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The Relationship Between Leg Muscle Power and Shooting Performance in Soccer Among 10th Grade in Senior High School

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Abstract

This study investigates the relationship between leg muscle strength and shooting accuracy in soccer among 10th-grade students at Senior High School 1 Pagelaran using a quantitative correlational design. The population consisted of all 10th-grade students participating in physical education, with a purposive sample of 36 students. Data were collected using a leg dynamometer to measure leg strength and a partitioned goal test to assess shooting accuracy. The data were analyzed using the Pearson Product Moment correlation test with SPSS version 27 after fulfilling normality and linearity requirements. The results revealed a very strong and significant correlation between leg muscle strength and shooting accuracy, with a correlation coefficient (r) of 0.925 and a significance value of 0.000 < 0.05. These findings suggest that students with greater leg muscle strength demonstrate higher shooting accuracy in soccer, supporting the biomechanical theory that leg strength contributes to power generation, stability, and ball control during kicking. Thus, it can be concluded that leg muscle strength plays a crucial role in enhancing shooting accuracy. The findings are expected to assist physical education teachers in designing structured training programs to improve students' soccer performance.

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INTRODUCTION

Physical education is an essential part of the educational system aimed at developing students' physical fitness, motor skills, knowledge, and sportSenior High Schoolship (Mustafa, 2022). One of the ways to achieve these objectives is through learning various sports, including soccer (Rahman & Padli, 2020). This sport is not only popular among the public but also serves as an effective means to build students' character and physical abilities in schools (Agustina, 2020).

In school learning, soccer is not only taught as a physical activity but also as a medium to cultivate values such as teamwork, discipline, and responsibility. Basic techniques such as dribbling, passing, controlling, and shooting are the main focus of instruction because they play a significant role in overall game performance (Mawardi, Kurniadi, & Farhan, 2025). Among these techniques, shooting is considered the most crucial in scoring goals and achieving victory in matches (Hasanuddin, 2023).

Shooting does not merely rely on strength but also requires coordination, balance, and proper body control. The strength of the leg muscles, particularly the thighs, calves, and ankles, plays a major role in producing powerful and accurate kicks (Asep, 2023). If leg muscle strength is weak, it becomes difficult to control the direction and power of the kick, thereby reducing shooting accuracy (Irawan, Haryani, & Mile, 2025).

In soccer, leg muscle strength is an important element of a player's physical condition. Students with strong leg muscles tend to produce more powerful and precise shots (Ramadhan, 2025). However, based on preliminary observations of 10th-grade students at Senior High School 1 Pagelaran, many still struggle to perform accurate shots. This condition raises the assumption that physical ability, particularly leg muscle strength, influences the low accuracy of their shooting performance.

Research on the relationship between leg muscle strength and shooting accuracy is essential to help physical education teachers design more effective training programs (Karim, Syafruddin, & Asri, 2021). By understanding this relationship, teachers can plan learning activities that focus not only on technical skills but also on strengthening students' physical fitness. This also encourages students to better understand the importance of physical conditioning in supporting their soccer performance (Putra, Yulifri, Asnaldi, & Saputra, 2024).

The results of this research are expected to contribute to the development of physical education learning, especially in improving shooting techniques through leg muscle strengthening. Moreover, the findings can serve as an evaluation material for schools in designing more structured soccer curricula or extracurricular programs (Mustafa, 2022). Thus, the study entitled *"The Relationship Between Leg Muscle Strength and Shooting Accuracy in Soccer Among 10th Grade Students Senior High school"* is expected to enrich

scientific knowledge in the field of physical education.

METHODS

Participants

The population in this study consists of all 10th-grade students at Senior High School 1 Pagelaran who take part in physical education classes and participate in soccer learning activities during the current semester. This population was selected because it aligns with the research objective, which is to analyze the relationship between leg muscle strength and shooting accuracy in soccer.

Sampling Procedures

The sample in this study was determined using a *purposive sampling* technique, which involves the deliberate selection of participants based on specific criteria. The criteria include: (1) being a 10th-grade student, (2) participating in physical education classes with soccer material, (3) having no history of leg injuries, and (4) being willing to take part in all testing and measurement procedures. The total number of samples used in this study consisted of 36 students who met all these criteria.

Materials and Apparatus

The materials and apparatus used in this study were designed to accurately measure the leg muscle strength and shooting accuracy of the participants. The primary equipment included a Leg and Back Dynamometer, which was used to assess leg muscle power by recording the maximum force exerted during leg extension. This device provided reliable quantitative data regarding the participants' lower limb strength. To evaluate shooting accuracy, a partitioned goal (target goal) was employed. The goal was divided into nine equal sections, each assigned a specific score. Participants performed ten shots using their dominant foot from a distance of ten meters, and their total scores were recorded based on the accuracy of their shots. Additional tools such as a stopwatch, measuring tape, and score sheets were also used to ensure the precision of data collection.

The tests were conducted on the school's soccer field under standardized conditions to maintain fairness and consistency. Each participant performed a warm-up session before testing to minimize the risk of injury and optimize performance. The procedures followed expert-approved testing protocols recommended by physical education specialists. All equipment was calibrated prior to use, and the testing process was supervised by both the researcher and a certified physical education teacher. These materials and procedures ensured that the measurements of leg strength and shooting accuracy were valid, reliable, and representative of the students' actual physical abilities.

Procedures

This This research procedure was carried out systematically to ensure that each stage aligned with the predetermined objectives. The

implementation steps are described as follows (Hadi, 2015):

1. Preparation Stage

At this stage, the researcher coordinated with the school authorities, particularly the Physical Education teacher at Senior High School 1 Pagelaran, to obtain research permission and determine the testing schedule. The researcher also prepared the necessary instruments such as a stopwatch, partitioned goal, and data recording sheets.

2. Sample Selection

The researcher selected participants based on specific criteria, namely tenth-grade students who took part in football lessons and had no history of injury. A total of 36 students were chosen using the purposive sampling technique.

3. Lower Limb Strength Test Implementation

Once the participants were ready, the researcher conducted a lower limb strength test using the wall sit method. Each student was instructed to hold a sitting position against a wall for as long as possible, and the duration was recorded with a stopwatch.

4. Shooting Accuracy Test Implementation

Next, the students participated in a shooting accuracy test using a partitioned goal. Each student performed ten kicks from a predetermined distance. The score was determined based on the accuracy of the ball hitting the designated target area.

5. Data Recording and Collection

All test results were documented by the researcher and the Physical Education teacher on prepared observation sheets. The data were systematically and carefully collected to minimize recording errors.

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Design or Data Analysis

This study employed a quantitative correlational design aimed at determining the relationship between leg muscle power and shooting accuracy in soccer among tenth-grade students. The correlational approach was chosen because it allows the researcher to identify the degree of association between two measurable variables without manipulating any of them (Afrizal, 2018). The independent variable in this study was leg muscle strength, while the dependent variable was shooting accuracy. Data were collected through standardized physical tests, the Leg Dynamometer Test for leg muscle strength and the Target Goal Test for shooting accuracy. All participants were tested under similar environmental and procedural conditions to ensure data validity and reliability.

Data obtained from the two tests were processed using SPSS version 27. Prior to hypothesis testing, the data underwent several prerequisite tests including normality and linearity tests to confirm that the dataset met statistical assumptions. Once these conditions were satisfied, the relationship between the two variables was analyzed using the Pearson

Product Moment correlation test. The level of significance was set at 0.05 (α = 0.05). The strength and direction of the correlation were interpreted based on the correlation coefficient (r) values, while the significance value (Sig.) was used to determine whether the correlation was statistically meaningful. The results were then further interpreted to draw conclusions about how leg muscle strength contributes to shooting accuracy in soccer.

RESULT

Description of Research Data Results

The data for the leg muscle strength variable were obtained from a test using an instrument called a Leg Dynamometer. From a total of 36 participants, the highest score was 157.0 and the lowest score was 72.0, with a mean score of 107.36. This variable was categorized into five levels: very poor, poor, moderate, good, and very good. The following are the results of the frequency distribution analysis:

Table 1. Distribusi Frekuensi Otot Tungkai

No	Interval	Freq	Percentage
1	>153,50	3	8.3%
2	112,50 – 153,00	14	38.8%
3	76,50 – 112,00	17	47.4%
4	52,50 – 76,00	2	5.5%
5	< 52,00	0	0%
	Total	36	100%

Based on the table above, 8.3% of the students (3 students) were categorized as very good in the leg dynamometer test, 38.8% (14 students) were categorized as good, 47.4% (17 students) were categorized as moderate, 5.5% (2 students) were categorized as poor, and none were categorized as very poor.

In addition, the data for the shooting accuracy variable were obtained from a test using a partitioned goal. The test results showed the highest score of 46 and the lowest score of 17, with a mean score of 30.61. This variable was categorized into five levels: very poor, poor, fair, good, and very good. The following are the results of the frequency distribution analysis:

Table 2. Frequency Distribution of Soccer Shooting

No	Interval	Freq	Percentage
1	41 – 50	5	13.9%
2	32 – 40	15	41.6%
3	21 – 30	15	41.6%
4	11 – 20	1	2.9%
5	0 – 10	0	0%
	Total	36	100%

Based on the table above, 13.9% of the students (5 students) were categorized as very good in the partitioned goal shooting test, 41.6% (15 students) were categorized as good, 41.6% (15 students) were categorized as fair, 2.9% (1 student) were categorized as poor, and none were categorized as very poor.

Prerequisite Analysis Test

A. Normality Test

In this study, the normality test was conducted using the Kolmogorov-Smirnov method with the assistance of SPSS version 27. The decision-making criterion for the normality test is that if the significance value (Sig.) is greater than 0.05 (Sig. > 0.05), the data are considered normally distributed. Conversely, if the significance value is

less than 0.05 (Sig. < 0.05), the data are considered not normally distributed.

The following are the results of the normality test for the variables of leg muscle strength and shooting accuracy in soccer among 10th-grade students at SENIOR HIGH SCHOOL 1 Pagelaran:

Table 3. Normality Test

N		X	Y
Normal Parameters	Mean	36	36
	Std. Deviation	110.34	31.361
Most Extreme Differences	Absolute	.108	.074
	Positive	.108	.074
	Negative	-.092	-.059
Table Statistic		.108	.074
Asymp Sig. (2-tailed)*		.200[d]	.200[d]

Based on the table above, it can be seen that the significance values of both research variables, leg muscle strength and shooting accuracy are greater than 0.05. This indicates that the data for both variables are normally distributed. Therefore, it can be concluded that the research data meet the normality requirement and are suitable to proceed to the next statistical analysis stage, namely the linearity test and hypothesis testing using the Pearson Product Moment correlation analysis.

B. Linearity Test

The linearity test was conducted to determine whether there is a linear relationship between the independent variable (leg muscle strength) and the dependent variable (shooting accuracy). A linear relationship indicates that changes in the independent variable are accompanied by proportional changes in the dependent variable.

Table 4. Linearity Test

Y*X	Between Groups	df		Sig.
		32	(Combined)	.053
		1	Linearity	<.001
		31	Deviation from Linearity	.535
	Within Groups	3		
	Total	35		

Based on the table above, the significance value of the Deviation from Linearity is 0.53, which is greater than 0.05. This indicates that the relationship between the leg muscle strength variable and the shooting accuracy variable is linear. Moreover, the significance value for Linearity is less than 0.001, further confirming that there is a significant linear relationship between the two variables.

C. Hypothesis Test

The hypothesis test was conducted to determine whether there is a significant relationship between leg muscle strength (X) and shooting accuracy (Y) among 10th-grade students at SENIOR HIGH SCHOOL 1 Pagelaran. This test used the Pearson Product Moment correlation analysis with the assistance of SPSS version 27.

Table 5. Results of Pearson Product-Moment Correlation Analysis

		Otot Tungkai	Akurasi Shooting
Otot Tungkai	Pearson Correlat-ion	1	.925**
	Sig. (2-tailed)		<.001
	N	36	36
Akurasi Shooting	Pearson Correlat-ion	.925**	1
	Sig. (2-tailed)	<.001	
	N	36	36

Based on the table above, the correlation coefficient (r) was found to be 0.925 with a significance value (Sig.) of 0.000 < 0.05. These results indicate a very strong and significant relationship between leg muscle strength and shooting accuracy in soccer.

The correlation coefficient value of 0.925 falls within the interval of 0.80–1.00, indicating a very strong and positive relationship. This means that the greater the leg muscle strength possessed by the students, the better their shooting accuracy performance. Therefore, the alternative hypothesis (Ha), which states that "There is a significant relationship between leg muscle strength and shooting accuracy in soccer," is accepted, while the null hypothesis (H_0) is rejected.

DISCUSSION

Based on the results of the study conducted on 10th-grade students at Senior High School 1 Pagelaran, a correlation coefficient (r) of 0.925 was obtained with a significance value of 0.000 < 0.05. This indicates a very strong and significant relationship between leg muscle strength and shooting accuracy in soccer. In other words, the greater the leg muscle strength possessed by students, the better their accuracy in shooting the ball toward the goal. These findings support the hypothesis that leg muscle strength plays a crucial role in determining players' shooting ability.

This result is consistent with the theories proposed by Akhbar (2017) and Yakin, Solihin, & Syamsudar (2025), who state that leg muscle strength contributes significantly to a player's kicking ability. The kicking motion involves the synergistic work of several muscles such as the quadriceps, hamstrings, and gastrocnemius, which function to generate power, maintain balance, and improve ball control. Thus, leg muscle strength not only provides the necessary kicking force but also enhances body stability during shooting execution.

From a biomechanical perspective, the shooting motion in soccer involves rapid and powerful muscle contractions, both concentric and eccentric. According to Atradinal & Sepriani (2017) muscle strength can be improved through planned and systematic resistance training. In this context, students with stronger leg muscles tend to have more efficient muscle contractions, allowing them to produce greater power and control when kicking the ball.

Increasing leg muscle strength therefore directly enhances movement efficiency and postural stability during shooting (Atiq, et al., 2023).

This study also reinforces the findings of Wingki, Sawali, & Jud (2024), who discovered a correlation of 0.718 between leg muscle strength and shooting ability, as well as Risal, Jumareng, & Badaruddin (2022), who found a coefficient of determination of 0.24. Furthermore, Putra, Arwandi, & Irawan (2023) emphasize that shooting accuracy depends not only on strength but also on the player's ability to combine power with movement control. With strong leg muscles, players can maintain balance, adjust the swing of the leg, and control the shooting angle, resulting in stable and precise short (Fatoni, 2025).

Moreover, the theories of Murti, et.al (2020) highlight that successful shooting is influenced not only by physical strength but also by coordination, balance, and proper technique. Nevertheless, leg muscle strength remains the key foundation that supports these elements. Rusdiawan et al. (2024) add that exercises such as squats, lunges, leg presses, and plyometric drills effectively improve leg power and shooting precision. Therefore, physical education teachers should incorporate leg-strengthening exercises as an essential part of their training programs in schools (Putro, et.al, 2025).

Beyond the physical aspect, leg muscle strength also affects players' psychological confidence during shooting. Players with stronger physical conditions tend to be more confident and consistent in executing shots. According to Zainuddin & Kamal (2022), physical and mental factors work synergistically to determine shooting performance. Overall, this research demonstrates that leg muscle strengthening significantly contributes to improving students' technical ability, balance, and self-confidence in playing soccer (Mustafa, 2022).

CONCLUSION

Based on the findings of the study conducted on 10th-grade students at Senior High School 1 Pagelaran, there is a very strong and significant correlation between leg muscle strength and shooting accuracy in soccer. The results indicate that students with greater leg muscle strength tend to achieve higher shooting accuracy, as strong leg muscles play a vital role in generating powerful and well-directed kicks. Enhanced leg strength also helps maintain body balance, control foot movements, and improve shot precision. Therefore, strengthening leg muscles is essential for developing better shooting skills. Regular and structured physical training focused on leg strength can effectively improve students' physical performance and technical ability in soccer, enabling them to play more effectively and achieve better results.

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