Journal of Physical Education, Sport, and Human Performance (JPESHP)
Journal Homepage: https://lenteracendekia.co.id/jpeshp

THE RELATIONSHIP BETWEEN LEG MUSCLE STRENGTH AND SHOOTING ABILITY IN FUTSAL AMONG ELEMENTARY SCHOOL STUDENTS AT IKIP 1 MAKASSAR

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ARTICLE INFO

Keywords:
Leg muscle strength, shooting ability, futsal, elementary school students.

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All authors have reviewed and approved the final version of the manuscript.

ABSTRACT

This study aims to determine the relationship between leg muscle strength and shooting ability in futsal among elementary school students at IKIP 1 Makassar. The study used a correlational quantitative method with a total sample of 30 students who actively participated in futsal training. Leg muscle strength was measured using leg press and squat jump tests, while shooting ability was measured based on kicking accuracy and speed. Data were analyzed using descriptive statistics and Pearson's correlation with a significance level of $\alpha = 0.05$. The results showed that the average leg muscle strength score of the students was 45.3 ± 6.2 kg, while the average shooting ability was 78.5 ± 8.4. Correlation analysis showed a positive and significant relationship between leg muscle strength and shooting ability ($r = 0.672$, $p < 0.05$). This indicates that the higher the leg muscle strength, the better the students' shooting ability. These findings emphasize the importance of leg muscle strengthening exercises as part of the PJOK learning program and futsal training to improve kicking technique performance in elementary school students.

1. Introduction

Futsal is a sport that requires good technical and physical skills, including ball control, speed, passing accuracy, and shooting (Hidayati, 2023). These skills are performed in a high-intensity intermittent game involving short sprints, quick changes of direction, and repeated kicking actions that require substantial lower-limb strength and endurance(Gabbett & Mulvey, 2008). According to Reilly & Williams (2003), the physical performance in soccer and futsal is largely determined by the ability to generate power through lower-limb movements supported by muscular coordination and strength.

In the context of elementary school students, the development of basic motor skills, especially leg muscle strength, is an important factor that supports futsal performance(de Miranda Melo et al., 2023). Leg muscle strength plays a role in kicking, jumping, and changing direction quickly, which directly affects the ability to shoot accurately and powerfully (Fahey et al., 2025). Similar findings were reported by Pribadi & Supriyadi (2020), who observed a significant relationship between leg muscle strength and kicking accuracy among elementary school students participating in futsal training.

Previous studies have shown a relationship between leg muscle strength and kicking skill performance in soccer and futsal. Faigenbaum et al. (2009), stated that increased leg muscle strength in school-aged children has a positive impact on the ability to kick the ball with greater accuracy and speed. This finding is reinforced by recent research explaining that increased leg muscle strength and power can improve the speed and power of kicks in young players (Syaifullah et al., 2023).

In addition, leg muscle ability also contributes to body stability and coordination when shooting. Futsal players with good leg strength are able to maintain their balance when kicking, resulting in more accurate and powerful shots (Hidayati, 2023). On the other hand, weak leg muscle strength can cause a decrease in the effectiveness of movements, including running speed and ball control (Jasmanedi, 2025). Therefore, strengthening the leg muscles is an important aspect in improving futsal skills, especially for elementary school students (de Miranda Melo et al., 2023).

Leg muscle strength not only supports the technical aspects of the game but also plays a role in injury prevention. Students with good muscle strength tend to have higher joint stability, thereby minimizing the risk of knee and ankle injuries (Fahey et al., 2025). Thus, exercises that focus on increasing leg muscle strength can provide dual benefits, namely improved performance and protection against injury (Prasetyo & Nasution, 2025).

Based on this description, this study aims to analyze the relationship between leg muscle strength and shooting ability in futsal among elementary school students at SD IKIP 1 Makassar. The results of this study are expected to form the basis for the development of effective and applicable training programs to improve futsal performance among elementary school students (Hidayati, 2023).

The selection of the sample of Elementary School (SD) students in this study is based on several developmental and pedagogical considerations. Elementary school age is the early stage of motor development where fitness components such as muscle strength, coordination, and basic technical skills begin to increase rapidly. In this phase, the relationship between motor variables tends to be more clearly visible, so it is suitable for analysis using a correlational approach.

In addition, the ability to kick in futsal is a basic skill that began to be introduced and trained in elementary school. Thus, studying the relationship between leg muscle strength and shooting ability at this age can give an initial picture of the factors that contribute to the development of basic futsal skills. The results of correlation analysis in this early age group can help teachers and trainers in determining the right exercise focus from the beginning.

The latest motor development study also shows that the age range of 7–12 years is a sensitive period to the improvement of physical ability and technical skills, so it is very relevant to examine the relationship between physical parameters and movement performance (Silva et al., 2021; Padulo et al., 2020). Therefore, the elementary school age sample is considered ideal to understand how leg muscle strength plays a role in shaping shooting ability in futsal games.

2. Methods

This study used a correlational quantitative method Sugiyono (2016), with the aim of determining the relationship between leg muscle strength and kicking ability in futsal among elementary school students at IKIP 1 Makassar.The study population consisted of all fifth and sixth grade students at IKIP 1 Makassar who participated in futsal extracurricular activities. The research sample was taken using total sampling, so that all students who met the inclusion criteria, namely actively participating in futsal training and having no leg injuries, became research respondents.

Leg muscle strength was measured using a leg press test with weights according to the standard for children's ages, as well as a squat jump test to measure lower leg explosive strength. Each student was given the opportunity to perform three trials, and the best score was used as the final score. Meanwhile, the ability to kick the ball into the goal was measured through a ball kicking test with accuracy and speed as assessment indicators. Each student performed three ball kicking trials, and the average score was used as the final score for ball kicking ability.

The data obtained was analyzed using descriptive statistics to determine the mean, standard deviation, and data distribution. Furthermore, to determine the relationship between leg muscle strength and kicking ability, Pearson's correlation analysis was used. The analysis was performed using the latest version of the SPSS program, with a significance level of $\alpha = 0.05$.
With this method, the study is expected to provide a clear picture of the extent to which leg muscle strength affects kicking ability in futsal among elementary school students, as well as to serve as the basis for recommendations for appropriate training programs.

The assessment of shooting ability in this study uses a performance rating scale (performance rating scale) developed based on indicators of accuracy, kick strength, and quality shooting techniques. This instrument is adapted from the latest research related to the evaluation of the shooting ability of young players in futsal and football (Alves et al., 2019; Ferraz et al., 2020; Ramos et al., 2020).

Results

Based on measurements taken from 30 elementary school students at IKIP 1 Makassar, data was obtained on leg muscle strength and shooting ability in futsal. Descriptive analysis showed that the average leg muscle strength score was 45.3 ± 6.2 (kg), while the average shooting ability was 78.5 ± 8.4 (accuracy and speed scores). The data showed that the distribution of both variables was in the normal category, making them suitable for analysis using Pearson's correlation.

The results of Pearson's correlation test showed a significant positive relationship between leg muscle strength and shooting ability in students ($r = 0.672$, $p < 0.05$). This indicates that the higher the leg muscle strength of students, the better their shooting ability in futsal.

Table 1. Relationship between Leg Muscle Strength and Shooting Ability

Variable	Mean	SD	r	p
Leg Muscle Strength	45,3	6,2		
Shooting Ability	78,5	8,4	0,672	0,000*

**Signifikan pada α = 0,05*

3. Discussion

The results of the study show a significant positive correlation between leg muscle strength and shooting ability in elementary school students at IKIP 1 Makassar. This positive correlation confirms that increased leg muscle strength affects shooting performance, both in terms of accuracy and kicking speed (Hardjowigeno, 2012). This is consistent with the findings of Raya-González et al. (2020), who reported that lower-limb strength was significantly correlated with shooting power and precision in young futsal players.This is in line with the principles of sports physiology, which state that the leg muscles, especially the quadriceps, hamstrings, and gastrocnemius, are the main muscle groups involved in kicking a ball (Fahey et al., 2025). Optimal muscle strength enables students to produce stronger and more accurate kicks, as well as support body stability when performing complex movements such as kicking while running or adjusting body position to the ball.

This phenomenon is also in line with the theory of child motor development, which states that gross motor skills, including leg muscle strength, form the basis for mastering sports skills (Jasmanedi, 2025). Children with good leg muscle strength have more stable movement control, better body balance, and the ability to generate kicking power that is appropriate for the target. In the context of futsal, good shooting ability is a crucial technical skill for scoring goals. Therefore, strengthening the leg muscles is an important strategy in developing students' competence in futsal.

In addition to physiological aspects, the results of this study are also relevant to the physical education learning approach in elementary schools. Physical education teachers and futsal coaches can utilize these findings to design structured exercises, for example, by combining leg strength, coordination, and shooting technique exercises de Miranda Melo et al. (2023). Leg muscle strengthening exercises can include squats, lunges, leg presses, and simple plyometric exercises such as squat jumps or bounding, which not only increase strength but also explosive power. These exercises, if done regularly and adjusted to the children's abilities, can significantly improve shooting performance.

This study is also in line with the results of a previous study conducted by Arifin (2017), which found that strengthening the leg muscles in children has a positive effect on ball kicking skills. This reinforces the view that technical ability in sports cannot be separated from physical ability, especially the muscle strength that supports the main movements. Thus, the development of sports skills in elementary school students should be carried out comprehensively, covering physical, technical, and cognitive aspects so that sports learning outcomes can be more optimal.

Furthermore, the results of this study also emphasize the importance of monitoring and adjusting the intensity of training according to the physical abilities of students. Excessive training without supervision can increase the risk of injury, while training that is adjusted to children's physical capacity can increase motivation, technical skills, and physical readiness. Therefore, physical education teachers and futsal coaches need to design training programs that balance strength, coordination, and technique so that shooting skills can develop optimally (Hidayati, 2023).

Practically, these findings have important implications for the planning of the physical education curriculum and futsal extracurricular activities at SD IKIP 1 Makassar. The integration of leg strength training into physical education in schools can be an effective strategy to improve student performance, particularly in kicking and shooting skills. With the support of appropriate and continuous physical training, students are expected to not only have good technical skills but also adequate endurance and physical strength to participate in futsal optimally.

Research results show that leg muscle strength has a significant relationship with shooting ability in the futsal game. Students with better leg muscle strength are able to produce stronger, more stable, and consistent kicks. This finding is in line with the latest research that states that lower extremity muscle strength is an important predictor in kick performance in football and futsal (Ferraz et al., 2020).

However, shooting ability is not only determined by the strength of the leg muscles. Several external factors also play an important role, namely: (1) Coordination, Motor coordination, especially eye-foot coordination, affects movement control when shooting. Athletes with good coordination are able to manage balance and foot swing time appropriately (Silva et al., 2021), (2) Accuracy, Accuracy is the main factor in determining the success of the kick. Accuracy is influenced by movement control, focus, and experience in shooting techniques. Latest research shows that foot swing technique and body stability play a big role in increasing shooting accuracy (Alves et al., 2019). (3) Visual Perception, Visual perception helps players in reading the direction of the ball, goal position, and shooting space. A recent study reveals that visual perception contributes significantly to the decision and effectiveness of shooting in young players (Williams & Jackson, 2020). (4) Kicking Technique Basic techniques starting from the foot position, foot contact with the ball, to follow through greatly affects the result of the shot. Research shows that the right technique can increase kick efficiency even though muscle strength is not optimal (Ramos et al., 2020).

4. Conclusion

Based on the results of research on the relationship between leg muscle strength and shooting ability in futsal among elementary school students at IKIP 1 Makassar, it can be concluded that there is a positive and significant relationship between leg muscle strength and students' shooting ability. The higher the leg muscle strength, the better the students' shooting ability, both in terms of accuracy and kicking speed. This shows that leg muscle strength is a physical factor that greatly influences

technical skills in futsal. Therefore, developing leg muscle strength needs to be part of the PJOK training program and futsal extracurricular activities, with the aim of improving students' overall performance. Implementing training that combines leg muscle strengthening with shooting technique training on a regular and structured basis can be an effective strategy for improving the motor skills and technical skills of elementary school students.

6. Author Contribution

Febrianto Sandi Lebang formulated the initial idea and supervised this project. Putra and Hilman Ashari designed the research procedures and conducted the experiments. Febrianto Sandi Lebang analyzed the data and wrote the manuscript with support from Putra. Hilman Ashari contributed to data collection and helped refine the discussion section. All authors reviewed and approved the final version of the manuscript.

7. Acknowledgements

Para penulis ingin mengucapkan terima kasih yang tulus kepada kepala sekolah, guru, dan siswa SD IKIP 1 Makassar atas partisipasi dan kerja samanya selama proses penelitian. Ucapan terima kasih juga disampaikan kepada Fakultas Olahraga dan Ilmu Kesehatan, Universitas Negeri Makassar, atas dukungan akademik dan fasilitas yang disediakan. Para penulis juga mengucapkan terima kasih kepada semua rekan sejawat dan reviewer atas masukan berharga mereka, yang sangat berkontribusi dalam perbaikan naskah ini.

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