

Kinematic Comparison of Different Technique of Putting the Shot at the Moment of Final Stance

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Abstract

Purpose: The purpose of the study was to conduct a kinematic comparison of different techniques of putting the shot at the moment of final stance. **Method:** Eight male shot putters of L.N.U.P.E. between the age group of 20 to 26 years, who had been participating regularly, were selected as subjects. 2 D silicon pro software was used for kinematical analysis of different techniques of putting the shot. Casio Exilim Ex F1 a standard camera which frequency was 300 frame/second and which was placed at 4.67 meter distance perpendicular to the subject in horizontal plane at height of 1.50 meter. To find out kinematical comparison between those shot putters who uses different stances t-test was used. For testing the hypothesis the level of significance was set at .05. **Result:** Results show that the calculated t value is .30, .210 and .703 in relation to linear kinematical variables i.e. performance, height of c.g. of subject and height of c.g. of shot. It also show that calculated t value for angular kinematic variables such as ankle (right & left),knee(right & left),hip(right & left),shoulder(right&left),elbow(right&left)andwristjoint(right&left)is (.568&.834),(.745&.341),(.266&2.613*),(.736&.767),(.262&.424) and (2.052&2.063) respectively. **Conclusions:** 1)Insignificant difference was found between those shot putters who uses different technique of putting the shot in relation to performance, height of c.g. of subject and height of c.g. of shot put.2)Insignificant difference was also found in relation to ankle (right & left), knee (right & left) and hip joint (right), shoulder (right & left), elbow (right & left) and wrist joint (right & left).3)Significant difference was found between those shot putters who use different technique of putting the shot in relation to hip joint (left).

KEYWORDS: Kinematic, Horizontal Plane, Techniques and Shot Put.

*Significant at .05 level

INTRODUCTION

The standard throwing events in track and field are the shot put, discus throw, the javelin throw and the hammer throw. In each of these events, the athlete's objective is to obtain as large a displacement of the implement as possible as, without infringing the rules governing the recording of a legal throw. The principal rules with which the athlete is concerned are those prescribing the manner in which the implement is to be thrown, the sector in which it must land, the manner in which it is to land (javelin throw) and the forward limits of the area from which the throw must be made. It is close that all the facts of shot technique have not year been explored. This is unfortunate, as otherwise use may reach a point of stagnancy, as the case might well have been where it is not for an innovation such as introduction by Perry O'Brien. Before O'Brien

we were probably more concerned with ‘‘style’’ as the new stance introduced by O’Brien paired the way towards a more scientific approach to shot putting. Today technique is equally the key to better performance, although we cannot escape the facts that ‘‘style’’ will always be an integral aspect in ultimate performance. This is due to the differences in the physical and anatomical structure of the human body, which differs from athlete to athlete.

Objective of the Study

The objective of the study was to conduct a kinematic comparison of different techniques of putting the shot at final stance.

Material and Methods

Eight male shot putters of L.N.U.P.E. between the age group of 20 to 26 years, who had been participating regularly were selected as subjects, the subjects had been undergoing training for a considerable period. Therefore it was considered that they possess good level of technique. Casio Exilim Ex F1 a standard camera for videography was employed for conducting the kinematical analysis of putting the shot. The frequency of the camera was 300frames/second. Kinovea Video analysis software was used for the analysis of kinematical variables at the moment of final stance. The subjects were photographed in saggital plane in controlled conditions. The distance of the camera from the subject was 4.67 meters and was fixed 1.50 meter height. An object of known dimension was also filmed prior to the filming the subject for reference purpose. The scholar developed stick figures utilizing joint point method. The angles at various joints were measured by Kinovea video analysis software. The centre of gravity of each subject at moment final stance was located by using segmental method. Each athlete was given three trials. The performance was measured from the inner edge of throwing circle to the point where the shot touched the ground, by using a steel tape. The performance was recorded in meter.

The following variables were selected for the purpose of the study:-

- Ankle Joint (Right, Left)
- Hip Joint (Right, Left)
- Elbow joint(Right, Left)
- Height of C.G. of subject at final stance.
- Length of Final stance.
- Height of C.G. of shot at final stance.
- Knee Joint (Right, Left)
- Shoulder Joint (Right, Left)
- Wrist Joint (Right, Left)

Two techniques were considered

- Final Stance (Less than 80 cm.)
- Final Stance (More than 80 cm.)

Results, Discussion and Conclusions

The statistical analysis of data was conducted on the kinematical variables (linear and angular) of eight male shot putters of Lakshmibal National

University of Physical Education, Gwalior while executing put from final stances of different cm. The “t” test was used to carry out the kinematical comparison from different final stances on the performance of shot putters. In order to test the hypothesis the level of significance was set at 0.05. The results are given in table 1, 2,3.

Table-1
COMPARISON OF MEANS OF PERFORMANCE OF SUBJECTS
USING DIFFERENT FINAL STANCES

Group	No. of Sub.	Means	S.D	d/f	t-ratio
Short final stance	4	11.18	.990	6	.300
Long final stance	4	11.02	.345	6	

Required value of ‘t’ for 6 degree of freedom at .05 level is 2.44 As shown in table- 1 that insignificant difference was found between the performance of subjects while putting the shot from various stances i.e. less than 80 cm, more than 80 cm. The obtained value of t – ratio of .30, was less than the required value at the selected level of significance. It is also shown at the figure-1.

Figure-1
COMPARISON OF MEANS OF PERFORMANCE OF SUBJECTS
USING DIFFERENT FINAL STANCES

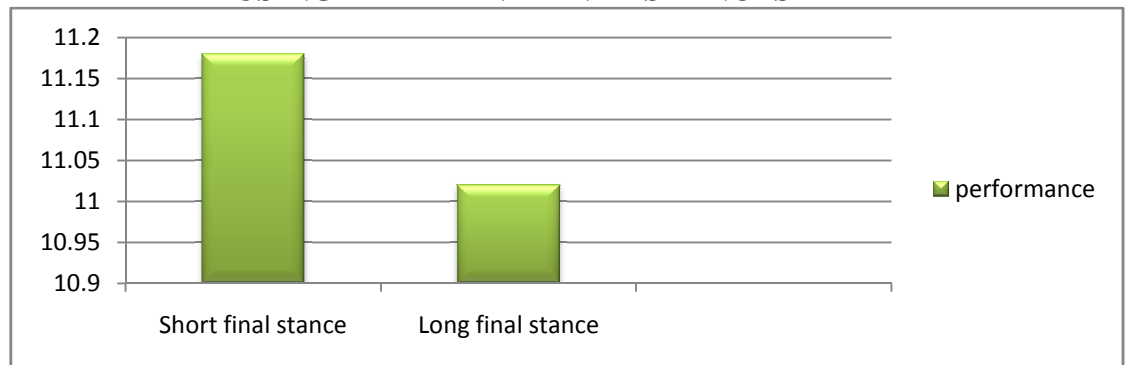


TABLE – 2
COMPARISON OF MEANS OF HEIGHT OF CENTRE GRAVITY AT
THE MOMENT OF FINAL STANCE

variable	group	No. of subject	Mean(M)	S.D.	d/f	T-ratio
Height of c.g. of subject	S.F.S	4	.93	.094	6	.210
	L.F.S	4	.95	.191		
Height of c.g. of shot	S.F.S	4	1.14	.106	6	.703
	L.F.S	4	1.20	.159		

S.F.S. = Short Final Stance, L.F.S. = Long Final Stance, Required value of ‘t’ for 6 degree of freedom at .05 level is 2.44.

Table- 2 shows that the insignificant difference was found between the means of height of centre of gravity of the subjects in putting the shot at the moment of various stances i.e. the obtained value of t-ratio of .210, was less than the required value at the selected level of significance. There was also insignificant difference found between the means of height of centre of gravity of the shot at the moment of various stances. The obtained' ratio of .703 was less than the required value at the selected level of significance. It is also shown through the figure-2

Figure-2
COMPARISON OF MEANS OF HEIGHT OF CENTRE GRAVITY AT THE MOMENT OF FINAL STANCE

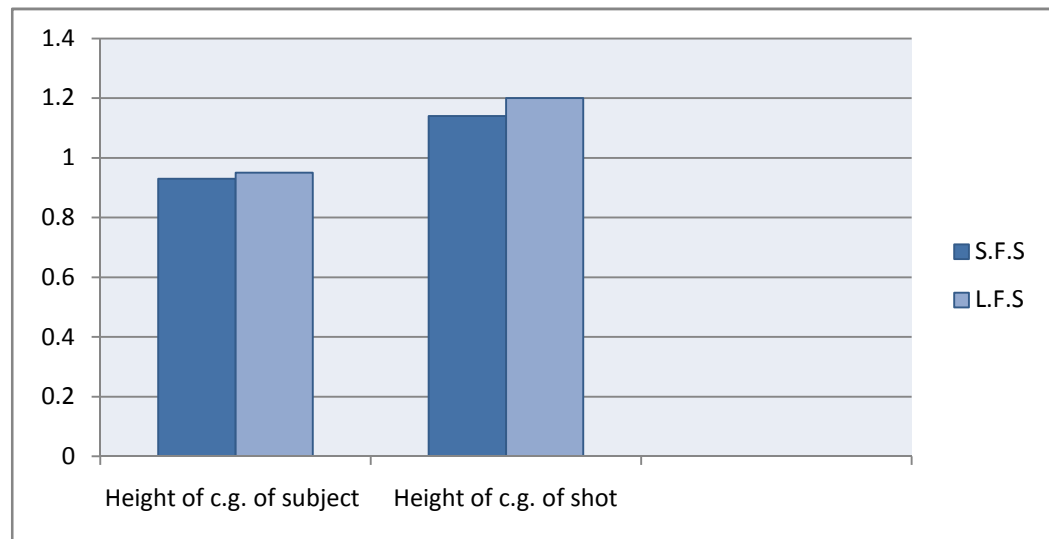


TABLE – 3
COMPARISON OF MEANS OF ANGULAR KINEMATIC VARIABLES OF THE SUBJECTS AT THE MOMENT OF FINAL STANCE

Variables (Angles in Degree)	Group	Subject	Means (Degree)	S.D.	d/f	t-ratio
Ankle Joint (Right)	S.F.S.,L.F.S	4	102.,97.25	12.56,11.02	6	.568
Knee Joint (Right)	S.F.S.,L.F.S	4	147.7,125.7	5.25,58.86	6	.745
Hip Joint (Right)	S.F.S.,L.F.S	4	110.7,115.2	81.25,83.50	6	.266
Shoulder Joint (Right)	S.F.S.,L.F.S	4	151.5,147.5	20.44,18.48	6	.736
Elbow Joint (Right)	S.F.S.,L.F.S.	4	166.2,160.5	4.78,20.35	6	.262
Wrist Joint (Right)	S.F.S.,L.F.S.	4	153.2,158.2	23.21,14.54	6	2.052
Ankle Joint (Left)	S.F.S.,L.F.S.	4	112.7,131.2	9.84,8.53	6	.834

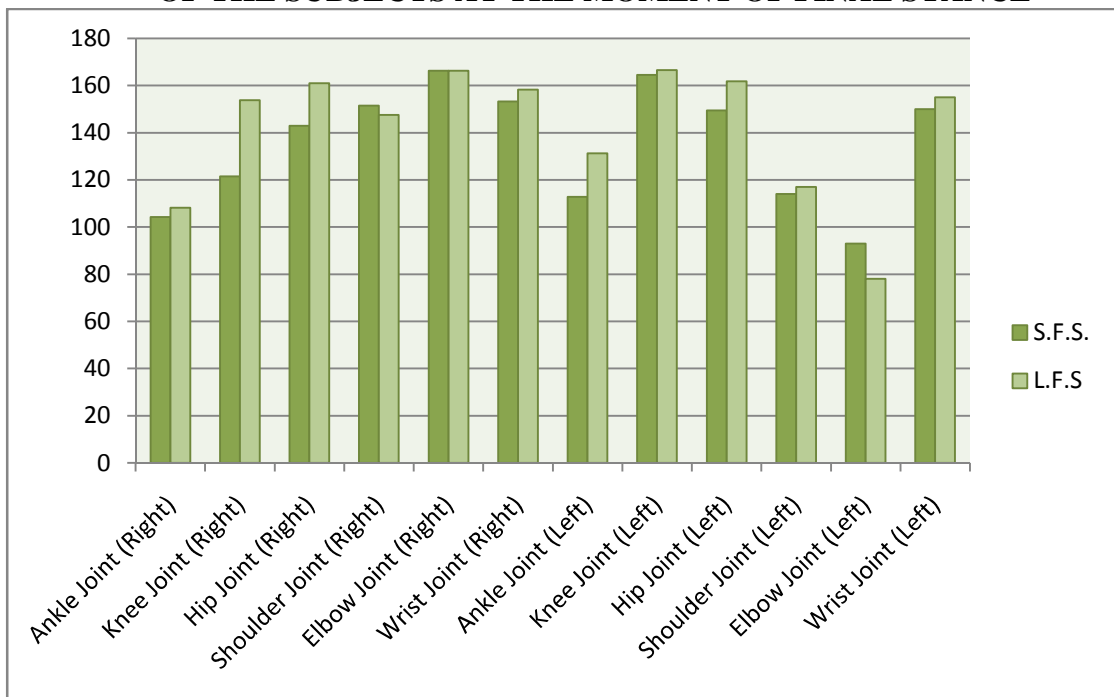
Knee Joint (Left)	S.F.S.,L.F.S.	4	164.5,166.5	10.21,5.06	6	.341
Hip Joint (Left)	S.F.S.,L.F.S.	4	149.5,161.7	14.64,161.7	6	2.613*
Shoulder Joint (Left)	S.F.S.,L.F.S	4	14.0.,17.0	10.98,9.28	6	.767
Elbow Joint (Left)	S.F.S.,L.F.S	4	26.93,158.0	144.0,62.88	6	.424
Wrist Joint (Left)	S.F.S.,L.F.S	4	150.7,170.5	18.67,4.203	6	2.063

S.F.S.-short final stance, L.F.S.-Long final stance, Required value of ‘t’ for 6 degree of freedom at .05 level is 2.44

Table-3 shows that there was no significant difference among the means of angle of right ankle joint, knee joint, hip joint, shoulder joint, elbow joint, wrist joint at various final stances. As it was also showed that calculated ‘t’ value which was lesser than the tabulated value at the selected level of significance.

There was also no significant difference among the means of angles of left ankle joint, knee joint, hip joint, shoulder joint, elbow joint, wrist joint at various final stances. As it was shown that calculated value of ‘t’ ratio was lesser than the tabulated value at the selected level of significance. It is also shown on the figure-3.

**Figure-3
COMPARISON OF MEANS OF ANGULAR KINEMATIC VARIABLES
OF THE SUBJECTS AT THE MOMENT OF FINAL STANCE**



Discussion of Findings

The result of the study show that there was significant difference was found between those shot-putters who uses short final stance and long final stance in relation to hip joint (left) this might be due to torque between hip and shoulder axis. The shot putters who use the length of final stance less than 80 cm. easily maintain torque in comparison to those shot putters who uses final stance more

than 80 cm and the shot putters who use narrower final stance to get the advantage of impulse. If the radius of rotation becomes too great, Lanka (2000) cautioned that it might actually hinder the speed at which the throwing arm can be extended and can potentially affect the linearity of the release. (Judge, 1991) more specifically, the delivery of an athlete using the narrower stance associated with the long-short technique may require a more forward facing orientation than an athlete using the short-long technique. The present study was supported by the study conducted by Lanka (2000) and not supported by (Judge, 1991). Insignificant difference was found in relation to performance, height of c.g. of shot, height of c.g. of subject, ankle joint (right & left), knee joint (right & left), hip joint (right), shoulder joint (right & left), elbow joint (right & left) and wrist joint (left & right) this might be due to due in both technique after achieving power position make similar body position kept shot as far back as possible in both technique torque is created between hip and shoulder axis c.90 J. Stepanek (Athens, 1986) conducted study on "Comparison of the Glide and the Rotation Technique in the Shot Put" and concluded that Comparison of the back and rotation technique in the shot put of juniors confirmed that the mechanical principles and characteristic features of the two techniques are similar. Present study supported by the study conducted by J. Stepanek (Athens, 1986).

Conclusions

- 1) Insignificant difference was found between those shot putters who use different technique of putting the shot in relation to performance, height of c.g. of subject and height of c.g. of shot put.
- 2) Insignificant difference was also found in relation to ankle (right & left), knee (right & left) and hip joint (right), shoulder (right & left), elbow (right & left) and wrist joint (right & left).
- 3) Significant difference was found between those shot putters who use different technique of putting the shot in relation to hip joint (left).

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