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Analysis The Determining Factors Of Performance In Horizontal Jump

Dr. Limon Kumar Saha

Assistant Professor in Physical education, Post Graduate Govt. Institute For Physical Education, Banipur, 24 Pgs(n), W.B., India

Abstract

Focus of the researcher in present investigation was to understand about the contribution of velocity of the run-up and power of leg muscles on performance of horizontal jump as those are most influential factors to achieve the higher performance level in competition. To fulfill the purpose, 30 male district level horizontal jumpers were selected as subjects from different coaching clubs of North 24 Parganas, South 24 Parganas and Kolkata district of West Bengal for the present study. Their age were ranged from 12 to 14 years. Velocity of the run-up, power of leg muscles and performance of horizontal jumpers were measured through time of run up, Hop test and Running Broad Jump respectively.

In order to analysis the data and find out the relationship, Pearson product moment correction of coefficient was applied. Further Multiple Correlation was applied to find out the combined effect of velocity of the run-up and power of leg muscle on performance of horizontal jump. Level of significance was set at 0.05 level.

The researcher found significant relationship between velocity of run-up & performance in horizontal jump and also between the power of leg muscle & performance in horizontal jump. Researcher also noted that velocity of run-up and power of leg muscle both has a combined effect on performance in horizontal jump.

Key words: Velocity of run-up, Power and Horizontal jump.

1. Introduction

Sports have been emerging itself one of the strongest unifying factors since the very first Olympiad. It is widely seen that, in recent years, sports science has rapidly become a very popular study in the field of sports, and recent research into the human body's reaction to exercise and other impetuses are changing the way that athletes and sports persons trained themselves. Enhancement of Athletic performance is the major objective for both sports scientists and coaches. In both areas, experts are constantly dealing with various curriculums for the enhancement of the capacity and ability of athletes. On the one hand, where sports scientists are randomly trying to enrich the knowledge of different aspects of sports there, on the other hand, coaches are continuously trying to lift up the performance level of athletes by applying the different inventions of sports science. Where sports scientists are playing the pivoting role by discovering lots of scientific facts that often remain responsible for the performance of an athlete, there, trainers and elite coaches are desperately applying those examined results and making those research results much more popular among common people.

Athletics, probably the most popular and ancient sport in the world, is an Olympic sport played in virtually every country. Vigorous types of Track and Field events are in Athletics which are also divided into three categories i.e. running, jumping and throwing. Day by day new records are created by the sportsperson in their respective fields. The horizontal jump which is familiar with a term of horizontal jump, is a field event in which athletes require speed, explosive leg strength flexibility and agility in an attempt to leap as far as possible from a take-off point. Whereas sprint event is a track event in which athletes require speed and explosive leg strength. Both are mostly similar but their physical structure may demand some specific gesture according to their nature of activity.

Horizontal jump is one of most attractive event among them where an athlete needs most explosiveness to perform better. Horizontal jump can be divided into four phases: the approach run (or run up), take off, flight and landing and each require many fitness components, and however each focuses on a primary component. The approach run consists of the Speed fitness component, as this is essential in order to execute a good jump. It has been researched and found that the approach speed has been found to be one of the most influential factors influencing the jump distance. Power is important in the take off, as it needs to be explosive and fast. Balance is required in the flight phase, because without good balance, it is impossible to be in position for excellent landing. Muscular Strength and Flexibility are also important as they help protect the body; strength allows the athlete to control and change the direction of the athlete's centre of mass and flexibility helps the athlete avoid destroying the muscle, connective tissue and joints while competing.

So, based on today's view, we could shout strongly that knowledge of various scientific principles and techniques is the foremost condition for a coach to execute his job quite competently. He or she must be possessed the good and optimum scientific knowledge to dictate, implement, and maintain his or her

coaching philosophy on the trainees. With the knowledge of the science-based subject, he will be possessed in their academic career at the same time they will be capable of understanding all those minute-to-minute areas of modern coaching. The different areas of coaching and its supporting hands like physical trainers, nutritionists, physiotherapists, and masseurs, will be benefited from the wisdom of scientific subjects respectively. So, the relationship between scientific knowledge and coaches plays a very vital role to make coaching much more effective. It is the contribution of sports scientists that they have been constantly making the area of sports science equipped with much new information day by day. Their discovery and invention have been creating lots of opportunities for us to know the many unknown facts in this field. And finally, the results of those creations decorate all aspects of the coaching-learning process in the field of sports.

The prime objective of this study is to investigate the actual contribution of velocity of the run-up and power of leg muscles on performance of horizontal jump as those are most influential factors to achieve the higher performance level in competition.

2. Methodology

A total of 30 male horizontal jumpers were selected as subjects for the present study. Their age were ranged from 12 to 14 years. The subjects for the present study were selected on the basis of their minimum participation in district level conveniently from different coaching clubs of North 24 Parganas, South 24 Parganas and Kolkata district of west Bengal. Although the performance of horizontal jump may ultimately depend upon various factors, hence the following parameters were considered as variables for the present investigation.

Independent Variables :

- Velocity of Run-up
- Power of Leg Muscle

Dependent Variable :

- Performance in Horizontal jump

2.1. Criterion Measures

Variables	Measuring Tools/Techniques	Unit of Measurement
Velocity of Run-up	Stop Watch	**sec.**
Power of Leg Muscle	Hop Test	hp
Performance in Horizontal jump	Running Broad Jump	mt.

2.2. Design of the Study

The researcher adopted single group design to formulate the group as per the structure of the investigation and to fulfill its purposes. Horizontal jumpers were selected by following the purposive sampling technique as subjects for the present study.

2.3. Statistical Procedure

Mean and standard deviation of the selected variables were calculated as descriptive statistics of the sample group. In order to draw the conclusion about the impact of velocity of the run-up on performance in horizontal jump and also the influence of power of leg muscles on performance in horizontal jump, Pearson product moment correction of coefficient was applied. Further Multiple Correlation was applied to find out the combined effect of velocity of the run-up and power of leg muscles on performance of horizontal jump. Level of significance was set at 0.05 level to justify the significance of the results.

3. Analysis of Data and Findings of the Study

The findings with regard to the present study depict the descriptive statistics and relationship of velocity of run-up and power of leg muscle with performance of horizontal jump and data pertaining to that have been presented in forms of tables and graphical representation.

Table - 1

Descriptive Statistics of Velocity of Run-up and Performance in Horizontal jump and Correlation of Coefficient Between the Parameters of Horizontal jumpers

Variables	Mean	Standard Deviation	'r' Ratio
Velocity of Run-up (sec)	6.24	0.75	0.389**
Performance in Horizontal jump (mt)	4.79	0.46	

Significant value at 0.05 level of significance, $r_{0.05}(28) = 0.361$
****- Significant**

From the above table- 2, it is clearly seen that in respect of velocity of run-up, mean and standard deviation were 6.24±0.75 and in respect of performance in horizontal jump, mean & standard deviation were 4.79±0.46. The table also reflected that the correlation of coefficient was 0.389 which was higher than the tabulated value [$r_{0.05}(28) = 0.361$] at 0.05 level of significance. So it can be concluded that a significant relationship existed between velocity of run-up and performance in horizontal jump. The above result also indicates that there was a positive relationship between the above mentioned independent and dependent variables.

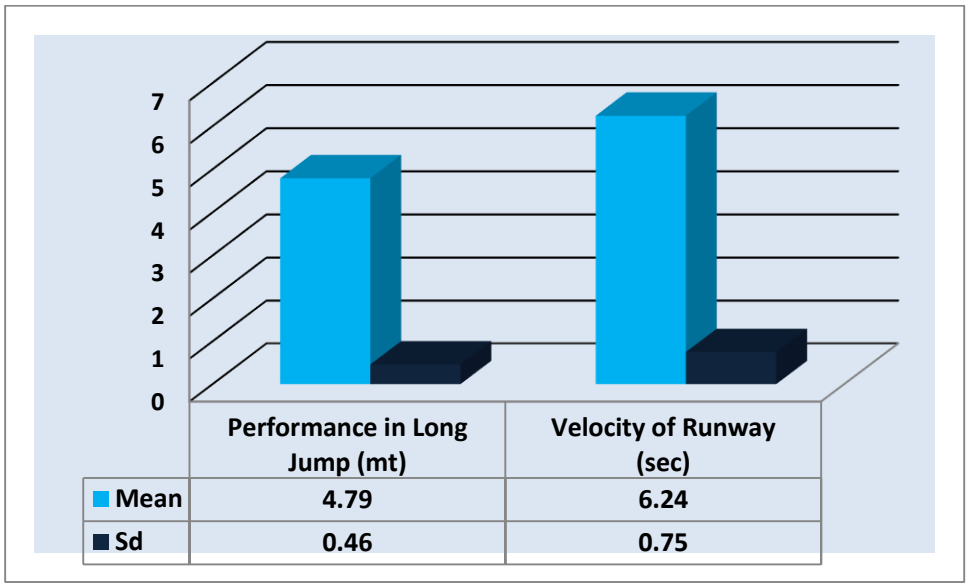

Fig-1 : Graphical Presentation of Descriptive Analysis of Velocity of Run-up and Performance in Horizontal jump

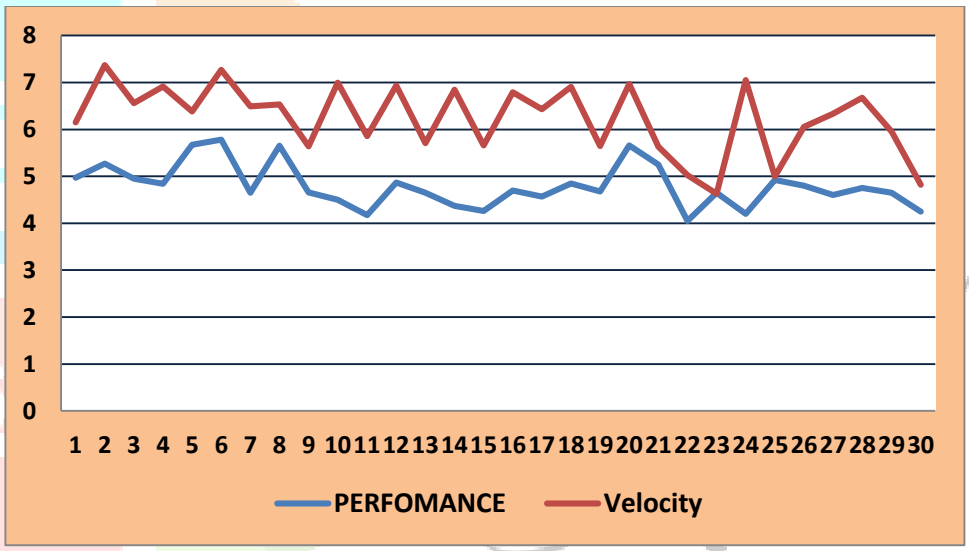

Fig-2 : Graphical Presentation of Association Between Velocity of Run-up and Performance in Horizontal jump

Table - 2

Descriptive Statistics of Power of Leg Muscle and Performance in Horizontal jump and Correlation of Coefficient Between the Parameters of Horizontal jumpers

Variables	Mean	Standard Deviation	'r' Ratio
Power of Leg Muscle (hp)	2.64	0.56	0.493**
Performance in Horizontal jump (mt)	4.79	0.46	

Significant value at 0.05 level of significance, $r_{0.05}(28) = 0.361$

****- Significant**

The above table no – 3 depicts that the descriptive statistics of power of leg muscle and performance in horizontal jump as mean and standard deviation of horizontal jumpers were 2.64 ± 0.56 and 4.79 ± 0.46 respectively. It also reveals that power of leg muscle and performance in horizontal jump are significantly associated with each other as the calculated 'r' value was 0.493 which was higher than the Table value,[$r_{0.05}$ (28) = 0.361] at 0.05 level of significance. The table also reveals that a positive relation exists between power of leg muscle and performance in horizontal jump.

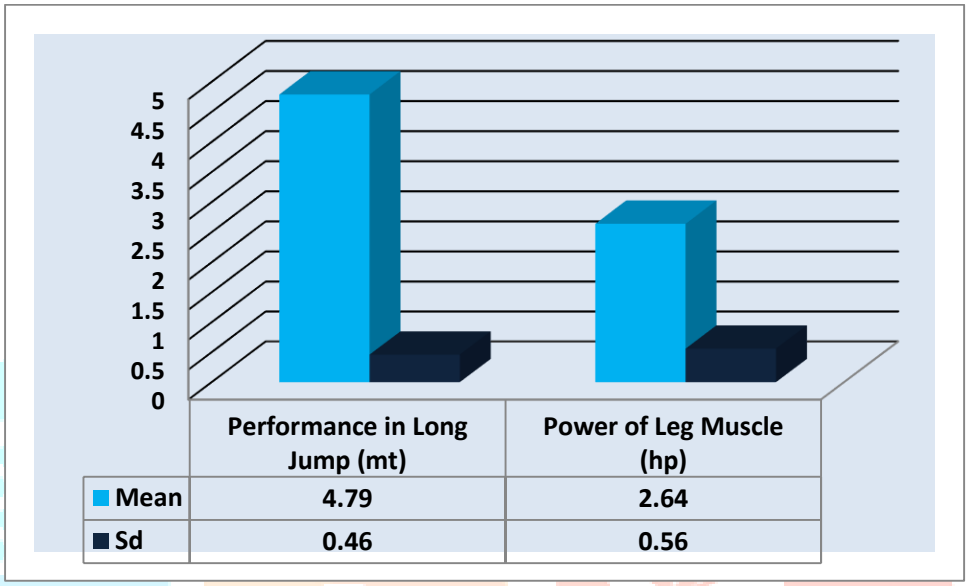

Fig-3 : Graphical Presentation of Descriptive Analysis of Power of Leg Muscle and Performance in Horizontal jump

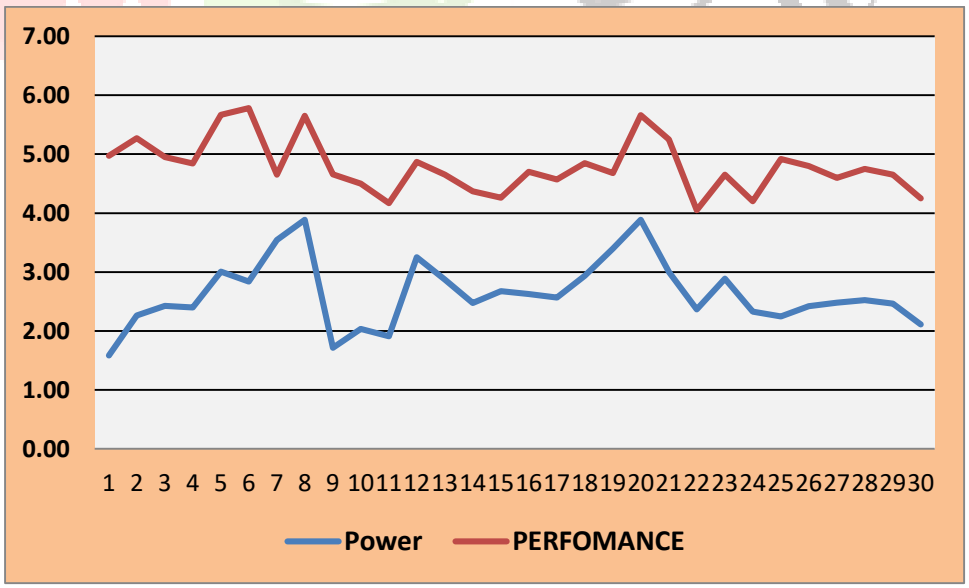

Fig-4 : Graphical Presentation of Association Between Power of Leg Muscle and Performance in Horizontal jump

Table - 3

Combined Impact of Velocity of Run-up and Power of Leg Muscle on Performance in Horizontal jump

Independent Variable	Dependent Variable	Correlation of Coefficient
Velocity of Run-up	Performance in Horizontal jump	r = 0.389
Power of Leg Muscle	Performance in Horizontal jump	r = 0.493
Velocity of Run-up and Power of Leg Muscle	——	r = 0.18
Velocity of Run-up and Power of Leg	**Performance in Horizontal jump**	**R = 0.58****

Significant value at 0.05 level of significance, $r_{0.05}(27) = 0.367$
****- Significant**

The above total reveals that the correlation of coefficient ('r' ratio) between velocity of run-up & performance, power of leg muscle & performance and velocity of run-up & power of leg muscle are 0.389, 0.493 and 0.18 respectively and the multiple correlation of coefficient ('R' ratio) was found 0.58 which was greater than the tabulated value ($r_{0.05}(27)=0.367$). So it can be concluded that there was a significant relationship of velocity of run-up and power of leg muscle with performance in horizontal jump which indicates that the independent variables have a combined impact on the dependent variable.

3.1. Discussion of Findings

In horizontal jump, there are numerous factors are strongly associated to gain supremacy in this event. The focus of the researcher was to determine those key factors which contribute exclusively to perform a horizontal jumper like a almighty.

The findings pertaining to the study revealed significant positive relationship existed between velocity of run-up and performance in horizontal jump. Bridgett et. al. (2002) found in their investigation that run-up speed has a strong influence on horizontal jump performance. Bayraktar et. al. (2021) also found similar result and concluded that there was a strong positive relationship between run-up velocity and jump distance.

In horizontal jump, one of the most key factor that determine jumping distance is the horizontal velocity of the center of gravity (CG) developed in the run-up. According to Hay et. al. (1986) performance in the horizontal jump is determined by mainly by the athlete's run-up speed. To achieve maximum speed and maximum body momentum, the phase of run-up is essential. Faster run-up speed can lead to longer horizontal jump distances. Actually the primary focus of the run-up is to increase the horizontal velocity of the jumper. As run-up velocity increases, body momentum also increases because they are associated with

each other and higher body momentum accelerates the body to achieve greater horizontal distance. According to Bridgett and Linthorne (2006) and Hay (1986), each 0.1 m/s increase in run-up velocity can increase jump distance by 6 to 12.8 cm.

On other hand, researcher also found in this investigation that power of leg muscle and performance in horizontal jump are significantly associated with each other. Lestari & Rifki (2020) concluded in their study that the power of leg muscle explosion influences directly on the performance of the horizontal jump. Similar result also observed by Marta (2020) in his experiment.

Strong leg muscles are important for horizontal jump performance because the jumpers need to generate the power and explosiveness to jump with a greater distance. It is well accepted that athletes with stronger dynamic leg strength can run faster and can exert a greater force at takeoff (Young, 1995). Strong leg muscle also helps horizontal jumpers to maintain their body stable during the run-up and take-off so they can use their muscle power to achieve the maximum horizontal momentum and also at the time of conversion of body momentum in the phase of take-off. However, the most influential fact is that who having more power of leg muscle, they can exert more power and can thrust on take-off board forcefully and due to Law of Reaction, Ground Reaction Force (GRF) increases. GRF is the most influential factor for the horizontal jumpers to jump with a maximum distance.

Along with that the researcher also found a significant relationship of velocity of run-up and power of leg muscle with performance in horizontal jump. Such finding indicates that the velocity of run-up and power of leg muscle have a combined impact on the performance of horizontal jump. If we observe the overall result of the present study very minutely then we can trace out that the strength of relationship between velocity of run-up & performance (r=0.389) and power of leg muscle & performance (r=0.493) both were lower than the strength of relationship of velocity of run-up and power of leg muscle with performance (R=0.58). So, it clearly indicates that the influence of both independent variables together on the performance of horizontal jump is more strong rather than the individual influences.

Therefore both the key factors cannot be separated in terms of their performance because of interconnectedness between one and the other. From the above discussion, the horizontal jump is not enough rely on run-up speed or power of leg muscle alone. It is necessary to consider both the factors in contribution to the horizontal jump ability.

4. Conclusions

The following conclusions have been drawn based on the present instigation by the researcher and his finding.

- ❖ The run-up velocity was significantly associated with the performance of horizontal jump. Thus, greater performance in horizontal jump event is influenced by the run-up velocity of the jumper.
- ❖ A moderate significant correlation was observed while investigating the association between the power of leg muscle and performance in horizontal jump.
- ❖ The combined impact of run-up velocity and power of leg muscle were significantly and moderately associated with the performance of horizontal jump. Thus, the results supported enough to conclude that the combine effect of run-up velocity and power of leg muscle of horizontal jumpers on their performance is much stronger than their individual effect on performance.

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