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CORRELATION OF LEG EXPLOSIVE POWER WITH SHOOTING QUALITY IN SOCCER GAMES

Marsuna[1], Muhtar Asshagab[2], Oril Saputra[3]

[1]Universitas Halu Oleo, Physical Education Health and Recreation, Kendari, Indonesia
[2]Universitas Halu Oleo, Physical Education Health and Recreation, Kendari, Indonesia
[3]Universitas Halu Oleo, Physical Education Health and Recreation, Kendari, Indonesia

*Coressponding Author. Email: marsuna@uho.ac.id
*Email Author: marsuna@uho.ac.id, muhtarasshagab@uho.ac.id, orilsaputra7@uho.ac.id

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Abstract
This study aims to determine the correlation between leg explosive power and shooting quality in soccer games. The research method uses a quantitative approach with a correlational design. The research sample consisted of 30 male students selected through a purposive sampling technique. The instruments used included a standing broad jump test to measure leg explosive power and a shooting test to assess shooting quality. The results of the descriptive analysis showed an average leg explosive power of 2.079 meters and an average shooting quality of 1.027. The normality test obtained a significance value of 0.46 for explosive power and 0.65 for shooting, which indicates that both variables are normally distributed. The linearity test produced a Sig. value of 0.724 > 0.05, so the relationship between the variables is declared linear. The results of the correlation test using SPSS showed a value of r = 0.678 with Sig. 0.000 < 0.05, which means there is a strong and significant relationship between leg explosive power and shooting quality. Thus, it can be concluded that the higher the leg explosive power, the better the shooting quality in soccer games.
Keywords: Explosive leg power; shooting; soccer

INTRODUCTION

Football is one of the most popular sports in the world and is played by people of all ages, including children, adolescents, and adults (Ramadan et al., 2024; Tarju & Wahidi, 2017; Ismi & Jufrianis, 2025). Its popularity is influenced not only by the large number of players, but also by the wide scope of competitions and strong public interest (Yudi, 2019). In physical education, football is commonly used as learning material because it helps develop students' physical abilities, technical skills, tactical understanding, and social interaction (Novianto & Saman, 2023; Agustinus & Sawali, 2023; Rufi & Asshagab, 2023). One of the most important basic techniques in football is shooting, which refers to the ability to kick the ball toward the goal with power and accuracy. Shooting skill plays a crucial role in determining individual and team success in scoring goals (La Ode & Sawali, 2024).

Shooting ability is influenced by several factors such as basic technique, physical condition, motor coordination, balance, and decision-making ability (Lamungga et al., 2020). Of these factors, leg muscle explosiveness is one component that plays a significant role in producing powerful, fast, and accurate kicks (Jatra & Sarwaki, 2022). Leg explosive power is defined as the ability of muscles to generate force quickly through a combination of strength and speed. During shooting, leg muscles such as the quadriceps, hamstrings, gluteus maximus, and gastrocnemius play a crucial role in generating propulsive force, which determines the speed and distance of the kick (Zaen, 2024). The greater a player's leg muscle explosiveness, the greater the force they can exert on the ball, potentially resulting in a more powerful and targeted kick (Jumaking, 2020).

Research on the correlation between leg explosive power and shooting quality in students is based on the fact that basic technical skills often do not develop optimally without adequate physical support. Many students can perform shooting techniques in theory, but are unable to produce powerful and accurate kicks in practice due to limited physical condition, particularly leg explosive power. This presents a challenge for physical education teachers and school soccer coaches to identify the main factors influencing students' shooting ability. By understanding the physiological factors that contribute to shooting quality, learning and training programs can be designed more effectively and effectively. Theoretically, the relationship between leg explosive power and shooting can be explained through the theory of biomechanics of movement. Shooting involves a series of kinetic movements ranging from foot-stance, thigh swing, hip rotation, lower leg swing speed, and foot-ball contact. This movement requires optimal muscle coordination, good muscle strength, and the ability to generate force quickly. Biomechanical theory states that a powerful and accurate kick results from the efficient transfer of energy from the muscles to the ball through a fast and stable leg swing. Thus, explosive power is a crucial factor in producing optimal ball speed. This principle is quite consistent with the concept of force-velocity relationship, namely the greater the force produced in a short time, the greater the final speed of the resulting motion.

In sports physiology studies, explosive power is also related to the muscle's ability to produce rapid contractions through the activation of type II muscle fibers (fast-twitch muscle fibers). These muscle fibers have a high capacity to generate large amounts of force in a short duration, making them crucial for explosive movements such as kicking a ball. The more trained type II muscle fibers are through exercises such as plyometrics, sprints, or squat jumps, the greater the potential for increased leg explosive power. Several previous studies have examined the relationship between physical condition and technical skills in soccer. Some studies have suggested that leg explosive power is positively related to the ability to kick a ball and control the momentum of a kick. Research by Afrinaldi et al., (2021), found that leg explosive power contributes 45% to kick speed in

adolescent athletes. Another study by Rahmadi et al., (2024) showed that eight weeks of plyometric training can significantly increase leg explosive power, thus improving the quality of kicks. Another study by Suharto et al., (2024) concluded that players with high leg explosive power tend to have better shooting accuracy.

Most previous research has focused solely on the power or speed of the ball, rather than on overall shooting quality, which includes strength, accuracy, and shooting stability. Furthermore, most studies have been conducted on soccer club athletes, rather than on school students, whose characteristics differ in technique, playing experience, and physical condition. This suggests the need for further research on school student populations to make the results more relevant to the context of physical education. This study addresses this gap by analyzing the relationship between leg strength and shooting quality in the context of school sports learning.

Practically, the results of this study contribute to the world of physical education in designing evidence-based soccer learning. If a strong relationship is found between explosive leg power and shooting quality, then explosive power development exercises such as plyometrics, squat jumps, or bounding can be an important part of learning shooting techniques. Furthermore, this research is also useful for novice coaches in developing training programs that not only teach shooting techniques but also strengthen the physical conditions that support shooting success. Theoretically, this research enriches the scientific literature on the relationship between physical factors and sports techniques. The research findings can be used as a reference for developing a physical condition-based shooting training model. In the context of school education, this research is an important contribution to the development of physical education and sports curriculum designs that support the holistic development of soccer skills.

METHODOLOGY

This research is a correlational study that falls under quantitative research. The population of this study is the entire population to be studied or the entire research subjects. Therefore, the population in this study is all 300 students of grade XI of SMA Negeri 1 Kulisusu, of which 131 are male and 169 are female. The sample is a portion of the number and characteristics of the population. The sampling technique in this study was purposive sampling, namely drawing samples based on certain considerations. With the criteria of male gender and those who can shoot in soccer games, thus the sample in this study amounted to 30 students. The instrument to measure explosive leg muscle power used the standing board jump test (Setiawan, 2021). The explosive leg muscle power referred to in this study is the testee's ability to perform a standing board jump, namely the testee in pushing or jumping forward with both feet as hard as possible and landing on

both feet. Each testee did it three times. Data was collected from the longest jump. The instrument for measuring shooting ability is using a shooting ability test (Widiastuti, 2015). The shooting skill in soccer games referred to in this study is the testee's ability to kick the ball on a predetermined target, by placing the ball at a point 16.5 meters from the goal right in the middle of the goal then the testee kicks directly towards the goal which has been marked with different scores starting from 1, 3, 5, and 7. Each testee does 3 shooting opportunities. Data return is taken from the total score from the entire shooting of the ball. The data analysis technique used in this study is correlation analysis. Before conducting the correlation analysis, the analysis prerequisite test is first carried out which includes the normality test and the linearity test with the help of SPSS version 26.

RESULTS

Based on the results of the leg muscle explosive power test with shooting ability in soccer games, the data obtained were the average value, standard deviation, maximum value, and minimum value obtained by students in each test conducted.

Table 1. Descriptive Statistics of Leg Muscle Explosive Power (X) and Shooting Ability (Y)

Variable	Mean	Standard deviation	Maximum	Minimum
X	2,079	0,208	2,60	1,60
Y	1,027	0,134	1,33	0,83

Based on the results of the descriptive analysis in table 1, it can be seen that the results of the study regarding the explosive power of leg muscles (X) obtained an average value (mean) of 2.079, a standard deviation value of 0.208, a maximum value of 2.60, and a minimum value of 1.60. Meanwhile, in shooting ability (Y), the average value (mean) was 1.027, a standard deviation value of 0.134, a maximum value of 1.33, and a minimum value of 0.83.

Table 2. Distribution of Interval Classes, Frequency and Percentage

Class Interval	Frequency	Percentage
1,60-1,76	2	7%
1,76-1,93	3	10%
1,94-2,10	14	46%
2,11-2,27	7	23%
2,28-2,44	2	7%
2,45-2,61	2	7%
Total	30	100%

Based on the table above, it can be seen that the sample group that has intervals, frequencies and percentages of explosive power of leg muscles, namely in the interval class 1.60-1.76 has a frequency of 2 with a percentage of 7%. In the interval class 1.76-1.93 has a frequency of 3 with a percentage of 10%. In the interval class 1.94-2.10 has a frequency of 14 with a percentage of 46%. In the interval class 2.11-2.27 has a frequency of 7 with a percentage of 23%. In the interval class 2.28-2.44 has a frequency of 2 with a percentage of 7%. In the interval class 2.45-2.61 has a frequency of 2 with a percentage of 7%. For more clarity graphically, the frequency distribution of the data distribution of explosive power of leg muscles can be seen in the following graph:

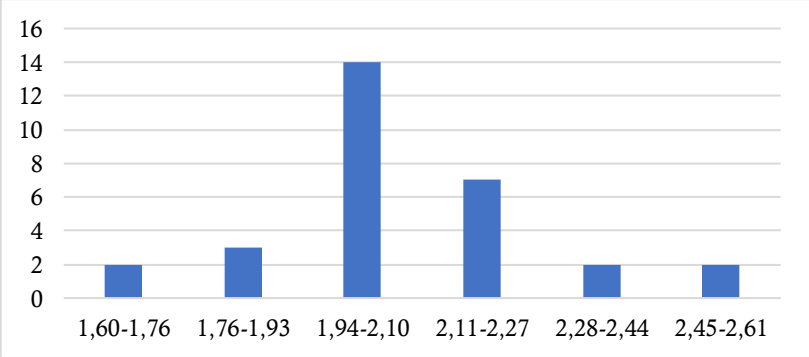

Figure 1. Histogram of Frequency Distribution of Leg Muscle Explosive Power Data (X)

Based on the table above, it can be observed that most of the sample is concentrated in the interval class 1.94–2.10, which has the highest frequency of 14 respondents (46%). This indicates that the majority of students have a moderate level of leg muscle explosive power. Meanwhile, fewer respondents are found in the lowest and highest interval classes, showing that only a small proportion of students possess very low or very high explosive power. Overall, the distribution of leg muscle explosive power tends to be centered around the middle interval, suggesting a relatively balanced variation among the sample.

Table 3. Distribution of Class Interval, Frequency and Percentage of Shooting Ability Data

Class Interval	Frequency	Percentage
0,83 - 0,91	7	23%
0,92 - 1,00	9	30%
1,01 - 1,09	5	17%
1,10 - 1,18	3	10%
1,19 - 1,27	5	17%
1,28 - 1,36	1	3%
Total	30	100%

Based on the table above, it can be seen that the sample group that has an interval class, frequency and percentage of shooting ability, namely in the interval class 0.83 - 0.91 has a frequency of 7 with a percentage of 23%. In the interval class 0.92 - 1.00 has a frequency of 9 with a percentage of 30%. In the interval class 1.01 - 1.09 has a frequency of 5 with a percentage of 17%. In the interval class 1.10 - 1.18 has a frequency of 3 with a percentage of 10%. In the interval class 1.19 - 1.27 has a frequency of 5 with a percentage of 17%. In the interval class 1.28 - 1.36 has a frequency of 1 with a percentage of 3%. For more clarity graphically, the frequency distribution of shooting ability data can be seen in the following graph:

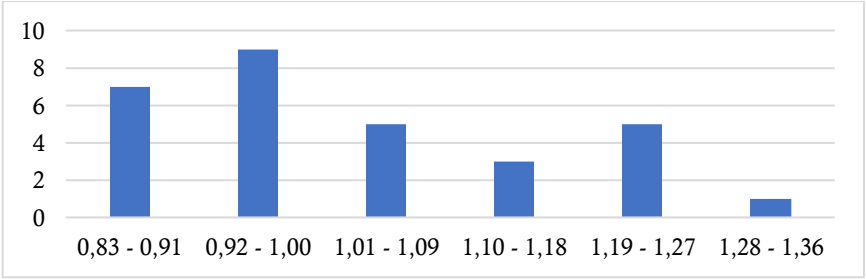

Figure 2. Histogram of the Frequency Distribution of Shooting Ability Data (Y)

Based on the table above, it can be observed that the highest frequency of shooting ability is found in the interval class 0.92–1.00, with 9 respondents (30%). This indicates that most students have a moderate level of shooting ability. In contrast, the lowest frequency appears in the highest interval class (1.28–1.36), with only 1 respondent (3%), showing that only a small number of students demonstrate very high shooting ability. Overall, the distribution of shooting ability data tends to cluster in the lower to middle intervals, suggesting that students' shooting ability is generally at a moderate level with limited variation at the extreme values.

Table 4. Results of Normality Test Calculation

Variable	Sig	*Asymp. Sig*	Conclusion
Leg muscle explosive power	0,46	0,05	Normal
Shooting ability	0,65	0,05	Normal

Based on the table above, it is known that the explosive power data for leg muscles obtained Asymp Sig (2-tailend) 0.46 > 0.05, so it can be interpreted that the data is normally distributed. The shooting ability data obtained Asymp Sig (2-tailend) 0.65 > 0.055, so it can be interpreted that the data is normally distributed. Therefore, the hypothesis that states that the sample is based on a normally distributed population is accepted.

Table 5. Results of Linearity Test Calculations

Variable	Significant	Conclusion
Explosive power of leg muscles with shooting ability	0,724	Linear

Based on the table above, it is obtained that the results of the linearity test found a relationship between X and Y obtained Sig. (deviation from linearity) 0.724 > 0.05, so it can be interpreted that the relationship between the variable of leg muscle explosive power and shooting ability in soccer games is linear.

Table 6. Results of the Correlation Test

Types of Correlation	R Count	Sig 0,05	R *Square*	Information
X-Y	0,801	0,000	0,641	Significant

Based on the table above, it can be seen that the correlation coefficient between leg muscle explosive power and shooting ability (rxy) is 0.801. The correlation table value at the significance level of 0.000 < 0.05, which means there is a significant relationship between leg muscle explosive power and shooting ability. The coefficient of determination (r2) is 0.641, in other words, 64.1% of soccer shooting ability is determined by leg muscle explosive power.

DISCUSSION

Research findings demonstrate a strong relationship between leg strength and shooting quality in soccer. Substantively, this indicates that a player's ability to generate explosive power from the leg muscles plays a crucial role in optimal shooting execution. Shooting is not simply the act of kicking a ball; it is a complex skill that requires a combination of strength, acceleration, timing, coordination, and situational awareness. Therefore, players with good leg strength generally have stronger, faster, and more accurate shots. These findings point to the understanding that shooting quality is not simply the result of technical training. A fundamental component, physical ability, serves as the primary foundation. When a player possesses explosive leg strength, the energy imparted to the ball during the leg swing is greater. This impacts ball speed and shooting effectiveness, both in training and in real games.

The research findings are in line with the basic theory of biomotor which states that explosive power (muscular power) is a combination of strength and speed of muscle contraction Febrianto, (2024), Shooting requires high movement speed, so players who have greater explosive power will

be able to produce a stronger impulse when the foot contacts the ball. From a biomechanical perspective, a kick is a series of movements that involve the transfer of momentum from the upper body, hips, to the legs. The main muscles involved include the quadriceps, hamstrings, gluteus maximus, and gastrocnemius. When explosive power increases, the acceleration phase of the leg becomes faster and stronger, so the force applied to the ball is also greater. According to Kurniawan et al., (2016), foot speed at the time of contact is a key factor in determining ball speed. Another supporting theory is the concept of the force-velocity relationship. The stronger and faster the leg muscles contract, the greater the power that can be generated in explosive actions such as shooting. This explains why players in good physical condition are often more consistent in producing powerful and accurate kicks.

The findings of this study reinforce many previous studies. Yuda et al., (2023) reported that leg explosive power significantly contributes to the shooting ability of young players. Sarifudin et al., (2023) found that leg power was the most dominant predictor of finishing ability. Jatra & Sarwaki, (2022) stated that players with good explosive power tend to have faster and more powerful shots, especially in dynamic game situations. These findings show a consistent pattern: that shooting performance depends on leg biomotor abilities. However, several studies also emphasize that technical factors still play a significant role. Arif et al., (2023) highlighted that the position of the supporting foot, the angle of the leg swing, and hip coordination also influence the quality of the shot. This means that technique and physical ability cannot be separated, but complement each other.

This study presents several novel aspects worth highlighting: many previous studies have focused on young athletes or club players. This study reveals the relationship between explosive leg power and shooting leg strength in school students, who are still in the motor development phase. Similar studies rarely test the linearity of the relationship between variables. The linearity analysis strengthens the methodological validity, suggesting that the relationship found is not coincidental. This study confirms that in the context of early childhood development, physical ability is a crucial foundation for technique. This provides a new direction for coaches to emphasize physical aspects in fundamental development. The finding of a stronger relationship reinforces the understanding that leg power at school age significantly determines movement quality, perhaps because players do not yet possess the complex technique distribution of trained athletes.

While this study makes significant contributions, it has several important limitations. The sample size was limited to male students, making it difficult to generalize to females or older age groups. Shooting measurements were conducted under controlled conditions, not in real-life game situations. Psychological factors, playing experience, and technical mastery were not analyzed

simultaneously, even though they can influence shooting quality. The study design was correlational, making it impossible to prove direct cause and effect. Other physical abilities, such as balance and coordination, were not measured, making their contribution to shooting quality unclear.

CONCLUSION

Based on the analysis and discussion of the research, it can be concluded that leg explosive power has a strong and significant relationship with shooting quality in soccer. Players or students with better leg explosive power tend to be able to produce stronger, faster, and more accurate kicks. This indicates that leg biomotor abilities, particularly the strength and speed of muscle contraction, play a crucial role in supporting optimal shooting technique execution. These findings confirm that increasing leg explosive power is an effective strategy for improving shooting quality. This study also provides empirical evidence that basic physical condition is an important foundation for mastering technical skills in soccer.

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