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Long Jump Ability: Analyze of Leg Explosive Power and Running Speed for Junior High School Students

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A B S T R A C T

The purpose of the study. aims to determine the contribution of leg explosive power and running speed to long jump ability.

Materials and methods. a research sample of 30 male students. Measurement of leg explosive power is determined by the ability to jump long without starting (standing broad jump). Running speed measurements are determined by running a sample distance of 30 meters. Measurement of long jump ability is determined by a sample of jumping as far as possible in the jumping.

Results. The results showed that leg explosive power, leg length and running speed contributed to long jump ability (r > 0.05). The results show that leg explosive power and long jump ability contribute (r = 0.58). There was a contribution in the correlation test between running speed and long jump ability (r = 0.51). The results of the multiple correlation test of leg explosive power and running speed with long jump ability showed that there was a contribution (r=0.70 and r^2 = 0.49)

Conclusions. There is a contribution between leg explosive power, leg length and running speed to long jump ability. The influence of physical activity and regular and structured training also greatly influences a person's long jump ability

A R T I C L E I N F O

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INTRODUCTION

The ability to perform a long jump is an essential skill for many sports, particularly in track and field events (Koyama et al., 2007). This athletic ability is influenced by various factors, including leg explosive power and running speed (Manson et al., 2021) (Ohtaka & Fujiwara, 2018). Assessing these physical qualities in junior high school students is crucial for identifying and nurturing young athletes with the potential to excel in long jump competitions(Ghigiarelli, 2011). The long jump is a complex

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movement that combines both horizontal and vertical components. It begins with a horizontal approach run, followed by a powerful take-off from the strongest leg, which generates the vertical force needed to project the body into the air (Hay, 1993). The jumper then utilizes their body positioning and technique to maximize the distance traveled during the floating phase before landing. Long jump is an athletic sport that requires a specific set of skills and physical attributes for optimal performance(Sun et al., 2012). Factors that contribute to long jump ability include speed, strength, and explosive power (Setiawan et al., 2023)(Jaitner et al., 2001). Speed refers to the athlete's ability to run quickly and change direction efficiently (Relationship Between the Kinetics and Kinematics of a..., 2022). Strength refers to the maximum force a muscle or muscle group can generate (Maćkała et al., 2015). Explosive power is a combination of speed and strength, allowing the athlete to generate a high level of force in a short amount of time (Turner et al., 2020). These physical characteristics are crucial for generating the necessary power and momentum to achieve maximum jump distance (Pennell et al., 2021).

Previous research has examined the relationship between leg explosive power and running speed performance. These studies have found that leg length, leg explosive power, and other physical attributes are significant factors that influence sprinting ability and overall athletic performance in children and adolescents (Rumpf et al., 2014). For example, one study on a pharmacist-led telehealth intervention in a rural clinic setting, while not directly related to long jump ability, suggests that targeted physical assessments and interventions can be effective in improving various physical performance outcomes (Wang et al., 2022). Additionally, the findings from a study on the vertical force-velocity profiling of elite female soccer players indicate that an individual's sprint ability is closely linked to their leg explosive power and jump height capabilities (Ortega et al., 2020)(Özbar et al., 2014)(Manson et al., 2021). This highlights the importance of developing lower-body power and speed for sports involving explosive movements like the long jump. Taken together, the existing literature suggests that measures of leg power, strength, and running speed are crucial

predictors of long jump performance, particularly among youth athletes (Rumpf et al., 2014)(Manson et al., 2021).

MATERIALS AND METHODS

Study participants

The research location is Junior High School Students 25 Medan, Indonesia. The research sample consisted of 30 people using random sampling techniques random sampling.

Study Organization

The type of this research is descriptive with the following research design:

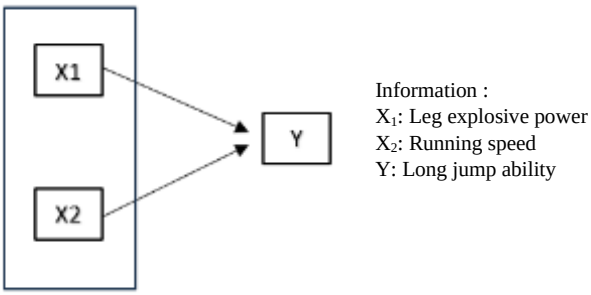

Figure 1. Research design

Test and measurement procedures

The data collection technique used to measure the leg explosive power test is by pushing forward with both feet without starting and landing on both feet with a meter measuring instrument. Running speed was measured by running the sample as fast as possible over a distance of 30 meters. Long jump ability is measured by measuring the distance from the tub then running as fast as possible, then leaning on the support board then flying and landing with both feet. The data obtained in the research will be analyzed descriptively and inferentially.

RESULTS

The data analysis used in this research is analysis using inferential statistical techniques. The descriptive data analysis is intended to get a general picture of the data which includes average, standard deviation, variance, range, maximum and minimum data, frequency tables and graphs. Next, the analysis requirements were tested, namely the normality test with a significance of $p>0.05$. To test the hypothesis, if it turns out that the data is normally distributed, then a parametric statistical test, namely correlation, will be usedproduct-moment from Pearson (r test), but if it turns

out that the data is not normally distributed, then a non-parametric statistical test is used, namely the Spearman's correlation test (rho). The results of the normality test for research variable data are $p>0.05$ for variables X_1, X_2 an Y normally distributed.

The research hypothesis was tested using the r test (r>0.05) which can be seen in the table:

Table 1. The Correlation Test Results

VARIABLE	N	R	INFORMATION
X_1 - Y	30	0.58	sig.
X_2 - Y	30	0.51	Sig.
X_1, X_2 - Y	30	0.70	Sig.

The correlation test results show that leg explosive power (X_1) and long jump ability (Y) have a contribution. There is a contribution to the correlation test of running speed (X_2) with long jump ability (Y). And the results of the multiple correlation test of leg explosive power (X_1) and running speed (X_2) with long jump ability (Y) show that there is a contribution. The results of the Pearson correlation analysis (r) in the hypothesis need to be studied further by providing an interpretation of the relationship between the analysis results achieved and the theories underlying this research. This explanation is needed so that we can know the suitability of the theories put forward with the research results achieved. To draw research conclusions that are in accordance with the research objectives, the results of data analysis need to be discussed in accordance withunderlying theories.

This supports the existing theory. This can be explained by the fact that if a student has good leg explosive power, it will produce a strong jumping ability resulting in a long jump. Therefore, one type of physical condition that needs to be developed in sports is the element of leg explosive power. However, it must be realized that this physical element does not stand alone, but must be supported and combined with other physical elements such as leg length and running speed and so on. Running Speed with Long Jump Ability in Junior High School students. This can be explained that these three independent variables together make a real contribution to the long

jump ability of Junior High School students. Leg explosive power is a supporting factor in jumping, where when jumping it is used to help improve ability. The jump can be maximized. The length of the legs in relation to running is utilized to direct strength and speed so as to produce maximum jumping ability. Meanwhile, running speed is used when starting and ending, resulting in good jumping ability.

DISCUSSION

The findings of this study suggest that leg explosive power and running speed are critical factors in determining long jump performance among junior high school students (Samozino et al., 2010)(Multilevel Development Models of Explosive Leg Power, 2022)(Soyal et al., 2023). An athlete's ability to generate high levels of force and power in their lower-body musculature is essential for maximizing their running distance and propelling themselves into the air during the long jump (Cormie et al., 2023)(Relationship Between the Kinetics and Kinematics of a..., 2022). This aligns with previous research indicating the significance of leg power and speed for sports involving explosive movements like sprinting and jumping (Butterfield et al., 2004) (Manson et al., 2021).

The results reveal a moderate positive correlation between both leg explosive power and running speed with long jump distance (Ren et al., 2022)(Regression Models of Sprint, Vertical Jump, and Change Of..., 2022). This suggests that students who possess greater leg strength, power, and linear speed capabilities tend to achieve longer jump distances compared to their peers with lower physical capacities (Cormie et al., 2023). This is likely due to their enhanced ability to generate the necessary force and momentum to project their body further through the air during the long jump (Lin et al., 2023)(Comfort et al., 2023).

Furthermore, the multiple regression analysis demonstrated that the combined effect of leg explosive power and running speed accounted for a substantial proportion of the variance in long jump performance (Chelly & Denis, 2001)(Thomas et al., 1983). This highlights the importance of targeted training to develop both lower-body power and linear speed in order to optimize long jump abilities among young athletes(Lin et

al., 2023). Improving these underlying physical attributes is crucial for maximizing long jump success (McGuigan et al., 2022).

From a practical standpoint, these findings underscore the need for coaches and physical education teachers to prioritize the development of leg explosive power and running speed in their training programs for junior high school students participating in the long jump event (Loturco et al., 2023). Incorporating exercises focused on plyometrics, strength training, and sprinting can help improve the crucial physical capacities that are critical to long jump success.

CONCLUSION

In conclusion, this study provides robust empirical evidence supporting the critical importance of leg explosive power and running speed as key determinants of long jump performance among junior high school students. The findings underscore the need for targeted training programs that prioritize the development of these underlying physical attributes in order to optimize long jump abilities in young athletes. The results reveal a moderate positive correlation between both leg explosive power and running speed with long jump distance, suggesting that students possessing greater lower-body strength, power, and linear speed capabilities tend to achieve longer jump distances compared to their peers with lower physical capacities. This is likely due to their enhanced ability to generate the necessary force and momentum to project their body further through the air during the long jump. Furthermore, the multiple regression analysis demonstrated that the combined effect of leg explosive power and running speed accounted for a substantial proportion of the variance in long jump performance. This highlights the importance of a holistic approach to training that concurrently develops these crucial physical components. Improving both lower-body power and linear speed through a variety of exercises focused on plyometrics, strength training, and sprinting is essential for maximizing long jump success in young athletes.

From a practical standpoint, these findings underscore the need for coaches and physical education teachers to prioritize the targeted development of leg explosive power and running speed in their training programs for junior high school students participating in the long jump event. By incorporating evidence-based training methodologies that address these key physical capacities, coaches can help young long jumpers unlock their full potential and achieve optimal performance outcomes.

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