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Effects of Wall Sit and Calf Raise Training on Futsal Shooting Performance

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Abstract

Shooting ability is a fundamental skill that critically determines performance effectiveness in futsal, particularly among elementary school students. However, its development is often hindered by inadequate lower limb muscle strength and ankle stability. This study investigated the effect of wall sit and calf raises training on shooting ability enhancement in futsal extracurricular participants at SDIT Wadi Fatimah. A pre-experimental one-group pretest-posttest design was employed. Eighteen students were selected using total sampling. Data were collected through shooting tests before and after an eight-week intervention. Wall sit was implemented during the first four weeks to develop leg strength, while calf raises were introduced in the final four weeks to improve ankle stability. Descriptive analysis showed increased mean shooting scores from 7.50 at pretest to 9.78 at posttest. The paired sample t-test yielded a significance value of 0.000 ($p < 0.05$), confirming a statistically significant improvement. These findings empirically demonstrate that the structured combination of wall sit and calf raises training effectively enhances futsal shooting ability. It is concluded that a progressive lower limb strengthening program contributes substantially to measurable improvements in shooting accuracy and consistency among young elementary school athletes.

Keywords : futsal, wall sit, calf raises, shooting ability, training program

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A. Introduction

Futsal is a very popular team sport and is enjoyed by many groups, including elementary school students. The fast and dynamic nature of futsal requires players to master basic techniques within a limited space. According to Hanafi (2020), futsal is played by two teams of five players each on a small field, requiring high technical skills. Mastery of basic techniques in ball-based team sports, such as dribbling and shooting, is a foundation that cannot be ignored because the quality of these basic movements determines a player's effectiveness on the field (Agustian et al., 2022). These motor skills develop gradually along with a child's physical growth, so understanding the principles of motor development is an important foundation in designing training programs that suit the characteristics of elementary school students (Sudirjo & Alif, 2018). Furthermore, Toro (2020) states that futsal requires ball control skills, quick thinking, and accurate decision-making during the game.

One of the most crucial basic techniques in futsal is shooting. Shooting, the ability to kick the ball toward the goal to score, requires a combination of strength, accuracy, coordination, and balance. Widodo (2017) explains that shooting success is influenced by leg muscle strength and body stability during the kick. Similarly, Loyola (2021) adds that shooting performance is influenced by the efficient transfer of energy from the leg muscles through a series of body movements.

However, the shooting ability of elementary school students is still relatively low. This is due to a lack of optimal leg muscle strength and body stability, as well as the lack of a structured training program. Fazri et al. (2024) stated that leg muscle strength has a significant relationship with shooting accuracy and power in futsal. A similar finding was found in the context of soccer learning, where the lack of a systematic and continuous training program was a major factor in students' low technical skill achievement (Agustian et al., 2022). Furthermore, Kurniawan and Soenyoto (2019) emphasized that body balance also plays a crucial role in maintaining consistent direction and shooting results.

One form of exercise that can be used to increase leg muscle strength is the wall sit. This is an isometric exercise performed while sitting against a wall without a chair and is effective for developing leg muscle strength and endurance. According to Pratama and Suryana (2020), isometric exercises such as the wall sit can significantly increase muscle strength. Therefore, wall sits are suspected to have an impact on improving shooting ability in futsal. Therefore, research is needed to test the effectiveness of this exercise in elementary school students.

Although previous studies have demonstrated that lower-limb strength training contributes to improvements in shooting performance, most investigations have focused on a single training method or involved adolescent and adult athletes. Limited evidence is available regarding the combined implementation of wall sit and calf raise exercises in elementary school futsal extracurricular settings. Furthermore, few studies have examined a progressive lower-limb strengthening program specifically designed for young players during their motor development stage. Therefore, this study addresses this research gap by investigating the effectiveness of a structured combination of wall sit and calf raise exercises in improving shooting ability among elementary school students participating in futsal extracurricular activities.

The novelty of this study lies in the implementation of a progressive training program combining wall sit and calf raise exercises specifically for elementary school futsal players. Unlike previous studies that examined these exercises separately or focused on older athletes, this study integrates both exercises into a structured

school-based training program to improve shooting performance during the early stages of motor skill development.

B. Methods

This study used a quantitative approach with a pre-experimental method that aimed to examine the effect of wall sit and calf raises exercises on improving shooting ability in futsal games. The research design applied is One Group Pretest- Posttest Design, which only involves one group given treatment without a comparison group. The population of this study consisted of all students who participated in the futsal extracurricular program at SDIT Wadi Fatimah during the 2025 academic year. The total population was 18 students. Considering that the population size was relatively small and manageable, this study employed a total sampling technique. Total sampling is a sampling technique in which all members of the population are selected as research participants (Sugiyono, 2023). This technique is recommended when the number of population members is limited, allowing researchers to obtain comprehensive data from all available participants and minimize sampling bias.

The selection of total sampling in this study was based on several considerations. First, the population consisted of only 18 students, making it feasible to involve all participants in the research process. Second, the inclusion of the entire population ensured that the results accurately represented the characteristics of all futsal extracurricular participants at SDIT Wadi Fatimah. Third, using all available participants increased the validity of the findings by eliminating potential errors that might arise from selecting only a portion of the population.

Therefore, the sample size was identical to the population size, resulting in a total sample of 18 students (n = 18) who participated in all stages of the study, including the pretest, intervention program, and posttest. This study involved two main variables, namely the independent variable in the form of wall sit and calf raises exercises as the given treatment, and the dependent variable in the form of shooting ability in futsal games. Data were collected through three stages, namely a pretest to determine initial shooting ability, providing treatment for eight weeks, and a posttest to measure the increase in ability after the treatment was given.

The training program in this study was designed in stages over four weeks, with each week consisting of three sessions. In the first week (sessions 1–3), training focused on movement adaptation and mastery of basic techniques, including unloaded calf raises and 30-second wall sits. This phase aimed to familiarize the muscles with basic movement patterns and introduce light shooting techniques. Entering the second week (sessions 4–6), the program shifted to increasing volume and stability, where calf raises were given light loads and the duration of the wall sit was increased to 45 seconds, accompanied by additional repetitions and holding time. In the third week (sessions 7–9), training entered the intensity and strengthening phase of shooting explosiveness, by combining calf raises, isometric wall sits, and shooting drills in an integrated manner to build maximum shooting power. The final phase, namely the fourth week (sessions 10–12), was the maximization and evaluation phase, where all training components were combined in a circuit that combined wall sits and calf raises, followed by target shooting practice in situations that mimicked real-life competition conditions.

Table 1. Progressive Training Program

Week	Session	Wall Sit	Calf Raises	Shooting Practice
1	1–3	3 × 30 s	3 × 15 repetitions	Basic shooting technique
2	4–6	3 × 45 s	3 × 20 repetitions	Target shooting
3	7–9	4 × 45 s	4 × 20 repetitions	Power shooting

Week	Session	Wall Sit	Calf Raises	Shooting Practice
4	10–12	4 × 60 s	4 × 25 repetitions	Circuit shooting under game situations

Shooting ability was assessed using a standardized futsal shooting test adapted from previous studies on futsal technical skill assessment. Before implementation, the instrument was reviewed by experts in physical education and futsal coaching to ensure content validity. The shooting test measured shooting accuracy by assigning scores based on the target zone reached by each kick. Each participant performed five shooting attempts from a distance of six meters, and the total score represented the participant's shooting performance.The data analysis in this study was conducted quantitatively to determine the effect of wall sit and calf raises exercises on improving futsal shooting ability. Data obtained from the pretest and posttest were first analyzed descriptively to determine the average value (mean), minimum score, maximum score, and standard deviation, so that a picture of the students' initial and final abilities could be identified. Next, prerequisite tests were conducted including a normality test using the Shapiro-Wilk test due to the small sample size ($n < 50$), and a homogeneity test using Levene's Test to ensure data consistency. Hypothesis testing was then conducted using a paired sample t-test to determine whether there was a significant difference between the pretest and posttest scores. The decision-making criteria were based on the significance value (Sig.), where Sig. < 0.05 indicates a significant effect of the treatment, while Sig. ≥ 0.05 indicates no significant effect. In addition, to determine the magnitude of the effect of the treatment, an effect size analysis was conducted using Cohen's d with interpretation criteria of 0.2 (small), 0.5 (moderate), and 0.8 (large). To further measure the level of shooting improvement, a gain score analysis was also applied using the N-Gain formula. N-Gain results were interpreted into three categories: high ($\geq$ 0.70), moderate (0.30–0.69), and low ($<$0.30). Through these analysis stages, it is hoped that the effectiveness of wall sit and calf raise exercises in improving futsal shooting ability can be identified comprehensively and objectively.

The normalized gain score (N-Gain) was calculated using the formula proposed by Hake (1999):

$$\text{N-Gain} = \frac{\text{(Posttest Score} - \text{Pretest Score)}}{\text{(Maximum Score} - \text{Pretest Score)}}$$

Where:

Posttest Score = average score obtained after treatment;

Pretest Score = average score obtained before treatment;

Maximum Score = maximum possible score of the shooting test.

The N-Gain interpretation criteria were categorized as high ($\geq$ 0.70), moderate (0.30–0.69), and low ($<$ 0.30).

C. Result and Discussion

Table 1. Description of Shooting Ability Data

Descriptive Statistics

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
pretest shooting	18	3.00	11.00	135.00	7.5000	2.33263
posttest shooting	18	6.00	14.00	176.00	9.7778	2.23753
Valid N (listwise)	18					

Based on Table 1, the results of the descriptive statistical analysis **showed** that the average value (mean) of shooting ability during the pretest was 7.50 with a standard deviation of 2.33263. After being given treatment, the average value in the posttest increased to 9.7778 with a standard deviation of 2.23753. In addition, the minimum and maximum values also increased, namely from a range of 3–11 in the pretest to 6–14 in the posttest.

To provide a clearer visualization of the improvement in students' shooting ability before and after the intervention, a comparison graph of the mean pretest and posttest scores is presented in Figure 1.

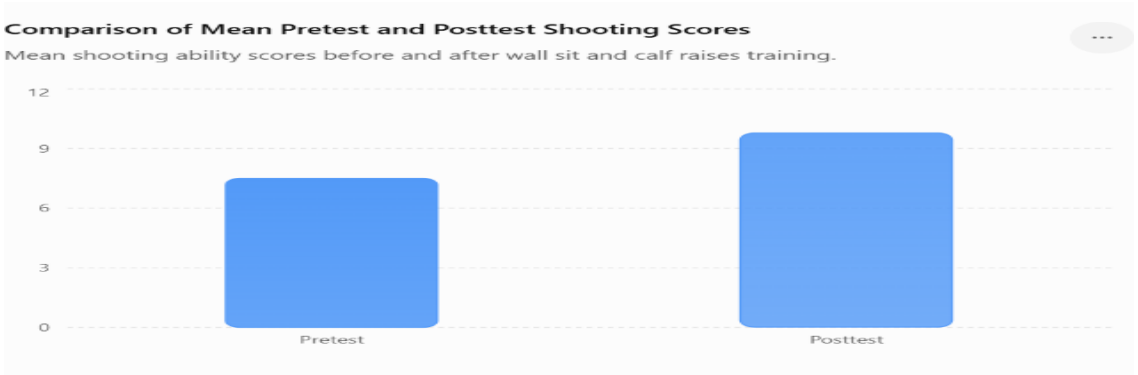

Figure 1. Comparison of Mean Pretest and Posttest Shooting Scores

Figure 1 illustrates the comparison between the mean pretest and posttest shooting scores. The average score increased from 7.50 during the pretest to 9.78 during the posttest, indicating a positive improvement following the wall sit and calf raises training program. The graphical representation supports the descriptive statistical findings and provides visual evidence of the effectiveness of the intervention in enhancing students' shooting ability

The increase in the average score indicated an improvement in the students' shooting ability after being given wall sits and calf raises. This indicated that the training program had a positive impact on shooting performance in futsal. Physiologically, this improvement can occur due to increased strength and endurance in the leg muscles, which play a crucial role in producing more powerful and accurate kicks.

Furthermore, there was a decrease in the standard deviation from pretest to posttest, although not significantly. This indicates that the variation in shooting

ability between students decreased, or in other words, student performance became more consistent after the treatment. This consistency **was** important in futsal because it indicated that shooting ability not only improved on average but also more evenly across players.

Thus, it can be concluded that the training provided not only improved overall shooting ability but also helped stabilize student performance. These results reinforce the idea that a structured training program can have a positive impact on both skill improvement and shooting consistency.

Table 2. Normality of Shooting Ability Data

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
pretest shooting	.129	18	.200*	.960	18	.611
posttest shooting	.191	18	.080	.952	18	.451

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Based on Table 2, the results of the normality test using the Shapiro-Wilk method show that the significance value (Sig.) for the pretest data is 0.611 and for the posttest data is 0.451. Both significance values are greater than 0.05, which means that the pretest and posttest data are normally distributed.

Furthermore, the Kolmogorov-Smirnov test showed a significance value of 0.200 for the pretest and 0.080 for the posttest, both of which are greater than 0.05. This further confirmed that the data in this study met the assumption of normality.

Thus, it can be concluded that the shooting ability data before and after treatment were normally distributed, thus meeting the assumption of normality. Therefore, parametric statistical analysis, such as the paired sample t-test, can be used in the next stage to test the research hypothesis.

Table 3. Paired Samples Test

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	pretest shooting - posttest shooting	-2.27778	.66911	.15771	-2.61052	-1.94504	-14.443	17	.000

Based on Table 3, the results of the paired sample t-test show a significance value (Sig. 2-tailed) of 0.000, which is less than 0.05. This indicated a statistically significant difference between the pretest and posttest shooting ability scores.

The mean difference value of -2.27778 indicates an increase in shooting ability after the treatment. The negative sign indicates that the posttest score is higher than the pretest. Furthermore, the calculated t-value of -14.443 with 17 degrees of freedom (df) further confirms that the difference was not due to chance, but rather a result of the treatment.

Table 4. N-Gain Analysis of Shooting Ability

Variable	Pretest Mean	Posttest Mean	Maximum Score	N-Gain	Category
Shooting Ability	7.50	9.78	15.00	0.30	Moderate

Thus, it can be concluded that wall sits and calf raises significantly improve shooting ability in futsal. The overall results of this study can be summarized as follows:

a. Descriptive analysis shows an increase in the average shooting score from pretest to posttest.
b. The normality test shows that the data is normally distributed, thus fulfilling the requirements for parametric analysis.
c. The paired sample t-test proves that the increase is statistically significant.
d. Therefore, the training program provided has proven effective in improving students' futsal shooting abilities.

Table 4 presents the results of the normalized gain (N-Gain) analysis used to determine the effectiveness of the training program in improving students' shooting ability. The average pretest score was 7.50, while the average posttest score increased to 9.78. Based on the N-Gain calculation, a value of 0.30 was obtained, which falls within the moderate category according to Hake's classification. This result indicates that the wall sit and calf raises training program produced a meaningful improvement in students' shooting performance. Although the improvement was not categorized as high, the training intervention was sufficiently effective in enhancing shooting ability among futsal extracurricular participants at SDIT Wadi Fatimah.

Discussion

The results of this study indicate that wall sit and calf raise exercises significantly improved shooting ability in futsal. This is evidenced by an increase in the average shooting score from pretest to posttest, as well as a paired sample t-test showing a significance value <0.05. This improvement indicates that the training program was able to improve students' performance in terms of both shooting power and shooting accuracy.

Theoretically, improving shooting ability is inseparable from the role of leg muscle strength. According to Bompa & Buzzichelli (2019), muscle strength is a crucial component of physical condition in supporting technical performance in sports, particularly in sports like futsal. Furthermore, Fazri et al. (2024) stated that leg muscle strength has a significant relationship to shooting ability, as leg muscles play a role in generating propulsion during kicks. These findings align with research by Agustian et al. (2022) which demonstrated that systematic and programmed ball-based basic movement training significantly improved the technical skills of elementary school students, while reinforcing the belief that consistency and progressive training load are key to the success of motor skill development programs. This finding aligns with the views of Sudirjo and Alif (2018) who emphasized that human movement development occurs sequentially and hierarchically, where mastery of basic movement patterns during childhood is a prerequisite for the development of more complex sports skills later in life. Therefore, increasing muscle strength through wall sit and calf raise exercises contributes directly to improved shooting results.

Wall sits, a form of isometric exercise, have been shown to be effective in increasing leg muscle strength and endurance. According to Pratama and Suryana (2020), isometric exercises can increase muscle strength without significantly changing muscle length, making them highly effective in improving body stability. This is supported by Kato (2020), who stated that wall sits can increase thigh muscle activation and knee

joint stability, which are essential for maintaining balance when shooting. Good body stability allows players to produce more controlled and accurate shots.

Furthermore, calf raises play a role in increasing calf muscle strength, which supports plantar flexion when kicking a ball. According to Amal et al. (2024), calf raises are effective in improving ankle stability and calf muscle strength, which contribute to motor performance in futsal. Calf muscle strength is crucial for generating the final push upon contact with the ball, thereby increasing shooting power and speed.

Furthermore, the results of this study also showed a decrease in the standard deviation in the posttest, indicating that students' shooting abilities became more consistent. This aligns with Loyola's (2021) opinion, which states that shooting consistency is influenced by good motor coordination and body stability. With structured training, players are able to control body movements more efficiently, resulting in more stable performance.

Thus, the results of this study align with previous theories and research stating that leg muscle strength training has a significant effect on improving basic futsal technical skills, particularly shooting. The combination of wall sit and calf raise exercises has been shown to be effective in improving strength, stability, and consistency of students' shooting performance. This is reinforced by Agustian et al. (2022) who found that a specific movement-based training program for elementary school students, although without significant differences between methods, still made a positive contribution to improving technical skills in ball games, with methods involving coordination and body agility tending to produce greater effects. Therefore, this training program can be used as an alternative, simple yet effective training method in futsal learning at the elementary school level.

Research Implications

The findings of this study have both practical and theoretical implications. Practically, the results demonstrate that a structured combination of wall sit and calf raises exercises can be implemented as an effective training strategy to improve shooting ability among elementary school students participating in futsal extracurricular activities. These exercises are simple, low-cost, and easy to apply in school environments without requiring sophisticated equipment. Therefore, physical education teachers and futsal coaches may incorporate these exercises into regular training programs to enhance lower limb strength, ankle stability, and shooting performance.

Theoretically, this study contributes to the growing body of knowledge regarding the role of lower-limb strength training in developing fundamental futsal skills among young athletes. The findings support previous research indicating that muscle strength and stability are important determinants of shooting performance. Furthermore, the study provides empirical evidence that progressive strength-training interventions can positively influence motor skill development in elementary school students.

Research Limitations

This study has several limitations that should be considered when interpreting the findings. First, the study employed a pre-experimental one-group pretest-posttest design without a control group, which limits the ability to attribute improvements solely to the intervention. Second, the sample size was relatively small, consisting of only 18 students from a single elementary school, which may restrict the generalizability of the results to broader populations. Third, the intervention period was limited to eight weeks, and longer training durations may produce different outcomes. Finally, the study focused exclusively on shooting ability and did not

examine other futsal performance components such as passing, dribbling, agility, or match performance. Future studies are recommended to involve larger samples, include control groups, extend the duration of the intervention, and investigate additional performance variables to provide more comprehensive evidence regarding the effectiveness of wall sit and calf raises training

that this research can provide benefits for the development of science, especially in the field of physical education and sports, and become a real contribution to improving the quality of futsal learning at SDIT Wadi Fatimah school. May all the good that has been given be rewarded many times over.

D. Conclusion

Based on the results of this study, it can be concluded that wall sit and calf raise exercises have a significant effect on improving shooting ability in futsal. This is indicated by an increase in the average score from pretest to posttest, as well as statistical test results that show a significant difference. Furthermore, the training provided also improved the consistency of student performance, resulting in more stable and even shooting ability. Thus, a structured training program through a combination of wall sit and calf raise exercises has proven effective in increasing leg muscle strength, which has an impact on shooting accuracy and power. Therefore, it can be used as a practical and efficient training method in futsal learning in elementary schools.

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F. Conflict of Interest

There were no problems or obstacles when conducting the research.

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