KINEMATIC ANALYSIS OF TAKE-OFF IN TRIPLE JUMPERS

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ABSTRACT

The purpose of the study was to give an account of the various kinematic parameters of take-off in triple jump and their relationship with the performance of the jumpers. Two male triple jumpers participated in this study one of which had Gold medal in the 2018 Asian games while the other participant was a bronze medalist in the Commonwealth games. The data was recorded with a video camera that recorded at 50 fps. Kinematic variables were extracted with motion analysis software (Silicon coach pro ver-8). The relation between the investigated kinematic parameters and the triple jump performances were calculated using the Karl pearsons coefficient of correlation. This study found that hip joint angle at take-off and take-off time correlated negatively with the triple jump performance of the jumpers with values of correlation -0.441 and -0.407 respectively.

Keywords: Kinematic, Jump, Hip Joint and Time.

INTRODUCTION:

Triple jump is one of the three jumping events in the track and field. A triple jump performance starts with an approach run fallowed by three complex movements that include hop, step and jump compared to long jump which only has one touchdown after the take-off. Triple jump is an asyclic- movement in structure, and a very demanding and complex athletic discipline characterized by a very high unity of motor skills and abilities (speed, explosive power, coordination, flexibility balance) that are precisely crucial for a successful performance(Pavlovic,2018). The distance of the third jump is crucial ,how to make the distance of the third jump farther is an important means to improve the overall performance. The take-off angle of the third jump is also crucial the performance of the triple jump. (Jin S; Liu F, 2014)

METHOD AND PROCEDURE: The problem is entitled Kinematic analysis of take-off in triple jump.Testing took place in the track B of NIS Patiala was the two athletes have been training for an upcoming international athletics event. The athletes were allowed to warm-up which included jogging and then stretching exercises. The warm-up session lasted for up to 30 minutes. By the time athletes had finished their warming up the researcher's team had set the recording situation. The two jumpers then did their triple jumps one after the other, with enough time between the jumps to make them recover.30 jumps were recorded from each athlete and the jump length was measured for each attempt. The jumps were the athlete overstepped or did any other fouls; those attempts were discarded and were not used for analysis process.

SELECTION OF VARIABLES

The selected variables are as follows:

The hip joint vertical acceleration at time of take-off

Time duration of support phase.

CRITERION MEASURE

The criterion measure for this study was the performance of the jumper. Total of fifteen attempts were given to each subject. The performance of each jump was judged accurately and performance was recorded.

The selected biomechanical variables such as Projection angle at the time of take-off, Angle of ankle joint (take-off leg) at the time of take-off, Angle of knee joint (take-off leg) at the time of take-off, Angle of Hip joint at the time of take-off, Horizontal velocity of the Ankle joint at the time of take-off, Vertical velocity of the Ankle joint at the time of take-off, Horizontal velocity of knee joint at the time of take-off, Vertical velocity of the knee joint at the time of take-off, Horizontal velocity of the hip joint at the time of take-off, Vertical velocity of the hip joint at the time of take-off.

FILMING PROTOCOL

This study employed the vedography technique to record the data on subjects. To record the video of the triple jump athletes, while they were performing the technique, digital video camera (50 fps) was used by a professional photographer who was instructed by theresearch scholar. After obtaining the recorded footage, the videos were analyzed through Quintic coaching v-17 software approved by Human kinetics. First the videos were digitized through Quintic coaching v-17 software. After the procedure of digitizing, the video were calibrated. The calibrated video gave us the results through makers, stroboscopic effect technique, stick figures, stopwatch programming, angle manual (horizontal, vertical, and draw angles), linear and angular analysis manual etc. With the help of "Quintic coaching v-17 software."

Motion capture technique/Digital videography will be used to analysis the kinematic variables of male triple jump athletes. Digital video camera CASIO EX-FH 100 (50 fps) was used for videography of triple jump athletes performance. The performance of the subject was recorded with stroboscopic effect from approach to landing. Digital video camera was placed 6 meter away perpendicular to the direction of motion at the right side of the athletes. The study demanded the use of Karl Pearson`s product moment coefficient correlation statistical technique to calculate the relation between selected kinematical variables with performance of male athletes in triple jump.

ADMINISTRATION OF THE TEST

Two Indian elite male triple jumpers who had represented at international level will be selected as a sample. All the selected subjects were asked to perform the triple jump with their full potential and accurate technique. The jumpers were well directed, informed and prepared for the study. Fifteen chances were given to every jumper. They were asked to perform the triple jump in the natural way as they actually perform. It was ascertained that subjects possess reasonable level of technique. Players were video graphed with systematic filming method as required. Motion capture technique was used in this study. To recorded the video of the triple jumpers, while they performing the jump, digital video camera (50 fps) was used by a professional photographer. The performance of the subject was recorded with stroboscopic effect

from approach to landing. Digital Video camera was placed 6 meter away at the perpendicular to the plane of motion.

ANALYSIS OF FILM AND COLLECTION OF DATA

Motion capture technique was used in this study. The films were analyzed by using standard **"quintic coaching v-17 software"**approved by **Human kinetics**. Videos. Analyzed through strobed photo sequence / stroboscopic effect, stick figure analysis, Quick snap shots with the help of software for analysis of selected variables are presented below:-

MEASUREMENT OF BODY ANGLES:

Angles were measured through videography technique. The videos of the short take-off were traced with the help of "Quintic coaching v-17 software" by using auto tracking markers on the selected body joints of the triple jump athletes. Using auto tracking markers in "Quinticcoaching v-17 software" the videos of triple jump attempts were analyzed. In order to receive the complete segmental diagram 'angle finding' option were selected in the software and marks of demanded joints were connected. After completing the marking by joining different highlighted marks on the selected body joints software automatically present the measurements of required angles. Different segments were drawn to find out different angles of the body. e.g., The angle of hip joint at time of take-off, The angle of knee joint at time of take-off, The angle of ankle joint at time of take-off.

STATISTICAL PROCEDURE

With regard to purpose of the study Karl Pearson's product moment coefficient correlation statistical technique was calculated between selected kinematical variables with performance of male triple jumpers. In order to check the significance, level of significanc was set at 0.05.

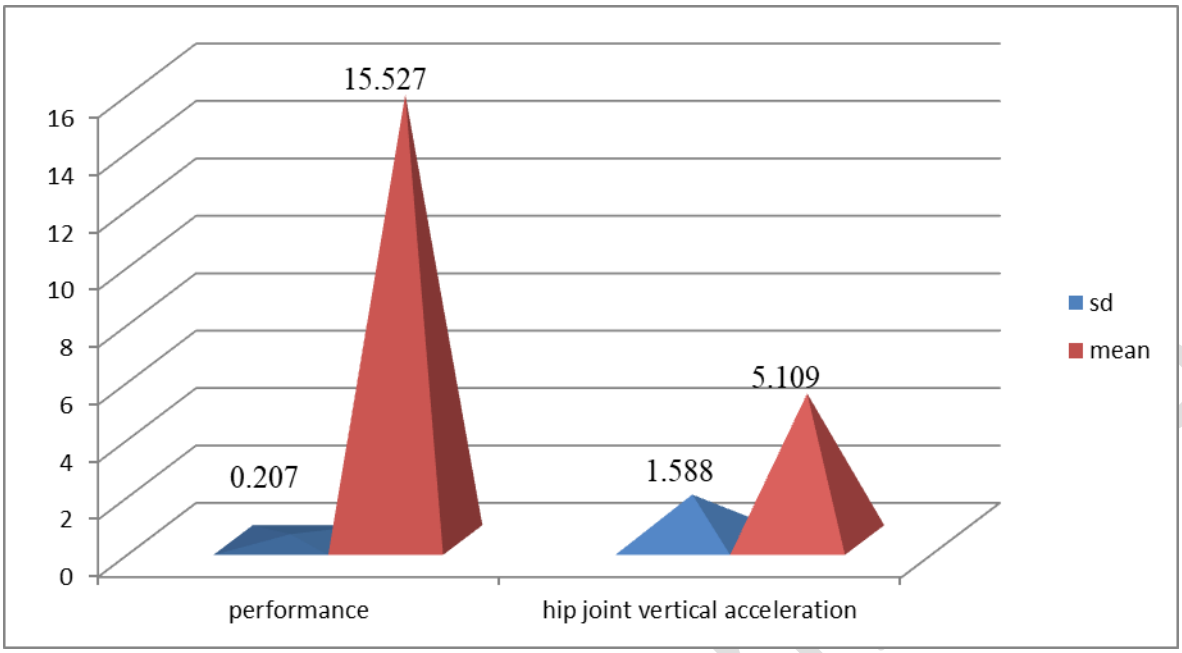
Table-1

Table 1: Relationship between take-off time of triple jumper's hip joint vertical acceleration and their performance

TRIALS	VARIABLES	Mean	STANDARD DEVIATION	CORRELATION (r) VALUES
30	Hip joint vertical acceleration	5.109	1.588	***0.658***
30	Performance	15.527	0.207	

'r'$_{0.05}$(28)= .361 significant at .05 level of significance

The table 1 shows the relationship between the hip joint vertical acceleration of the triple jumpers with their performance. The mean value of take-off is 5.109(s) while the standard deviation is 1.588. A correlation value of 0.6587 was found between the two variables



Graph 1: Mean and standard deviations of triple jumper's performance and hip joint vertical acceleration

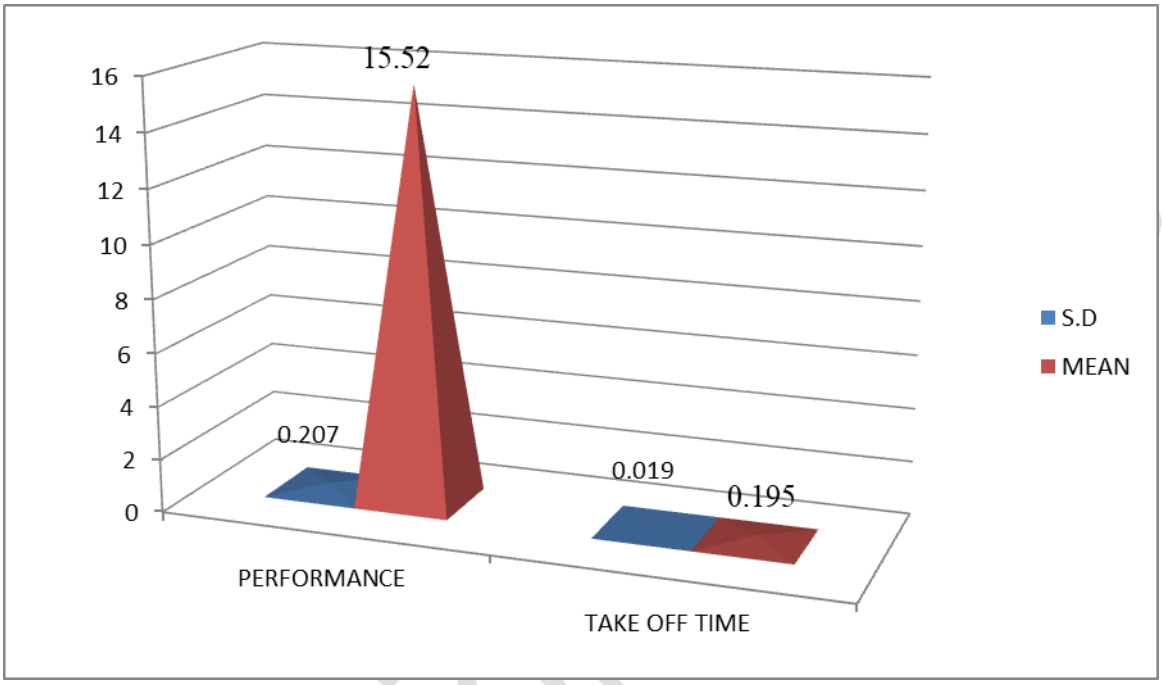
Table – 2

Table.2: Relationship between take-off times of the triple jumpers with their performance

TRIALS	VARIABLES	Mean	STANDARD DEVIATION	CORRELATION (r) VALUES
30	Take-off time	0.195	0.019	**-0.407**
30	Performance	15.527	0.207	

$r'_{0.05}(28)= .361$ significant at .05 level of significance

The table 2 shows the relationship between the take-off times of the triple jumpers with their performance. The mean value of take-off is 0.195(s) while the standard deviation is 0.019. A correlation value of -0.407 was found between the two variables.



Graph 2: Mean and Standard deviation values of triple jumpers take of time and their performance

CONCLUSION

This study claims two relationships of the selected kinematic variables with the performance of the athletes at 7m. The kinematic variables and their correlation values are: hip joint vertical acceleration at the take-off time (r=0.658), take-off time and their performance (-0.407).

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

1) There will be a significant relationship between take-off time and Performance of Indian elite male triple jumpers.

2) There will be significant relationship between Hip joint vertical acceleration and Performance of Indian elite male triple jumpers.

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