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The Relationship Between Leg Muscle Strength and Balance with Shooting Accuracy Among Futsal Extracurricular Participants In Man Tegal City

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ABSTRACT

This study aims to determine the relationship between leg muscle strength and balance to shooting accuracy in futsal extracurricular participants at MAN Kota Tegal. The problem begins with the low shooting accuracy, which is thought to be caused by weak leg muscle strength and player body balance. The research method used is quantitative correlation. The sample in this study amounted to 30 students who were members of the futsal extracurricular, using the total sampling technique. The research instruments included a vertical jump test for leg muscles, a standing stork test for balance, and a shooting test into the goal. The results of the analysis show that there is a significant relationship between leg muscle strength and balance on shooting accuracy. The t-test showed significant values for both variables, and the F test showed a simultaneous effect that was also significant ($p < 0.05$). In conclusion, leg muscle strength and balance together affect shooting accuracy. Therefore, futsal training programs need to focus on improving these two aspects to support optimal shooting performance.

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A. Conception and design of the study;
B. Acquisition of data;
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INTRODUCTION

Futsal is a widely favoured sport among students due to its fast-paced and engaging nature. In Indonesia, futsal is not only a competitive sport but also a significant extracurricular activity in many schools (Utomo, 2017). The development of futsal as part of school programs plays a crucial role in shaping students' physical and mental discipline (Santoso et al., 2024). One of the key technical elements in futsal is shooting, which directly influences a team's chance of winning. However, observations at MAN Kota Tegal revealed that many players often failed to perform accurate and powerful shots, particularly during competitive matches. The inability to execute proper shooting is presumed to be caused by insufficient leg muscle strength and poor balance, two

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essential physical components in performing effective shots (Rosita & Fachrezzy, 2019).

Several studies have highlighted the importance of physical conditioning in futsal performance. Rosita and Fachrezzy (2019) emphasized that leg muscle strength contributes to the power and speed of the ball during shooting. Suwardi (2023) added that basic techniques, including shooting, require proper physical readiness to be executed effectively. Moreover, Jefri et al. (2024) pointed out that shooting accuracy is not only influenced by technique but also by an athlete's ability to maintain body balance during ball contact. Faozi et al. (2024) reinforced that both strength and coordination must work in harmony to generate accurate and controlled shots. Despite these findings, most studies focus on professional or semi-professional players and rarely address youth-level athletes, especially those in the school extracurricular system. In addition, previous studies have not sufficiently explored the simultaneous effect of leg muscle strength and balance on shooting accuracy in futsal.

The lack of structured physical training programs in extracurricular settings also exacerbates the issue. Based on preliminary observations at MAN Kota Tegal, training routines primarily consist of warm-ups, partner passing, basic defending drills, and scrimmage games, without targeted exercises for shooting, strength, or balance. This is in line with Khilmi & Sudarmono (2023), who argue that unstructured training often leads to suboptimal physical performance. During the Walisongo inter-school futsal competition in February 2025, the MAN Kota Tegal team failed to capitalize on several shooting opportunities, which ultimately led to their defeat against SMA 1 Tegal. These findings suggest an urgent need to investigate the role of physical conditioning in shooting performance at the school level (Henjilito & Hidayat, 2023).

This study aims to analyze the relationship between leg muscle strength and balance with shooting accuracy among futsal extracurricular participants at MAN Kota Tegal. While prior research has examined these variables separately, this study seeks to evaluate their combined influence within the context of high school students engaged in regular extracurricular training (Juniarsyah et al., 2019). The novelty of this research lies in its practical approach to real-world training conditions and its focus on a school-based population. By understanding the physical factors that affect shooting performance, this study hopes to contribute to more effective coaching strategies for improving player performance in youth futsal.

METHODS

This study employed a quantitative correlational design to examine the relationship between leg muscle strength and balance with shooting accuracy. This approach was selected to explore the association between variables without manipulating the natural environment of the participants (Sugiyono, 2019).

The study population consisted of 30 male students who were members of the futsal extracurricular program at MAN Kota Tegal. Given the relatively small population

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size, a total sampling technique was used, meaning all participants were included as research subjects (Sugiyono, 2019).

Leg muscle strength was measured using the Vertical Jump Test, which evaluates lower-body explosive power. Participants performed a standing jump beside a vertically marked wall, and the difference between their standing reach and jump reach was recorded. According to Palinata (2023), this test is effective for measuring leg muscle strength in athletic performance.

Balance was assessed through the Standing Stork Test. In this test, participants stood on one foot, placing the other foot against the supporting leg's knee, then raised their heel and maintained balance for as long as possible. Timing stopped once the balance was lost. This test has demonstrated a validity of 78% and a reliability of 94%, ensuring consistent results (Bagaskoro, 2023; Sepdanius et al., 2019).

Shooting accuracy was evaluated using a target-based shooting test. Participants were instructed to take ten shots from a distance of 10 meters toward a futsal goal divided into nine target zones, each assigned a score from 1 to 5. Points were awarded based on shot placement, and missed shots received no score. The instrument showed strong reliability with a coefficient of 0.940 (Annisa, 2018).

Data analysis included preliminary tests and hypothesis testing. Assumption testing was conducted before analysis, including the Shapiro-Wilk test for normality and a homogeneity test to assess data uniformity (Hanusz et al., 2016). Hypothesis testing involved multiple linear regression and the coefficient of determination (R^2) to assess the influence and contribution of the independent variables. All statistical analyses were conducted using SPSS version 16.

This section outlines the procedures used in the study, including participant selection, measurement tools, data collection, and analysis methods, to ensure clarity and replicability in line with accepted quantitative research practices.

RESULTS AND DISCUSSION

This research was conducted on 30 male students who participated in futsal extracurricular activities at MAN Kota Tegal. The study aimed to determine the relationship between leg muscle strength and balance with shooting accuracy.

Table 1.

Descriptive Statistics of Leg Muscle Strength Test Results

Variable	Leg Muscle Strength Test
N	30
Mean	55
Median	55
Mode	55
Std.Deviation	2.816
Range	10
Min	50
Max	60

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The average leg muscle strength of the participants was 55. This indicates that, in general, students had a good level of leg muscle strength, with the lowest value being 50 and the highest 60. The standard deviation of 2.816 shows that the data were relatively homogeneous.

Table 2.
Frequency Distribution of Leg Muscle Strength

Interval	Frequency	Percentage
56 – 60	10	33%
50 - 55	20	67%
Total	30	100%

Most students (67%) were in the 50–55 range, indicating that the majority had moderate leg muscle strength.

Table 3.
Descriptive Statistics of Balance Test Results

Variable	Balance Test
N	30
Mean	33.97
Median	34
Mode	34
Std.Deviation	2.800
Range	12
Min	28
Max	40

The mean value of balance was 33.97 seconds, with a minimum of 28 and a maximum of 40. The small range and low standard deviation indicate relatively consistent results among participants.

Table 4.
Frequency Distribution of Balance Test

Interval	Frequency	Percentage
36 - 40	7	23%
31 - 35	20	67%
26 - 30	3	10%
Total	30	100%

It can be seen that the majority of participants (67%) had balance scores between 31 and 35 seconds, indicating a good level of balance.

Table 5.
Descriptive Statistics of Shooting Accuracy Test

Variable	Shooting Accuracy Test
N	30
Mean	34.8
Median	35
Mode	35
Std.Deviation	2.660
Range	10
Min	30
Max	40

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The mean value of shooting accuracy was 34.8, with a range of 10. This suggests that students generally had a good shooting accuracy performance.

Table 6.
Frequency Distribution of Shooting Accuracy Test

Interval	Frequency	Percentage
36 – 40	10	33%
30 - 35	20	67%
Total	**30**	**100%**

Most students (67%) had a shooting score between 30 and 35, which falls into the good category. This supports the conclusion that shooting accuracy among participants was adequate.

Classical Assumption Test

The classical assumption tests consist of the normality test and the homogeneity test.

Table 7.
Normality Test Results (Shapiro-Wilk)

Variable	Sig. Value
Leg Muscle Strength	0.146
Balance	0.194
Shooting Accuracy	0.175

Based on the results of the Shapiro-Wilk test, the significance value for variable X1 is 0.146, for variable X2 is 0.194, and for variable Y is 0.175. Since the significance values for both the dependent and independent variables are greater than 0.05, according to the decision rule of the Shapiro-Wilk normality test, it can be concluded that the data of the dependent and independent variables are normally distributed.

Table 8.
Homogeneity Test Results

N	30
Sig.	0,883

The test results showed a significance value of 0.883. Since this value is greater than 0.05, it can be concluded that the data variance among groups is homogeneous. With the assumption of homogeneity fulfilled, the data meet the requirements to be further analyzed using parametric statistical techniques.

The results of the hypothesis testing of multiple linear regression equations are shown in the table, namely:

Table 9.
Multiple Regression Summary

Variabel	koefisien Regresi	t_{hitung}	Sig.
konstanta	8.659		
X_1	0,533	7,792	0,001
X_2	0,416	6,038	0,001
F_{hitung}	= 1686.83		
R Square	= 0,992		

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The resulting regression equation is as follows:

$$\mathbf{Y = 8.659 + 0.533X_1 + 0.416X_2}$$

The obtained regression coefficients indicate that most of the independent variables have a significant contribution to the dependent variable. This is evidenced by the significance values of each coefficient being below the 0.05 significance level.

The t-test results are shown in the table, viz:

Table 10.
Partial t-Test Results

Variabel	t_{hitung}	Sig.
X_1	7,792	0,001
X_2	6,038	0,001

Based on the table above, the significance value (Sig.) for the leg muscle strength variable (X_1) is 0.001 < 0.05, and for the balance variable (X_2) is also < 0.05. Therefore, it can be concluded that there is a significant effect of leg muscle strength (X_1) on shooting accuracy (Y), and a significant effect of balance (X_2) on shooting accuracy (Y).

The results of the F test, namely:

Table 11.
F-Test Result

F	1686.837
Sig	0,001

Based on the table above, the significance test result is 0.001 < alpha (0.05), which means that both independent variables simultaneously have a significant effect on the shooting accuracy variable (Y) among male futsal extracurricular participants at MAN 1 Tegal.

The test results appear in the table, namely:

Table 12.
Correlation (R) and Determination (R^2) Analysis Results

R	0,996
R.Square	0,992
Sig	0,001

Based on the analysis conducted using SPSS software, the multiple correlation coefficient (R) was obtained at 0.996. This value indicates a strong and positive linear relationship between all independent variables collectively and the dependent variable. The coefficient of determination (R^2) was 0.992, meaning that 99.2% of the variation in the dependent variable can be explained by the variations in the independent variables included in the model. The remaining 0.8% is explained by other factors outside the model that were not examined in this study. The significance value of the F change was 0.001 < 0.05, indicating that leg muscle strength and balance simultaneously and significantly affect shooting accuracy. This study examined the relationship between leg muscle strength and balance on shooting accuracy among male futsal extracurricular participants at MAN 1 Tegal. After empirical testing of several hypotheses, the results showed that both independent variables had a significant effect on the dependent

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variable. A more detailed analysis of the relationship between each independent variable (X_1 and X_2) and the dependent variable (Y) is presented in the following section.

The Relationship between Leg Muscle Strength (X_1) and Shooting Accuracy (Y).

Based on the results of multiple linear regression and partial t-test, the leg muscle strength variable (X_1) had a t-value of 7.792 with a significance level of 0.001, which is lower than the 0.05 threshold. This indicates that there is a significant effect of leg muscle strength on the shooting accuracy of male futsal extracurricular participants at MAN Kota Tegal.

The regression coefficient of 0.533 indicates that for every one-unit increase in leg muscle strength, the shooting accuracy score increases by 0.533 units, assuming other variables remain constant. This relationship is positive, meaning that the stronger a player's leg muscles, the more accurate their shooting ability (Kuswoyo, 2017). This finding is logical, as leg muscle strength contributes greatly to power and control during shooting in futsal.

The Relationship between Balance (X_2) and Shooting Accuracy (Y).

The results of the partial t-test showed that the balance variable (X_2) had a t-value of 6.038 with a significance level of 0.001, which is also less than 0.05. This indicates that balance has a significant effect on shooting accuracy.

The regression coefficient of 0.416 means that for every one-unit increase in balance ability, the shooting accuracy score increases by 0.416 units, assuming other variables remain constant. This positive relationship suggests that the better a player's balance, the more accurate their shooting becomes (Gunawan et al., 2023). This is because balance affects body stability during shooting, which is crucial for producing targeted and accurate shots.

The Simultaneous Relationship of Leg Muscle Strength (X_1) and Balance (X_2) with Shooting Accuracy (Y).

Based on the F-test, the calculated F-value was 1686.837 with a significance level of 0.001, which is far below 0.05. This indicates that leg muscle strength and balance simultaneously have a significant effect on shooting accuracy.

Furthermore, the multiple correlation test showed that the correlation coefficient (R) was 0.996, indicating a very strong linear relationship between the independent variables and the dependent variable. The coefficient of determination (R^2) was 0.992, meaning that 99.2% of the variation in shooting accuracy can be explained by the combination of leg muscle strength and balance. The remaining 0.8% is attributed to other factors outside the model. This suggests that training leg muscle strength and balance together will significantly influence the accuracy of shooting direction (Gunawan et al., 2023).

With the assumptions of normality and homogeneity fulfilled, and the regression results showing statistical significance, it can be concluded that the regression model used is appropriate and accurate in explaining the relationships among the variables.

CONCLUSION

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According to the results of the research that has been conducted, it can be concluded that leg muscle strength has a positive and significant relationship with shooting accuracy, as evidenced by the results of the t-test, which shows a significance value of 0.001 < 0.05. Strong leg muscles contribute to shooting precision by providing the necessary power and stability to execute accurate shots during futsal matches.

Balance also plays an important role in shooting accuracy. The significance value for this variable in the t-test was 0.001, which is also below the 0.05 threshold, indicating a significant influence. A player's ability to maintain body stability during shooting increases the precision and control of each shot taken, leading to more accurate and effective shooting outcomes (Gunawan et al., 2023).

In conclusion, both independent variables—leg muscle strength (X_1) and balance (X_2)—significantly predict shooting accuracy (Y). Based on the F-test, the significance value was 0.001 < 0.05, showing a simultaneous and significant effect. The coefficient of determination (R^2) of 0.992 indicates that 99.2% of the variation in shooting performance can be explained by the combination of leg muscle strength and balance. This proves that training both variables simultaneously is essential for improving shooting accuracy in futsal.

The researcher suggests that schools should enhance futsal extracurricular programs by providing sufficient training facilities and support. Coaches are advised to develop training programs that integrate both leg muscle strength and balance exercises. Students should engage in structured and consistent training to improve their shooting skills, while future researchers are encouraged to explore other potential variables—such as coordination or psychological factors—that may also influence shooting accuracy.

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