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The Relationship Between Leg Muscle Length and 60-Meter Sprint Speed Performance Among Upper-Grade Male Students at Maol State Elementary School, Kefamenanu

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Abstract
This study aims to determine the relationship between leg muscle length and 60-meter sprint performance among upper-grade male students at Maol Kefamenanu Public Elementary School. The research is grounded in the importance of anthropometric factors—particularly leg muscle length—in supporting sprint performance among elementary school–aged children. The study employed a quantitative method with a correlational approach. The population consisted of 21 male students, all of whom were included as samples using a total sampling technique. The instruments used were a measuring tape to assess leg muscle length and a 60-meter sprint test to measure running performance. Data were analyzed using the Pearson Product Moment correlation formula. The results showed a correlation value of r = –0.842, indicating a very strong negative relationship between leg muscle length and 60-meter sprint time. The calculated t-value (6.70) exceeded the critical t-value (2.093), leading to the acceptance of the alternative hypothesis. This indicates that the longer the leg muscles, the faster the students complete the 60-meter sprint. Therefore, it can be concluded that leg muscle length makes a significant contribution to sprint performance. The findings of this study are expected to serve as a reference for physical education teachers in designing training programs that consider students' physical characteristics and as supporting literature for future research.

INTRODUCTION

Running speed is one of the components of physical fitness that has been taught since basic education in Indonesia (Sepriadi, Syafruddin, Khairuddin, Ihsan, & Liza, 2022). In the Physical Education, Sports, and Health (PJOK) curriculum, short-distance running such as the 40-meter and 60-meter sprints is used to measure students' speed ability, lower limb strength, and movement coordination (Iyan, 2025; Mukholid, 2007; Riki & Sitompul, 2024). At the elementary school level,

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sprint performance is strongly influenced by each student's physical condition, including anthropometric factors such as leg muscle length (Hsu et al., 2021; Zou, Chen, Yang, Xiao, & Wang, 2018).

Research conducted in the Indonesian context shows that body characteristics, particularly leg length and muscle strength, contribute to sprint performance. For example, a study by (Yani & Hasri, 2020) reported that leg length has a positive relationship with running speed among elementary school students. Another study by (Santika, 2024) found that variations in students' anthropometric characteristics affect stride length and movement efficiency in short-distance sprinting. However, most of these studies were conducted in urban populations or in schools with relatively adequate sports facilities.

A major limitation of previous studies in Indonesia is the lack of research conducted in rural or peripheral elementary school contexts, which have different child characteristics and limited training facilities. In addition, most studies have focused more on muscle strength than on leg muscle length as a biomechanical variable that may influence running speed. Therefore, research opportunities related to the contribution of leg muscle length to running speed in the elementary school context remain widely open.

In the context of East Nusa Tenggara (NTT), students' athletic potential is actually quite promising, as evidenced by the emergence of several talented runners from this region. However, scientific studies that specifically link anthropometric factors to sprint performance among elementary school-aged children are still very limited. At SD Negeri Maol, variations in 60-meter sprint performance among upper-grade male students are clearly observable, and PJOK teachers have noted that students with longer legs tend to achieve faster sprint times. These observational findings are interesting but have not yet been scientifically verified through structured measurements.

The limitations of previous research and the lack of empirical evidence in elementary schools in the NTT region indicate the need for more focused research on the relationship between leg muscle length and 60-meter sprint performance. This study is expected to contribute scientifically by providing new insights into how students' anthropometric characteristics influence running speed, while also offering practical benefits for teachers in designing more targeted and data-driven training programs.

Therefore, the purpose of this study is to analyze the relationship between leg muscle length and 60-meter sprint performance among upper-grade male students at SD Negeri Maol, North Central Timor Regency.

METHOD

According to (Sugiyono, 2022), saturated sampling is a sampling technique in which all members of the population are used as research samples. This technique is commonly applied when the population size is relatively small or fewer than 30 individuals, or when the researcher intends to produce findings with a very small margin of error. In other words, this study is a population study because the entire population was included as research participants.

This study employed a quantitative approach with a correlational research design. This approach was selected because the purpose of the study was to determine whether there is a relationship between two variables, namely leg muscle length (independent variable/X) and 60-meter sprint speed performance (dependent variable/Y) among upper-grade male students.

According to (Creswell, 2021), correlational methods are used to identify and measure the degree of relationship between two variables without manipulating them. In this context, measurements of leg muscle length and 60-meter sprint speed were analyzed to determine the

strength of their relationship statistically. The data obtained were analyzed using the Pearson Product Moment correlation statistical technique to examine the relationship between leg muscle length and 60-meter sprint speed, using the following formula:

$$r_{xy} = \frac{n\sum X_i Y_i - (\sum X_i)(\sum Y_i)}{\sqrt{(n\Sigma X_i^2 - (\sum X_i)^2)(n\Sigma Y_i^2 - (\sum Y_i)^2)}}$$

RESULT AND DISCUSSION

General Description of the Research Findings

Based on the research data, students' leg muscle length ranged from 83 to 95 cm, while 60-meter sprint times ranged from 9.5 to 11.2 seconds. In general, the data indicate that students with longer leg muscle length tend to achieve faster sprint times. This suggests a tendency toward a negative relationship between leg muscle length and running time (speed performance), which was subsequently examined through correlation analysis.

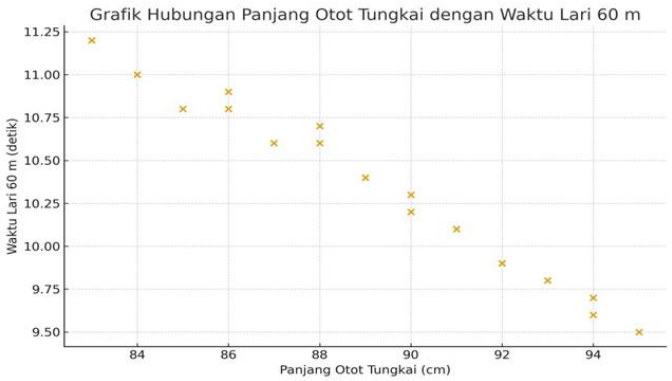

Figure 1. Graph of the Relationship between Leg Muscle Length and 60-meter Running Time

Figure 1 shows the distribution of the relationship between leg muscle length and 60-meter sprint time among 21 students. The points on the graph form a pattern that tends to decline from left to right. This indicates that the longer the leg muscle length possessed by the students, the faster the 60-meter sprint time achieved. The data distribution pattern on the graph demonstrates a strong tendency toward a negative relationship, in which an increase in leg muscle length is associated with a decrease in sprint time.

Descriptive Statistics

The data obtained from the 21 students include two variables, which are presented in the following table:

Table 1. Descriptive Statistics of Research Variables

Statistics	Leg Muscle Length (cm)	60 m Running Time (seconds)
Number (n)	21	21
Lowest value	83	9.5

Highest value	95	11.2
Mean	89.1	10.33
Standard deviation (SD)	3.62	0.49

The average leg muscle length of the students was 89.1 cm, with a range of 83–95 cm, indicating that most students had leg muscle lengths in the moderate to high category. The average 60-meter sprint time was 10.33 seconds, with results varying between 9.5 and 11.2 seconds, reflecting noticeable differences in running ability among students. Overall, there is a clear tendency that students with longer leg muscle length tend to achieve faster sprint times. This provides an initial indication that leg muscle length may play a role in supporting students' sprint performance.

Pearson Correlation Analysis

The results of the correlation test between leg muscle length and sprint time are presented in the following table:

Table 2. Pearson Correlation Test Results

Variable X	Variable Y	r-count	r-table ($\alpha = 0.05, n = 21$)	Information
Leg Muscle Length	60m Running Time	-0.842	0.433	Significant (Very Strong)

Based on Table 4.3, the Pearson correlation coefficient obtained was $r = -0.842$, with an r-table value of 0.433 at the 5% significance level ($n = 21$). Since the calculated r-value is greater than the r-table value in absolute terms and is negative, this indicates a very strong negative relationship between leg muscle length and 60-meter sprint time. This means that the longer the students' leg muscle length, the faster the time achieved in the 60-meter sprint. Therefore, it can be concluded that leg muscle length has a significant influence on students' 60-meter sprint speed performance.

CONCLUSION

Based on the results of the study and the data analysis conducted, it was found that leg muscle length has a significant relationship with 60-meter sprint speed performance among upper-grade male students at SD Negeri Maol Kefamenanu. The correlation coefficient obtained, $r = -0.842$, indicates a very strong negative relationship. This means that the longer a student's leg muscle length, the faster the time achieved in the 60-meter sprint. These findings indicate that leg muscle length makes an important contribution to short-distance sprinting ability in elementary school-aged children.

Descriptively, the average leg muscle length of the upper-grade male students at SD Negeri Maol was 89.1 cm, while the average 60-meter sprint time was 10.33 seconds. The combination of descriptive results and correlational analysis further confirms that leg muscle length is one of the factors influencing sprint speed performance. Therefore, anthropometric characteristics—particularly leg muscle length—play an important role in fast running ability among elementary school students.

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