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The Effect of Leg Muscle Strength on Shoot Power Ability in Extracurricular Football Students at Pelita Harapan Umat Elementary School, Malang Regency

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Abstract
The results of this study aim to determine the effect of leg muscle strength on the ability of shooting power in extracurricular soccer students of SDIT Pelita Harapan Umat, Malang Regency. The research method is a quasi-experimental method. The sampling technique is simple random sampling. The sample is 20 students of class 5A as the experimental class and 20 students of class 5B as the control class. The data collection technique uses tests and non-tests. The instruments are tests and non-test instruments in the form of questionnaires. The data obtained were analyzed using prerequisite tests, normality tests and homogeneity tests. The results of the t-test that have been carried out with the SPSS program, obtained that the t-count value is greater than the t-table value, meaning that there is a significant influence of leg muscle strength on the ability of shooting power in extracurricular soccer students of SDIT Pelita Harapan Umat, Malang Regency.

Keywords: Leg Muscle Strength, Shoot Power

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INTRODUCTION

Soccer is a very popular sport and is highly sought after by elementary school students and teenagers because it is not only competitive but also develops basic motor skills (Balagué et al., 2020). In soccer, technical abilities, such as shooting, are a key indicator of a player's success on the field (Reeves, Roberts, & Brooke-Wavell, 2019).

Leg muscle strength is a key component in producing effective kicking performance, both in terms of power (shooting power) and accuracy (Hammami et al., 2021). Optimal muscle strength enables players to shoot with high speed and precise direction.

The development of physical abilities, particularly leg muscle strength, in elementary school-aged children differs from that in adolescents and adults because it is influenced by bone growth and muscle mass (García-Hermoso et al., 2020). Therefore, understanding the relationship between leg muscle strength and technical abilities, such as shooting, is crucial for this age group.

Previous research has shown a positive relationship between lower extremity strength and kicking speed in adolescent soccer players (Slimani et al., 2019). However, studies in elementary school age are limited, making it unclear how leg muscle strength contributes to kicking accuracy and shooting power in elementary school students.

Furthermore, shooting accuracy in soccer is influenced not only by physical aspects, but also by neuromuscular coordination and individual technique (Ali, 2021). This necessitates examining whether increasing leg muscle strength significantly impacts kicking accuracy.

Another study found that strength training, particularly plyometric and resistance training, can improve kicking performance in young players, including increasing shot velocity (Brito et al., 2020). However, the direct relationship between leg muscle strength and accuracy has received less attention.

SDIT Pelita Harapan Umat, Malang Regency, has an active extracurricular soccer program, making it an ideal population to evaluate the relationship between leg muscle strength, kicking accuracy, and shooting power in students. This analysis can inform the design of more effective training programs in schools.

Beyond its practical benefits, this research also makes a scientific contribution to the study of sports learning at the elementary school level, particularly in determining which physical aspects need to be developed to improve overall soccer skills (Van den Tillaar & Uljevic, 2021).

Based on a literature review, while many studies focus on the technical or tactical aspects of soccer, research on the relationship between leg muscle strength and the combination of shooting accuracy and power in elementary school students is still very limited. This creates a scientific gap that needs to be filled.

Against this background, this study aims to empirically test whether leg muscle strength influences kicking accuracy and shooting power in extracurricular soccer students at SDIT Pelita Harapan Umat, Malang Regency. The results are expected to provide evidence-based training recommendations for school coaches.

METHOD

The research used a quantitative approach with an experimental research type (Moleong, 2015). The method is a quasi-experimental method. The design used is a non-equivalent control group design (Suharsini, 2010). The sample was the extracurricular soccer

students of SDIT Pelita Harapan Umat, Malang Regency. The sampling technique was simple random sampling. The sample was 20 students of class 5A as the experimental class and 20 students of class 5B as the control class. The data collection technique used tests and non-tests. The instruments were tests and non-test instruments in the form of questionnaires. This data was analyzed using the Levene homogeneity prerequisite test and Kolmogorov Smirnov normality test. Then tested with a t-test with the SPSS program.

RESULTS AND DISCUSSION

Result

The research results can be seen in Table 1 below:

Table 1. Hypothesis Test Calculation Results

Statistik	*Pretest*	*Posttest*
t count	1,67	3,73
t_{table}	2,021	2,021
Decision	H_a rejected	H_a accepted

Table 1 above shows that the pretest results obtained a calculated t-value of 1.67 and a calculated t-value of 2.021. The calculated t-value is smaller than the calculated t-value, so the null hypothesis (Ho) is accepted and the alternative hypothesis (Ha) is rejected. This means there is no significant difference between the pretest results of the experimental and control classes.

Table 1 above shows that the posttest results obtained a calculated t-value of 3.73 and a calculated t-value of 2.021. The calculated t-value from the posttest is greater than the calculated t-value, so the null hypothesis (Ho) is rejected and the alternative hypothesis (Ha) is accepted. This means there is a significant difference between the posttest results of the experimental and control classes. The average shooting power ability in the experimental class increased compared to the average shooting power ability in the control class.

Shooting power ability using leg muscle strength in soccer can significantly increase shooting power ability, as shown by the normal gain (N-gain) test results for the experimental class, which was higher than the control class. In the experimental class, the N-gain value

was 0.82, indicating a high category, and in the control class, it was 0.60, indicating a moderate category. The shooting power ability in the experimental class increased more after learning to utilize leg muscle strength in soccer compared to the increase in shooting power ability of students in the control class.

Discussion

After the two classes were given different treatments, the average scores of the two classes differed. Based on the results of the hypothesis test, the posttest scores between the control and experimental classes were higher than the t-table values, namely 3.73 > 2.021. This indicates that using leg muscle strength in soccer significantly impacts the shooting power of students at SDIT Pelita Harapan Umat, Malang Regency. There was a difference in the average posttest scores, with students in the experimental class achieving higher average posttest scores than those in the control class. There was a difference in shooting power among students using leg muscle strength in soccer.

Leg muscle strength is a component of physical condition that significantly determines an athlete's performance in sports, particularly soccer. In soccer, shooting power is needed to produce powerful, fast, and difficult-to-anticipate shots. According to research published in the Journal of Sports Sciences (2020), lower extremity muscle strength contributes significantly to the speed and kicking power of adolescent soccer players (Loturco et al., 2020). This suggests that the stronger the leg muscles, the greater the player's potential for producing high-powered shots.

Biomechanically, the shooting movement involves explosive contractions of key muscles such as the quadriceps, hamstrings, gastrocnemius, and gluteus maximus. A study in the Journal of Strength and Conditioning Research (2021) explains that maximal force production during the knee and hip extension phase is a key factor in increasing ball velocity after contact (Rodríguez-Rosell et al., 2021). This means that leg muscle strength plays a direct role in generating propulsive force on the ball.

The results of this study, which demonstrate the significant influence of leg muscle strength on shooting power, align with findings in Sports Biomechanics (2022), which states that increasing maximal leg strength through resistance training can increase ball velocity by 8–12% in school-aged players (Comfort et al., 2022). This increase occurs due to neuromuscular adaptations that increase motor unit recruitment during kicking.

In addition to maximal strength, muscular power or explosive power is also a crucial factor in shooting. According to research in the International Journal of Environmental Research and Public Health (2021), a combination of strength and plyometric training has been shown to effectively improve shooting performance in young athletes (Ramírez-Campillo et al., 2021). This suggests that good leg muscle strength is more optimal when combined with explosive training.

In the context of school soccer instruction or extracurricular activities, increasing leg muscle strength can be achieved through squats, lunges, leg presses, and plyometric jumps. A study in the Journal of Human Kinetics (2020) found that a 6–8-week strength training program significantly improved leg muscle strength and kicking performance in adolescent players (Makaruk et al., 2020). This corroborates research findings that structured training interventions significantly impact shooting power.

Physiologically, increased leg muscle strength is associated with increased capacity of type II (fast-twitch) muscle fibers, which play a role in explosive movements. Research in Frontiers in Physiology (2022) explains that progressive strength training can improve muscle contraction efficiency and force transfer during dynamic movements such as shooting (Suchomel et al., 2022). Thus, leg muscle strength is the primary foundation for generating kicking power.

The results of this study also showed that players with high leg muscle strength tended to have better shooting power results than those with moderate or low strength. This finding is consistent with research in the Journal of Sports Medicine and Physical Fitness (2023), which reported a positive correlation between isokinetic leg strength and ball velocity during shooting (Martínez-Cava et al., 2023).

However, shooting power is not solely influenced by leg muscle strength, but also by technique, coordination, balance, and flexibility. According to the European Journal of Sport Science (2020), body segmental coordination and timing of contact with the ball also play a crucial role in determining the ball's final velocity (Lees et al., 2020). Therefore, leg muscle strength is a dominant factor, but it must also be supported by good technique.

CONCLUSION

It was concluded that there was a significant influence of leg muscle strength on the shooting power ability of extracurricular football students at SDIT Pelita Harapan Umat, Malang Regency.

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