Correlation Of Leg Length And Leg Muscle Power Towards Futsal Shooting In Extracurricular Students Of Smp Bina Satria Mulia Medan In 2025

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Abstract.

This study aims to determine the relationship between leg length and leg muscle power on futsal shooting ability among extracurricular students at SMP Bina Satria Mulia Medan in 2025. The research background is based on the low conversion rate of scoring opportunities among futsal extracurricular students, where only 40% of students achieve the minimum shooting success standard. The research method used was correlational research with a three-variable reciprocal relationship design. The research population consisted of all futsal extracurricular students at SMP Bina Satria Mulia Medan, totaling 32 students, using total sampling technique. Research instruments included leg length measurement using an anthropometer, leg muscle power test using Standing Broad Jump, and futsal shooting test with scoring targets. Data analysis employed Pearson correlation and multiple regression with a significance level of α = 0.05. The research results showed: (1) There was a significant positive relationship between leg length and futsal shooting ability (r = 0.356; p = 0.045 < 0.05); (2) There was a significant positive relationship between leg muscle power and futsal shooting ability (r = 0.378; p = 0.033 < 0.05); (3) There was no significant relationship between leg length and leg muscle power (r = 0.162; p = 0.379 > 0.05); (4) The multiple regression model showed that the combination of leg length and leg muscle power together contributed 23.2% to futsal shooting ability (R^2 = 0.232; F = 4.379; p = 0.022 < 0.05). The conclusion of this study is that there is a significant positive relationship between leg length and leg muscle power with futsal shooting ability, with leg muscle power having a more dominant contribution. This indicates that both anthropometric and physiological factors play important roles in determining futsal shooting ability, although there are still 76.8% of other factors affecting shooting ability beyond the variables studied.

Keywords: *Leg Length, Leg Muscle Power, Futsal Shooting*

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INTRODUCTION

Improving the quality of Indonesian society and individuals is fundamentally a result of national development, and one way to achieve this is through sports development. The Indonesian government has strived to improve the overall quality and quantity of education. This is clearly

related to improving the quality of life of individuals, the nation, and the state. Games, competitions, and intense athletic activities conducted for enjoyment, victory, and optimal results are known as sports. To support national development, physical and health education aims to help students improve their health and fitness by teaching them basic movement skills, positive attitudes, and other movement skills.

To realize a just and prosperous society and enable its citizens to develop themselves in all aspects, both physically and spiritually, national development in the field of education is an effort to enlighten the nation and improve the quality of Indonesian people. "Educational sports are held to instill character values and acquire the knowledge, skills, and attitudes needed to build a healthy, active lifestyle throughout life," according to Law of the Republic of Indonesia No. 10 of 2022, Article 18 Paragraph 1.

Consequently, it is necessary to improve physical education and sports in the school environment. Physical education is a conscious and systematic educational process for individuals and members of society through physical activities to improve physical abilities and skills, develop intelligence, and build character. One of the subjects in physical education in schools is futsal.

Futsal is a rapidly growing sport in Indonesia and has become an integral part of extracurricular activities at various levels of education, including junior high schools (SMP). This sport is a modification of conventional soccer played indoors on a field measuring 25-42 meters x 15-25 meters, with five players per team. The fast, dynamic, and technical nature of futsal requires players to possess strong basic technical skills, particularly shooting, a crucial element in scoring goals.

Shooting in futsal is more complex than in conventional soccer. The limited space for movement, shorter decision-making time, and the use of a special futsal ball with different characteristics mean that shooting techniques in futsal require specific adaptations and skills. According to data from the FIFA Futsal Development Program (2023), the average futsal match produces 6-12 goals per game, significantly higher than the 2-3 goals per match in conventional soccer. This demonstrates the importance of shooting ability in determining the outcome of a futsal match.

Leg muscle power, which is the combination of force and velocity of muscle contraction, plays a significant role in producing an explosive and accurate kick. This component involves the complex coordination of various muscle groups, including the quadriceps, hamstrings, gastrocnemius, and stabilizer muscles. A recent study in the Journal of Sports Science (2023) revealed that leg muscle power contributes 72% to the speed of a kick in futsal, while the remaining 28% is influenced by other factors such as technique, coordination, and timing. At SMP Bina Satria Mulia Medan, futsal extracurricular activities have been a flagship program since 2020. Based on systematic observations from August to November 2024 and in-depth interviews with the coaching team, several interesting phenomena were discovered. Of the 30 students actively participating in futsal extracurricular activities, only 12 (40%) had shooting abilities that met the minimum success standard (SKM) set by the coach, namely a shooting conversion rate of at least 60% of opportunities. Initial measurement data showed significant variations in the students' anatomical and physiological characteristics. The students' leg lengths varied between 65-85 cm, while leg muscle power, measured using the vertical jump test, varied between 35-60 cm. An interesting finding is that there was not always a linear correlation between these two variables and shooting performance. Some students with relatively long legs (80-85 cm) demonstrated below-average shooting performance, while others with shorter legs (65-70 cm) actually had a higher shooting success rate.

Previous studies have attempted to uncover the relationship between anatomical and physiological characteristics and sports performance. Rahman (2018), in his study of 50 youth soccer players, found a positive correlation ($r = 0.68$) between leg length and kicking speed. Wijaya (2019), in his experimental study, revealed that leg muscle power contributes 65% to penalty kick accuracy. Meanwhile, Siregar (2021), in his study of professional futsal athletes, found that the optimal combination of leg length and leg muscle power can increase shooting effectiveness by up to 78%. The talent development program at SMP Bina Satria Mulia Medan currently lacks measurable parameters for identifying and developing student potential, particularly in futsal shooting. Coaches still rely on subjective observations to assess student abilities. This can lead to under-identification of hidden potential, as well as training programs that are poorly targeted and not based on individual student characteristics.

The urgency of this research is increasingly relevant given the suboptimal performance of the SMP Bina Satria Mulia Medan futsal team in various city- and provincial-level championships. In the last three years (2022-2024), this team has never reached the semifinals in an official championship, with one of the main factors being the low rate of converting chances into goals. Based on the complexity of this problem, researchers deemed it necessary to conduct a comprehensive scientific study on the correlation between leg length and leg muscle power on shooting ability in futsal. The study, entitled "Correlation of Leg Length and Leg Muscle Power on Futsal Shooting in Extracurricular Students of Bina Satria Mulia Middle School Medan in 2025," lower leg muscles are the muscles that move the legs from the knee to the ankle. These muscles have various functions ranging from moving the leg bones, moving the joints both bending and straightening. These muscles contract and generate power so that the desired leg movement can occur without obstruction or injury.

METHOD

Research Design

This research is a correlational study. This correlational study evaluates the relationship between three variables by comparing their measurement results. According to Arikunto (2006), this study has leg length as the independent variable (X1), leg muscle power as the independent variable (X2), and ball dribbling skills as the dependent variable (Y). The design of this study, according to Kusumawati (2015:35), can be described as follows:

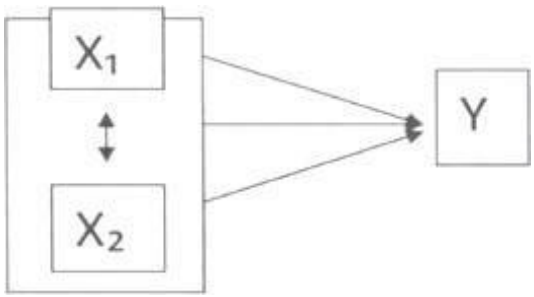

Figure 1. Research Design of the Reciprocal Relationship of Three Variables

Participant

This research was conducted in Medan, Indonesia, and involved 32 students from the Extracurricular Program of Bina Satria Mulia Middle School, Medan, in 2025, consisting of 32 people, out of 30 subjects of this research. The sample is part of the number and characteristics possessed by the population (Sugiyono, 2010:91). The number and characteristics of the population are included in the sample (Sugiyono, 2010:91). Therefore, the sample in this study amounted to 32 people, in accordance with the opinion of Arikunto (2006:134) that all samples/total sampling must be taken if the population is less than 100 people.

Data Analysis

The author uses the following data collection techniques: 1) Observation: Observation techniques are used to observe the research location to find out what problems are related to the research title. 2) The concepts and theories needed for this research, namely about how agility and speed affect dribbling the ball in extracurricular students of SMP Bina Satria Mulia Medan in 2025, are obtained through the use of literature. 3) Tests and measurements The test in this research is to measure extracurricular students of SMP Bina Satria Mulia Medan in 2025 who were tested on leg length, leg muscle power, and futsal shooting. Multiple correlation coefficients, also known as multiple correlation coefficients, are calculated to measure the tendency of the relationship between one dependent variable (criterion variable) and two or more independent variables (predictor variables). The level of relationship between the dependent variable and several independent variables is represented by the multiple correlation coefficient, which is represented by the symbol R.

If there is a correlation between independent variables with high correlation coefficients, a tendency to obtain a low multiple correlation coefficient will emerge when the dependent variable is related to them. Conversely, if the correlation between independent variables is low, a tendency

to obtain a high multiple correlation coefficient will emerge. One way to examine the relationship between three or more variables is through multiple correlation, where two variables are independent and one variable is dependent. This multiple correlation statistical test uses SPSS Version 2023. Therefore, comparing the probability value of 0.05 with the probability value of Sig. using the following decision-making basis can assist in decision-making in multiple correlation tests:

1. If the probability value of 0.05 is less than or equal to the probability value of sig. Fchange or [0.05 < sig. Fchange], then H0 is accepted and Ha is rejected, meaning there is no significant relationship between variable X and variable Y.
2. If the probability value of 0.05 is greater than the probability value of sig. F change or [0.05>sig.F change], then H0 is rejected and Ha is accepted, meaning there is a significant relationship between variable X and variable Y.

RESULTS AND DISCUSSION

Results

In this sub-chapter, the results of the study are presented, namely the relationship between leg length and explosive power of leg muscles on futsal shooting in extracurricular students of SMP Bina Satria Mulia Medan in 2025. The initial activities in this study began with a test of leg length (cm) and explosive power of leg muscles, standing broad jump and futsal shooting goals which were given a score. The researcher carried out this test on the futsal field commonly used by SMP BINA SATRIA MULIA Medan. The following researcher will explain in detail the results of the leg length measurement test, explosive power of leg muscles and the futsal shooting test that the researcher has conducted.

Based on the results of leg length measurements on 32 individuals, the average leg length was 33.47 units of measurement (e.g., cm), with a minimum value of 30 and a maximum of 39. The median value was 34, indicating that half of the respondents had a leg length below or equal to 34. The mode value was also 34, indicating that this number appeared most frequently in the data. The range value of 9 indicates a relatively moderate variation in leg length between individuals. The standard deviation of ±2.37 indicates that most of the data falls within a range not too far from the average, indicating consistency of leg size in this population. The data distribution tends to be symmetrical (skewness ≈ 0.17), with no extreme tendency to one side. Overall, these measurement data indicate that the majority of individuals have leg lengths that are in the moderate and homogeneous category, so that they can be used as a basis for consideration in designing exercises, evaluating posture, or selecting appropriate sports equipment. The complete data can be seen in table 4.1 below:

Table 1. Frequency Distribution of Leg Length Measurement Results (X1) for Extracurricular Students at Bina Satria Mulia Middle School, Medan

Statistik	Value	Description
N (Jumlah data)	32	Total number of values in the data
Minimum	30	smallest value
Maksimum	39	largest value
Range	9	Difference between the maximum and minimum values
Mean (Rata-rata)	33.47	Average of all values
Median	34	middle value when the data is sorted
Modus	34	Most Frequently Occurring Value (9 times)
Standar Deviasi (σ)	±2.37	Measures the spread of the data from the mean
Varians	5.60	Square of the standard deviation

Skewness	≈ 0.17	nearly symmetrical, slighty skrewed to the right
Kurtosis	≈ -0.89	Distribution is slighty flatter than normal

The standard deviation value of 2.37 cm indicates a moderate spread of data, neither too narrow nor too wide from the average. Thus, the majority of individuals have fairly homogeneous leg lengths and are close to the population average in this group.

Table 2. Frequency Distribution of Leg Length Measurement Results (X1) of Extracurricular Students at Bina Satria Mulia Middle School, Medan

Interval Nilai	**Frekuensi (F)**	**Frekuensi Relatif (%)**
30 – 31	4	12.5%
32 – 33	9	28.1%
34 – 35	10	31.3%
36 – 37	10	31.3%
38 – 39	2	6.3%
Total	**32**	**100%**

2025 research processed data Based on the table above, the researcher also describes the graph as follows:

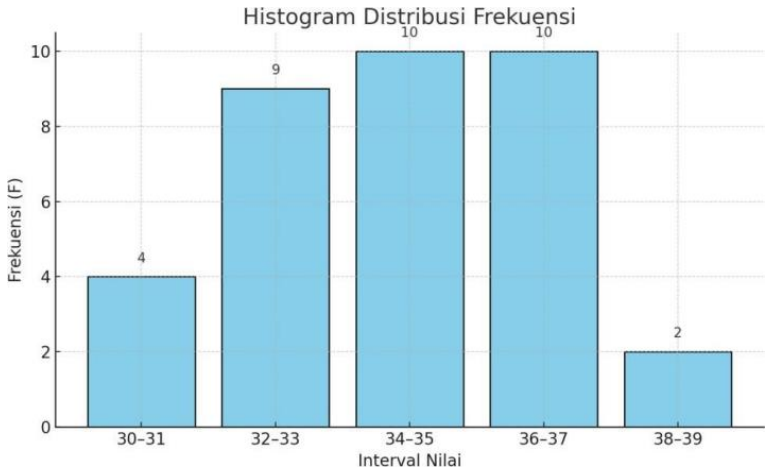

Figure 3. Histogram Distribution Frekuensi

Discussion

The results of the study showed a significant positive relationship between leg length and futsal shooting ability (r = 0.356; p = 0.045 < 0.05). This finding aligns with several previous studies indicating that anthropometric factors, particularly leg length, contribute to shooting performance in soccer and futsal. Previous research demonstrated a significant relationship between leg length and shooting accuracy, with r = 0.459 > r = 0.361 (Anas, 2018), confirming the importance of anthropometric leg dimensions in determining shooting ability.

From a biomechanical perspective, optimal leg length provides a mechanical advantage in shooting through the lever system principle. The kicking motion in soccer is characterized by a proximal-to-distal movement of the lower leg segments, where angular velocity is maximized first by the thigh, then by the calf, and finally by the foot (Kellis & Katis, 2007). In this context, the longer leg acts as a longer lever arm, thus producing higher linear velocities at the tip of the limb (foot) upon contact with the ball. The third class of

lever system found in the leg allows for amplification of movement, where small muscle contractions can produce larger movements at the tip of the leg (Blazevich, 2013).

Biomechanical studies have shown that to optimize the instep kick in soccer, the kinetic movement can be divided into six main phases, and the greater the momentum generated during the run, the more optimal the kick result (Lees & Nolan, 1998). Greater leg length allows players to generate greater momentum during the approach and swing phases, ultimately contributing to ball speed and accuracy. Research has shown that longer foot contact time with the ball is important for the power and speed of a pass or shot, which correlates with the formula "force = mass x acceleration" (Barfield, 1998).

In the context of anthropometric characteristics of futsal players, a study of 75 professional futsal players showed that anthropometric variables such as height and body mass, along with physiological capacity tests, contribute to differentiating futsal player performance levels (Sporiš et al., 2020). Although futsal is played in a smaller space than soccer, the fundamental biomechanical principles of shooting still apply. The biomechanical principles applied to soccer free kicks can be applied to various other contact sports, including futsal, rugby, Australian Rules Football, and American Football (Isokawa & Lees, 1988). However, it is important to note that the relationship between leg length and shooting ability is not absolute. Research shows that leg length is one of several components that influence shooting accuracy and speed, along with leg muscle power and concentration (Fahrizqi, 2018). This indicates that although leg length makes a significant contribution, other factors such as muscle strength, coordination, and technical aspects also play an important role in determining optimal shooting ability.

Practically, the findings of this study have important implications for player selection and training program development. Although leg length is a non-modifiable anthropometric characteristic, understanding its contribution can help coaches identify potential players and develop training strategies tailored to individual physical characteristics. Research shows that leg muscle power significantly contributes to shooting ability in futsal, with a coefficient of determination of 0.52 or 52% (Rosita et al., 2019), emphasizing the importance of a holistic approach to shooting ability development.

CONCLUSION

Based on the data analysis and discussion conducted in this study, the following conclusions can be drawn:

1. There is a significant positive relationship between leg length and futsal shooting ability, with a correlation coefficient of $r = 0.356$ and a significance level of $p = 0.045 < 0.05$. This indicates that the longer a person's legs, the better their futsal shooting ability tends to be.
2. There is a significant positive relationship between leg muscle power and futsal shooting ability, with a correlation coefficient of $r = 0.378$ and a significance level of $p = 0.033 < 0.05$. These results indicate that leg muscle power has a more dominant contribution than leg length to futsal shooting ability.
3. There is no significant relationship between leg length and leg muscle power, with a correlation coefficient of $r = 0.162$ and a significance level of $p = 0.379 > 0.05$. These findings indicate that the two independent variables are relatively independent factors.
4. The multiple regression model formed is statistically significant with an F value of 4.379 and $p = 0.022 < 0.05$. The regression model shows that 23.2% of the variation in futsal shooting ability can be explained by a combination of leg length and leg muscle power, while the remaining 76.8% is influenced by other factors not examined in this study.

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AUTHOR CONTRIBUTION STATEMENT

This research was conceptualized and designed by Erwin Tafonao, who developed the research objectives and methodology, managed data collection, coordinated with participants, and supervised fieldwork at STOK Bina Guna Medan. Devi catur winata performed data analysis, interpreted the findings, and contributed significantly to the preparation of the manuscript. All authors participated in the revision of the manuscript,

approved the final version for submission, and take full responsibility for the integrity and accuracy of the work.

CONFLICT OF INTEREST AND FUNDING

The authors declare no conflict of interest related to the conduct, authorship, or publication of this study.

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