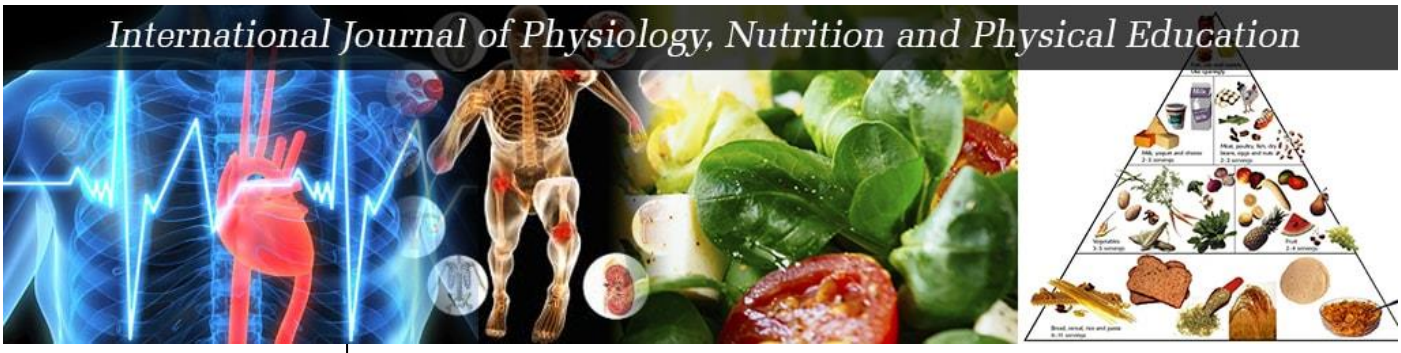

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Analysis the relationship between selected kinematic variables with performance of long jumpers

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Abstract
The aim of the present study was to investigate the relationship between selected Kinematic variables with performance analysis of Long Jumpers. Total two long jumpers were as a sample: Indian elite male long jumpers were selected as a sample on the basis of performance in preceding competition. The age of all the subjects was ranged above 18 years. The kinematic variables were Horizontal velocity of the hip joint, Vertical velocity of the hip joint and performance of long jump athletes. The Kinematic Analysis of long jump athlete's descriptive statistics and Karl Pearson's product moment coefficient correlation were employed with the help of statistical package of SPSS. The level of significance was set at 0.05. The outcome of the study shows that significant relationship with performance (-.917& .979) of Long Jump athletes in Horizontal velocity of the hip joint and Vertical velocity of the hip joint variables.

Keywords: Horizontal velocity, vertical velocity and kinematic

Introduction
The long jump is a formerly commonly called the "broad jump". It is a track and field event in which athletes combine speed and strength in an attempt to leap as far as possible from a takeoff point. The long jump is the only known jumping event of Ancient Greece's original Olympics' pentathlon events. The long jump has been part of modern Olympic competition since the inception of the games in 1896 (Hay Thorson and Kippenhan, 1999) [2].
A biomechanical analysis conducted from either of two perspectives, kinematics and kinetics. Kinematics is concerned with motion characteristics and examines motion from a spatial and temporal perspective without reference to the force causing the motion. A kinematic analysis involves the description of movement to determine how fast an object is moving, how high it goes, or how far it travels. Thus, position, velocity, and acceleration are the component of interest in a kinematic, analysis by examining an angular or linear movement kinematic, one can identify segments of a movement that require improvement, obtain ideas and technique enhancement from elite performers, or break a skill down into identifiable parts. By each of these, further understanding of human movement. Pushing on table may or may not move the table, depending upon the direction and strength of the push. A push or pull between two objects that or may not result in motion is termed a force. Kinetics is the area of study that examines the force acting on a system, such as the human body, or any object. A kinetic movement analysis attempts to define the forces causing a movement. a kinetic movement analysis is more difficult than a kinematic analysis (Kelly, McKean (2009) [4].
Take-off mechanism: Just before touchdown the athlete pre-tenses the muscles of the take-off leg. The subsequent bending of the leg during the take-off is due to the force of landing, and is not a deliberate yielding of the ankle, knee, and hip joints. Flexion of the take-off leg is unavoidable and is limited by the eccentric strength of the athlete's leg muscles. Maximally activating the muscles of the take-off leg keeps the leg as straight as possible during the take-off. This enable athlete's COM to pivot up over the foot, generating vertical velocity via a purely mechanical mechanism. Over 60 per cent of the athlete's final vertical velocity is achieved by the instant of maximum knee flexion, which indicates that the pivot mechanism is the single most important mechanism acting to create vertical velocity during the take-off. The knee extension phase makes only a minor contribution to the generation of vertical velocity, and the rapid plantar flexion of the ankle joint towards the end of the take-off contributes very little to upward velocity.

Long jumpers spend a lot of time on exercises to strengthen the muscles of their take-off leg. Greater eccentric muscular leg strength gives the athlete a greater ability to resist flexion of the take-off leg, which enhances the mechanical pivot mechanism during the take-off and hence produces a greater take-off velocity. The stretch-shorten cycle, where the concentric phase of a muscle contraction is facilitated by a rapid eccentric phase, does not play a significant role in the long jump take-off. Rather, fast eccentric actions early in the take-off enable the muscles to exert large forces and thus generate large gains in vertical velocity. In the long jump take-off the instant of maximum knee flexion is a poor indicator of when the extensor muscles of the take-off leg change from eccentric activity to concentric activity (Lees, Fowler and Derby 1993, Lee, *et al*., 1994) [5, 6].

Vertical velocity is a special type of velocity because velocity in the vertical direction is always affected by acceleration due to gravity. Any object thrown up, thrown down, or dropped in the vertical direction is affected by this acceleration, which has a magnitude of about 10 meters/second/second (or 10 meters/second squared) directed downward (toward the center of the Earth). The saying "what goes up must come down" is a perfect description of vertical velocity. The gravity of the Earth will cause objects to fall back down to the Earth at a rate of about 10 meters/second/second. The horizontal velocity of a projectile is constant (a never changing in value), in projectile motion, horizontal velocity is the rate at which an object is traveling parallel to the earth (Wikipedia).

Method and Procedure

Selection of subjects

Total two long jumpers were select as a sample: Indian elite male long jumpers who had represented at international level were selected as a sample on the basis of performance in preceding competition. The age of all the subjects was ranged above 18 years.

Selection of variables

- (HHv) Horizontal velocity of the hip joint at the time of take-off
- (HVv) Vertical velocity of the hip joint at the time of take-off

Criterion Measure

- The criterion measure for this study was the performance of the jumper. Total of six attempts were given to each subject. The performance of each jump was judged accurately and performance was recorded.
- The selected biomechanical variables such as 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

Motion capture technique/Digital videography was used to analysis the kinematic variables of male long jumper. Digital video camera CASIO EX-FH 100(50 fps) was used for videography of long jump performance. The performance of the subject was recorded with stroboscopic effect from approach to landing. Digital Video camera was placed 6meter away at the side of take-off leg (lateral axis) of the long jumper. After obtaining the recorded video, the video was analyzed through 'quintic coaching v-17 software' approved by Human kinetics.

Statistical Procedure

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

Results

Table 1: Shows Mean, S.D. and relationship value between horizontal velocity of Hip joint and performance of long jumpers

Trials	Variable	Mean	S.D.	Correlation (r) Values
12	Horizontal velocity of Hip joint	-12.62	1.80	-.917*
12	Performance	7.60	.078	

'R'0.05(10) = 0.576
*=Significant at .05 level of significance

Table & figure no. 2: illustrations that the Mean and S.D. value of Horizontal velocity of Hip joint of long jumpers was -12.62± 1.80 respectively. But in performance variable the mean and S.D value is 7.60±.078 respectively. At the time of calculation of relationship between Horizontal velocity of Hip joint with performance of long jumpers the r value was 0.979, it is more than the tabulated value. The outcome does recommend that there is significant relationship between Horizontal velocity of Hip joint and performance of long jumpers.

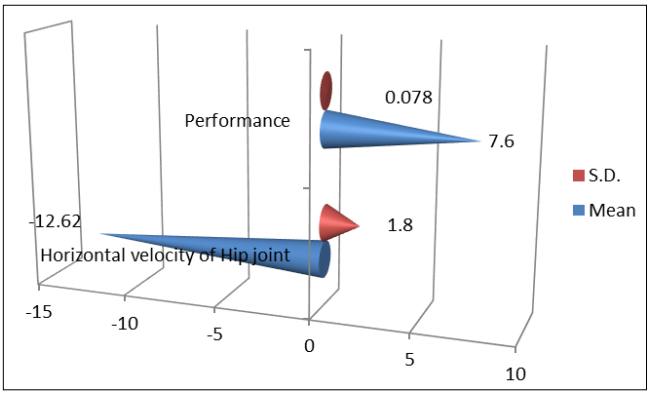

Fig 1

Table 2: Shows Mean, S.D. and relationship value between Vertical velocity of Hip joint and performance of long jumpers

Trials	Variable	Mean	S.D.	Correlation (r) Values
12	Vertical velocity of Hip joint	2.44	.521	.979*
12	Performance	7.60	.078	

'R'0.05(10) = 0.576
*=Significant at .05 level of significance

Table & figure no. 2: illustrations that the Mean and S.D. value of Vertical velocity of Hip joint of long jumpers was 2.44± .521 respectively. But in performance variable the mean and S.D value is 7.60±.078 respectively. At the time of calculation of relationship between Vertical velocity of Hip joint with performance of long jumpers the r value was 0.979, it is more than the tabulated value. The outcome does suggest that there is significant relationship between Vertical velocity of Hip joint and performance of long jumpers.

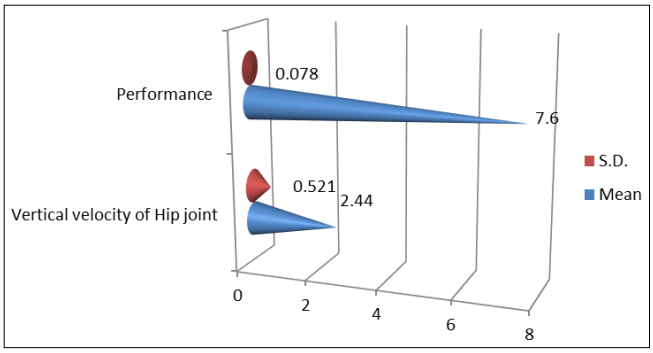

Fig 2

Discussion of the Funding

The result of the study informs that there was significant relationship between Horizontal and vertical velocity of Hip joint of long jumpers with performance. On the basis of analysis of the data, investigator found that the earlier study of Gideon Ariel, Andrei Vorobiev and Igor Ter-Ovanessian (1993) "Biomechanical Analysis of the World Record Long Jump" supported the present study.

References

1. Gideon Ariel, Andrei Vorobiev, Igor Ter-Ovanessian Biomechanical Analysis of The World Record Long Jump-11 International Symposium on Biomechanics in Sports. 1993; 2:101-109. ISSN 1999-4168.
2. Hay JG, Thorson EM, Kippenhan BC. Changes in muscle-tendon length during the take-off of a running long jump'. Journal of Sports Sciences. 1999; 17:159-72.
3. https://en.wikipedia.org/wiki/Projectile_motion
4. Kelly McKean. Kinematic & Kinetic Differences between Male & Female Soccer Players", ISB XXth Congress-ASB 29th Annual Report, Cleveland, Ohio, 2009, 458.
5. Lees A, Fowler N, Derby D. A biomechanical analysis of the last stride, touch-down and take-off characteristics of the women's long jump'. Journal of Sports Sciences. 1993; 11:303-14.
6. Lees A, Graham-Smith P, Fowler N. A biomechanical analysis of the last stride, touchdown, and takeoff characteristics of the men's long jump'. Journal of Applied Biomechanics. 1994; 10:61-78.