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How Elastic Power is Related to Long Jump Performance ?

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Abstract: **The purpose of this investigation is to find out the relationship among elastic power and long jump performance. To achieve the purpose of the study, 20 male physical education students' age ranging from 18 to 21 were purposively selected to act as subjects. Measurement for elastic power was done by depth jump test from dropping height of 45cm. Running long jump was measured by using running long jump performance. The Pearson's Product moment correlation was used in order to find out the relationship between selected variables. The level of significance was set at 0.05. Results showed statistically significant ($p<0.05$) coefficient of correlation ($r=0.67$) among selected variables. The positive value of Coefficient of correlation indicates that increase in depth jump performance is followed by increase in running Long jump performance. These findings suggest that elastic power testing and training should be utilized for enhancing long jump performance.**

Keywords: **Long Jump; Elastic power; Depth jumping.**

1. INTRODUCTION

The Long Jump is a contest that determines how far a competitor can jump horizontally after a running start (Srivastava, 2007).Whenever a long jumper makes contact with the takeoff board, there is an absorption of the shock of landing marked by slight flexion of the hip, knee and ankle followed by a rapid extension of the takeoff foot and leg as the jumper leaves the board [2]. The long jump is a track and field event in which athletes combine speed, strength, and agility in an attempt to leap as far as possible from a take off point. This event has a history in the Ancient Olympic Games and has been a modern Olympic event for men since the first Olympics in 1896 and for women since 1948.

Genes play a major role in the ability to run fast, but there are ways to train that can significantly improve running speed. Sprinting is a matter of mechanical efficiency and transmitting nerve impulses from the brain to the muscles involved. Getting off the ground quickly is considered a major objective in stretch shortening cycle work and in running [3]. Muscle elasticity is an important factor in understanding how the stretch shortening cycle can produce more power than a simple concentric muscle contraction [2]. Elastic Power may be defined as ability of muscle or groups of muscles to release (exert) maximum force per unit of time during stretch-shorten cycle. During stretching phase, tension is developed in the muscle. The release of tension developed at the time of rapid stretching in a muscle, per second during stretch-shorten cycle is called Elastic Power of that muscle [4]. Therefore, the purpose of this study was to determine the extent of relationship among elastic power and Long Jump performance of Indian college level male athletes.

2. METHODOLOGY

2.1Sample:

Sample consists of 20 male physical education students' age ranging from 18 to 21 were purposively selected to act as subjects.

2.2 Criterion Measures:

The subjects participated in an instruction session before testing to ensure proper technique and comprehension of the testing process. Tests were demonstrated by the trained athletes. To ensure uniformity in the testing conditions, the subjects were tested in the morning sessions under the supervision of the Investigator. Subjects participated in a warm-up programme before testing for different criterion measures. 3-5 minutes rest was given between the tests due to the energy required was attaining from the phosphagen system [5]. 1-minute recovery of slow jog was given between trials for Depth Jump Test and Running long jump test. Administration of tests is as follows:

2.2.1. Depth jump test:

A black-board of 60x120cms2x4 feet painted with red lines parallel to the ground, one centimeter apart. The board was fixed firmly to a wall above the ground according to the reach point of the subject with shortest height. The subject was asked to stand with one side toward the wall, heels together and raised the fingertips marked with chalk powder to a maximum height on the black-board without lifting the heels so as to mark his maximum reach point. This reach point was recorded in centimeters. Then, the fingertips were re-chalked. With the chalked hand side toward the wall, the subject was asked to stand on a 45cms high box (height approved by [6]), toes closer to the front edge of the box. then, the subject took step from box and drop to the gymnastic mat on both feet and immediately upon landing in the shortest possible time, keep the body from "settling" on the landing and spring up as high as possible by swinging arms as demonstrated by the earlier trained helper to make another mark at the maximal height of the jump. This jump point marked on the black-board was recorded in centimeters. Three trials were given and the maximum difference between reach point and jump point was considered as the score in centimeters.

2.2.2. Running Long jump Performance:

A take-off area of 2.16 meters length (it was the average standing broad jump performance of 10 subjects tested for this purpose) was marked by spreading lime on the surface of the runway from the jumping pit (figure-1), to identify take-off mark. The subject was asked to perform a Long Jump after a sprint start by taking-off from the take-off area (figure-2) to jump as far as possible. The distance between landing spot near to the take-off area and take-off mark in the take-off area was measured. Three trials were given and performance was recorded to the nearest 0.01meter below the distance measured if the distance measured was not a whole centimeter. Best performance was considered as score.

Figure-1: jumping pit with take-off area.

Figure-2: A subject during Take-off in running Long Jump test.

3. STATISTICAL ANALYSIS

The Pearson's Product moment correlation was used in order to find out the relationship between selected variables. The level of significance was set at 0.05

4. RESULTS

The values of Relationship assessed between Elastic power and long jump are presented in Table-1. Since the obtained value of coefficient of correlation (r=0.67) is greater than the required value (0.468) for 0.05 level of significance for 18 Degrees of freedom. The positive value of Coefficient of correlation indicates that increase in depth jump performance is followed by increase in long jump performance. Therefore, Results showed statistically significant relationship among selected variables.

Table 1. The relationship between Elastic power and long jump

Variable	Subjects	df	r	p-value
Elastic power & running speed	20	18	0.67*	P<0.05

*significant at 0.05 level.

5. DISCUSSION

These results showed significant relationship among Elastic power and long jump performance as measured by depth jump test and running long jump test, respectively. This finding may be attributed to the results that indicate a negative correlation between jump length and contact time with the takeoff board during the long jump takeoff. In good performances, the center of gravity began to rise immediately after the first touch of the board, while in poorer jumps it remained at about the same height during the early contact phase [7],[8].

It is important to mention that long jump performance depends upon the ability to raise the body vertically at the time of takeoff after gaining horizontal momentum during the approach run. These findings have also reported in the existing literature, as Young et al. [9] found statistically significant relationships between drop jump performance and straight speed. Bissas and Havenetidis [10] concluded that sprinting ability is linked with drop jump performance especially the drop jump from height of 30 centimeters. Luhtanen and Komi [11] recognized the eccentric-concentric coupling in Running Speed. They partitioned the total contact time of the foot on the ground into negative contact time and positive contact time, assuming that with initial foot plant to the lowest position of the centre of gravity, the contact leg's extensor muscles were contracting eccentrically and performing negative work. The later portion of contact time consisted of concentric contractions with a rise in the center of gravity, the work being positive. It is further supported by Lundin and Berg [12] who attributed improved efficiency of running at higher speeds to the effects of the stretch reflex and use of elastic energy.

6. CONCLUSIONS

It is concluded from the above findings that elastic power as measured by using the depth jump test and long jump performance has positive relationship each other. The positive value of Coefficient of correlation indicates that increase in depth jump performance is followed by increase in long jump performance. Thus, athletic trainers and sports scientists who work to improve long jump performance of athletes should aware to test and train for elastic power.

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