analyzed. Quick snap shots under motion pro software for analysis of variable.

Measuring time to perform the course:

To check the time taken by the performer to perform the set shot, Software set-timer option was used. Time gets started from the moment of stance and stops at the moment of release of ball by the performer (Fig: 01)



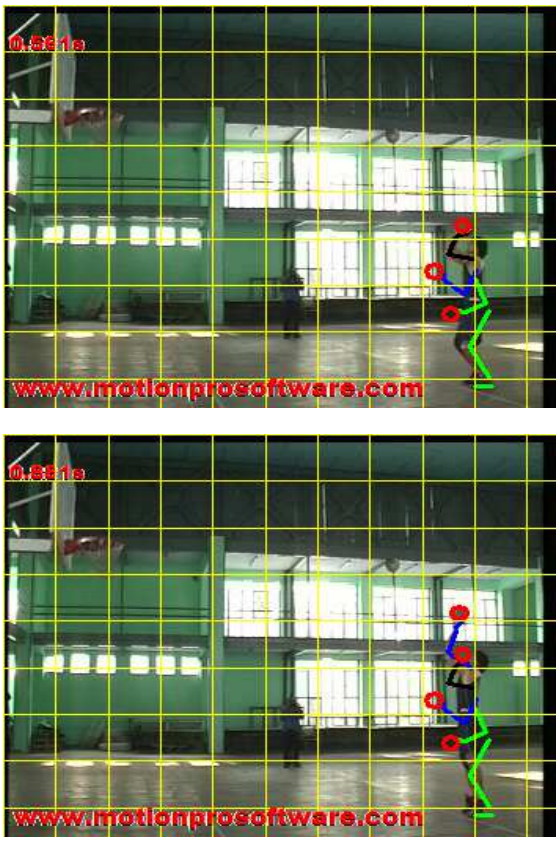


Figure 01. *Display of elapsed time from mark in through motion pro software. (Four snap shots)*

Location of C.G.:

On the basis of Quick snap shot obtained by the software, researcher developed stick figures, with the help of which the location of center of gravity during the moment stance and moment of release of ball in set shot was found.

Statistical analysis of data:

With regard to purpose of the study product moment correlation was calculated between selected kinematical variables with the performance of subjects in set shot in basketball. Analysis of variance (One way ANOVA) was used to study the significance of difference in selected kinematic variables among three different height groups with mean comparisons of different groups through post hoc test while performing set shot. In order to check the significance, level of significance was set at 0.05.

4. Result

Product moment correlation was used to find out the relationship of the selected Kinematical variables with the performance of Basketball players in set shot.

Table 01. *Showing coefficient of correlation of time to perform the course and displacement of center of gravity with the Performance in set shot (N=60)*

Sl.No.	Variables	Coefficient of Correlation
1	Time to perform the course	-.261*
2	Displacement of center of gravity	0.090

Note: * - Significant at 0.05 level

As shown in table 01 the obtained value of coefficient of correlation of the time to perform the course for 58 degree of freedom (-.261) is more than the required value (.250) for 0.05 level of significance, therefore the variable has shown significantly low relationship with the performance in set shot in basketball. However, the selected variable has shown negative correlation with the performance in set shot. This can be stated that there is significant relationship between the time to perform the course and the performance in set shot of different height group players in basketball. Whereas the obtained value of coefficient of correlation of the variable displacement of center of gravity for 58 degree of freedom (0.090) is less than the required value (.250) for 0.05 level of significance, therefore the selected variable has shown no significant relationship with the performance in set shot in basketball.

Table 02. *Showing Regression analysis of time to perform the course (TPC) as independent variable and performance as dependent variable*

Model	R	R square	Adjusted R square	Standardized Coefficients Beta	Sig.
TPC	.261	.068	.052	-.261	.044

Constant: Time to perform the course.

Dependent Variable: Performance.

Table 02 depicts R at .261 and R square at .068. Indicating that 7% variation in the performance was being caused by time to perform the course. The value of Beta coefficient has arrived at -.261 (significant at .05 level), so it signifies that time to perform the course affects performance.

Table 03. *Showing F value of time to perform the course and displacement of center of gravity of three different height groups while performing set shot in basketball.*

	Sources of Variance	SS	Df	MS	F
time to perform the course (TPC)	SS Between	3.386	2	1.693	1.021
	SS with in	94.486	57	1.658	
Displacement of center of gravity (DCG)	SS Between	1120.713	2	560.357	16.304**
	SS with in	1959.024	57	34.369	

There was no significant difference in the time to perform the course of three different height group players while performing set shot. The value of F-ratio for the displacement of center of gravity of three different height groups while performing set shot was significant at .01 level. It indicates that there was significant difference in the displacement of center of gravity of three different height groups while performing set shot.

Table 04. *Showing multiple comparison of different height groups in displacement of center of gravity*

	Group (s)	Group (j)	MD
Displacement of center of gravity	I	II	-6.41250**
		III	-10.50100**
	II	I	6.41250**
		III	-4.08850
	III	I	10.50100**
		II	4.08850

Note: * - Significant at 0.05 level. Height groups: I=5'5'' to 5'8'', II=5'9'' to 6', III=6'1'' to 6'4''

Table 04 indicates that first height group players i.e. 5'5'' to 5'8'' were significantly different from the other two height group players in displacement of center of gravity.

5. Discussion of the Findings

Time to perform the course showed no significant difference among the three different height groups. It was analyzed that 7% of contribution in the performance of set shot was caused by time to perform the course but when we consider players of different heights, time period among different height players may not be different in performing the skill of set shot.

In another previous research study on the relationship of kinematic variables with the performance of standing broad jump (Ruhal A.S. and Ruhal G.S, 2014) it was found that the angle at knee joints and angle at ankle joints were significantly related with the performance in broad jump. In the same study it was also found that the time taken to perform the broad jump was not significantly related with the performance in broad jump. It is felt that executor of any skill, usually take its time according to the personal style of technique. Therefore, the main concentration players put is on performance or accuracy of the technique not on time consumption (it is preferred on the sports where fraction of seconds do not matter much but the accuracy plays important role)

It was also found that the displacements of center of gravity of the shooter have no relationship with the performance of set shot in basketball. Previous study with the purpose to investigate the pattern of motion of the striking arm and muscular/joint activities responsible for it during the arm swing phase of the volleyball spike (Soo Chung, 2013) also showed that the elbow muscles and joint contains no significant value in strengthening respective arm rotation and performance directly. Previous research to develop suitable and feasible criteria for the evaluating different variations of seoi nege and to find out the contributing biomechanical, anthropometric flexibility and motor fitness factors for effective execution of different variation of seoi nage (S. Dhananjoy, 1992) also shown that (i) left elbow joint, right knee joint and center of gravity at the basic stances prefer no correlation with the seoi nege perfecton and (ii) the angle at the ankle joint found not to be significantly correlated with total time as it was less effective too.

6. Conclusions

Based on the analysis and within the limitations of the study following conclusions were drawn:

1. Significant relationship was observed between time to perform the course and the performance of set shot in basketball. Therefore, selected variable puts impact on the performance of set shot.
2. There is no significant relationship found between the displacement of center of gravity and the performance of set shot of different height group players in basketball and therefore, the selected variable puts no impact on the performance of set shot.
3. Time to perform the course had lowest impact (7%) in the performance.
4. Displacement of center of gravity was significantly different in first group (5'5'' to 5'8'') from the other two groups.
5. Time to perform the course was not significantly different among three groups.

References

[1] Aboub, M.A. (2010). "A Biomechanical Model for the Upper Extremity Using Optimizational Structure of Kinesiology", *Journal of Physical Education*, Pb., Vol. 20, pp.120-121.

[2] Anndrews, J.G. (1995). "Strength Curves for Multiple - Joint Single Degree of Freedom Exercises", *Journal of Biomechanics*, Vol. 18, p.226.

[3] Andrzej W. and Elisaz J. (2004). "Kinematic Analysis of Handball Throws", *Annual Publishing-Poland Polish Air Force Institute of Medicine-II, p.37.*

[4] Asami, Takkaaki, and Toketo (1978). "An Analytical Study on the Position of the Center of Gravity in the Osae-waza (Art of Holding) in Judo". *Bulletin of the Association for the Scientific Studies on Judo*, Repsort V Tokyo: Kodokan.

[5] Aydin, Bergün and Mensure (2009). "Kinematic Analysis of Over Arm Movements for Different Sports", *Journal of Kinsiology*, Vol. 41, pp.105-111.

[6] Barfield, R.W. (2002). "Kinematic Instep Kicking Differences between Elite Female and Male Soccer Players", *Journal of Sports Science and Medicine*, Vol. 72,pp.286-294.

[7] Beach, Clark Richard (1984). "Kinematic Analysis of Spatial and Temporal Errors in Rapid Timing Tasks", *Dissertation Abstract International*, Vol. 44, p.270-A.

[8] Boyson, J.P. (1977). "Interactive Computer Graphics in the Study of Human Body Planner Motion under Free Fall Conditions", *Journal of Biomechanics*, Vol. 10, pp.783-787.

[9] Coh M. (2003). "Cathy Freeman's sprinting Technique", *Track Coach*, pp.4988-4992.

[10] Claessens, A. (1987). "Somatotype and Body Structure of World Top Judoists", *The Journal of Sports Medicine and Physical Fitness*, Vol. 27, pp.105-113.

[11] Cook, E.B. and Wherry, R.J. (1950). "A Statistical Evaluation of Physical Fitness Tools", *Research Quarterly*, Vol. 21, pp.94-111.

[12] Dawson and Lov (1984). "Relationship of Selected Kinematic Variables to in High Jump", *A Review of Literature - Athletic Training*, Vol. 14, pp.161-164.

[13] Dapena, Jesus (1985). "Systematic Error in Three-Dimensional Coordinates within a Large Object - Space when Using DLT & NLT Methods of Three Dimensional Cinematography", *Journal of Biomechanics*, Vol. 18, p.230.

[14] Deol, N.S., S. Mandeep and Gill, M. (2014). "Physical Education for Special People: A Kinematical Analysis", *HPE Forum Bi-annual Professional Journal*, Vol. 08, pp.47-50.

[15] Deusinger, Robert H. (1969). "A Kinetic Analysis of the Book Break Fall and Force of Impact in Judo", *Completed Research in Health, Physical Education and Recreation*, Vol. 11, pp.145-146.

[16] Greenwald, Rosca and Morra (2009). "Assessment of Influence of Contemporary Knee Design on High Flexion", *Human Mov. Sci.*, Vol. 16, pp.457–467.

[17] Greeve, D.w. (1969). "A Device Called The Polon for the Measurement of the Orientation of Parts of the Relative to a Fixed Externalo Axis", *Journal of Physiology*, Vol. 07, p.201.

[18] Guimaraes R. and Cliquet (2009). "Kinematic Analysis of the Knee when Climbing up/down Stairs in Patellofemoral Instability", *Acta. Ortop. Bras.*, pp.157-154.

[19] Huang Chi (2009). "Biomechanics of Standing Long Jump with Handheld Weight", *Journal of Sports Sciences*, Vol. 17, pp.574-575.

[20] Hutto, Louis E. (1938). "Measurement of the Velocity Factor and of Athletic Power in High School Boys", *Research Quarterly*, Vol. 39, p.109.

[21] Ikai, M. and Matsumoto Y. (2014). "The Kinetics of Judo", *Bulletin of the Association for the Scientific Studies on Judo*, Report I Tokyo: Kodokan.

[22] Ikai, M. (1968). "Electromyographic Studies on the Nagewaza (Throwing Techniques) of Judo", *Bulletin of the Association for the Scientific Studies on Judo*, Report II Tokyo: Kodokan.

[23] Kelly McKean (2009). "Kinematic & Kinetic Differences between Male & Female Soccer Players", *ISB XXth Congress - ASB 29th Annual Report*, Cleveland, Ohio, p.458.

[24] Kim L. (1979). "Kinematical Analysis of the Flight Phase in the Long Jump", *Journal of Biomechanics*, Vol. 12, pp.147-157.

[25] Kitagawa, Onishi and Kato (2001). "Kinematical Variables of Underwater Running and Walking", *IEEE Annual Int. Conf. on Systems, Man, and Cybernetics*, Charlottesville, VA.

[26] Lusin, G.F. (1979). Gajdosik, R.L. and Miller, K.E., "Goniometry: A Review of the Literature", *Athletic Training*, Vol. 14, pp.161-164.

[27] Miller, D.I. (1978). "Biomechanics of Running what should the Future Hold", *Canadian Journal of Applied Sport Sciences*, Vol. 3, pp.229-236.

[28] Miura, S. (1970). "An Electrogoniometric Study of a Judo Throwing Technique", *Judo Throwing Technique*, Vol. 42, pp.51-57.

[29] Motoyasu, Koshiyama and Katsumata (2009). "Effects of Joint Movement on the Accuracy of 3-point Shooting in Basketball", *Journal of Sports Sciences*, Vol. 17, pp.85-93.

[30] Murtaugh and Karen (2001). "Initiating Rotation in Back and Reverse Arm Stand Triple Somersault Tuck Dives", *Journal of Applied Sciences*, Vol. 17, pp.21-27.

[31] Nesbit S.M. (2005). "A Kinematic and Kinetic Study of the Golf Swing", *Journal of Sports Science and Medicine*, Vol. 4, pp.499-509.

[32] Rojas F.J., Cepero and Gutierrez (2000). "Kinematic Adjustments in the Basketball Jump Shot against An Opponent", *Annual Ergonomics*, Vol. 43, pp.1651-1660.

[33] S. Mandeep (2010). "Evaluation and Improvement of Sports Techniques through Biomechanical Updated Analyzing Technology", *University News - Special Issue*, Association of Indian University, Vol. 48, pp.54-57.

[34] Soo Chung (2013). "Analysis of Motion of the Striking Arm and Related Muscular/Joint Activities in Volleyball Spike", *Dissertation Abstract International*, Vol. 77, pp.48-49.

[35] Smith R., Bake M. and Fiatarone (2009). "Gait and Posture in Arthritic and Healthy Knees", *Scientia Iranica*, Vol. 3, pp.257-261.

[36] Winter, D.A. (1974). "Measurement anpd Reduction of Noise in Kinematics of Locomotio", *Journal of Biomechanics*, Vol. 7, pp.157-159.

[37] Zernicke, R.F. (1976). "Fitting Biomechanical Data with Cubic Spline Functions", *Research Quarterly*, Vol. 45, pp.9-19.

[38] Zhou Fou (2009). "Kinematical Research on Elite Chine's Male 3m Spring Board Divers", *Human Mov. Sci.*, Vol. 16, pp.259-274.