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The Role of Leg Muscle Explosive Power in Jump Shoot Performance in Adolescent Basketball Players

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ABSTRACT

The ability to perform an effective jump shoot requires coordination of movement, balance, and especially support from the player's physical abilities, such as leg muscle explosiveness. This study aims to determine the role of leg muscle explosiveness with jump shoot ability in adolescent basketball players. This study uses a descriptive method with a correlational approach. The population in this study was a youth basketball team consisting of 25 people, and the entire population was sampled using the total sampling technique. The data collection instruments used were a vertical jump test to measure leg muscle explosiveness and a jump shoot test to measure the ability to perform jump shots. Data analysis was carried out by correlation testing using the SPSS version 26 application. The results of the analysis were 0.61, there was a significant relationship, meaning that the higher a player's leg muscle explosiveness, the better his jump shoot ability. These results indicate that leg muscle explosiveness has a fairly large and significant role in jump shoot ability. This study shows that leg muscle explosiveness plays an important role in improving jump shoot performance in adolescent basketball players. This means that physical ability, especially explosive leg strength, should be the focus of shooting technique training. Recommendations for schools or clubs to provide strength and jump training facilities, for further researchers to examine other physical and technical variables that affect jump shooting.

Keywords: Leg muscle explosive power; jump shoot; basketball

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INTRODUCTION

Basketball is a team sport that requires a combination of optimal technique, physical, tactical, and mental (Ricky, 2020; Wakatsuki et al., 2024). In this game, the ability to score points is the main goal, where one of the most frequently used forms of attack techniques is the jump shoot (Yenes & Mariati, 2025; Jutreša et al., 2024). The jump shoot movement requires integration between motor coordination, muscle strength, explosive power, and accuracy (Hidayat et al., 2024). Among the physical components that support the success of a jump shoot, the explosive power of the leg muscles plays an important role because it determines the height of the jump and the stability of the body in shooting while in the air (Wu et al., 2025). In the context of sports achievement development, especially basketball, the ability to make an effective and efficient jump shoot is an important indicator of an athlete's success in dealing with game pressure (Li et al., 2025). Therefore, a deeper understanding of the physical factors that

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influence these abilities is very important, both for coaches, athletes, and policy makers in the world of sports. This study is important to provide empirical data on the relationship between leg muscle explosive power and jump shoot ability shoot (Boddington et al., 2019).

According to Oudejans et al., (2002), explosive power is the ability of muscles to overcome resistance at maximum speed, which is very useful in sports that require jumping. Leg muscle explosive power specifically refers to the ability of the leg muscles to generate force in a short time, which supports vertical jump performance such as in jump shooting. From a biomechanical perspective, the jump shoot movement involves a rapid transition phase from a stationary position to the jump phase, and then the shooting phase. In the jump phase, players utilize the momentum of the explosive power of the leg muscles to reach the optimal height in order to shoot without interference from opposing players. The greater the explosive power of a player's leg muscles, the more likely they are to be able to do a jump shoot more effectively. According to França et al., (2021), in their theory of motor control, they emphasize the importance of movement efficiency in complex sports actions such as jump shots. Factors such as reaction speed, muscle strength, and body stability are very influential in this process. In other words, the better the body's ability to produce explosive movements, the greater the chance of producing an accurate and unblockable jump shoot.

Previous studies have discussed the relationship between biomotor components and basketball playing skills. For example, a study by Radenković et al., (2022), showed a significant relationship between leg muscle strength and lay up and jump shoot abilities in adolescent players. Another study by Gusril et al., (2021), highlighted the importance of muscle strength and muscle endurance in supporting shooting performance in basketball. However, several studies tend to still combine various physical components in one framework, without isolating the variable of leg muscle explosive power specifically. Meanwhile, a study by Cabarkapa et al., (2022), examined the correlation between vertical jump test results and jump shoot accuracy, and found a positive but limited contribution. The study suggests that measuring leg muscle explosive power be carried out using more appropriate methods, such as standing broad jump or technology-based vertical jump tests.

This study focuses on a more specific study of leg muscle explosive power as a predictor of jump shoot ability, which has not been studied in depth, especially at the student or young athlete level. In addition, this study uses a quantitative correlational approach that allows researchers to see the strength of the relationship between these variables objectively and measurably. The measurement approach used has also been adjusted to a valid and reliable protocol in competitive sports. In addition, in the local context, there has not been much research conducted on high school basketball athletes that can be used as a reference for coaching. Therefore, this study can enrich academic literature and local data-based basketball training practices. The purpose of this study is to determine whether there is a significant relationship between leg muscle explosive power and jump shoot ability in basketball games.

METHODS

This study uses a descriptive method with a correlational approach, which aims to determine the relationship between leg muscle explosive power and jump shoot ability

in male basketball players. This method was chosen because it is in accordance with the objectives of the study which want to find out how strong the relationship is between two variables without conducting experimental treatment. The design is described as follows X → Y, where the arrow indicates a relationship between the two variables (Sugiyono, 2019).

This research was conducted on male adolescent athletes at SMA Negeri 1 Unaaha, which was held in April 2024. The implementation time was 2 days. The main objective of this study was to determine and analyze the role of leg muscle explosiveness on jump shooting ability in adolescent basketball players. This study aims to provide scientific and practical contributions for basketball coaches and trainers in designing training programs that focus on increasing leg muscle explosiveness to support jump shooting accuracy and quality. This research was conducted through several systematic stages, namely coordinating with coaches and schools/clubs to determine research subjects, as well as preparing the necessary measuring instruments. Data collection on leg muscle explosive power was carried out using a vertical jump test to determine the explosive power of each player's leg muscles. Data collection on each player's jump shoot ability was carried out by conducting a number of jump shoot attempts according to predetermined standards, then recording the number of successful shots. Data processing obtained from both variables was collected, recorded, and processed using descriptive and inferential statistics. Data was analyzed to see the relationship between leg muscle explosive power and jump shoot ability using the Pearson correlation test. Compiling the final research results based on the analyzed findings.

The vertical jump test to measure leg muscle explosive power, refers to the procedure (Saiful, 2021). The speed spot shooting test to measure jump shoot ability, based on the procedure from (Setiawan, 2021). The supporting instruments used in the implementation of the test include a 30×150 cm scale board, chalk powder, stationery, meter, stopwatch, cones, whistle, and basketball. The test was carried out on the school basketball court in accordance with the applicable physical measurement protocol. Data collection was carried out through direct observation and recording the results of each test carried out by the subject. For the vertical jump test, participants first smear their fingertips with chalk, stand upright near the scale board, then do a maximum jump to tap the board. Each participant does three jumps, and the best result is used as data. Meanwhile, the jump shoot test is carried out through shooting activities from five predetermined points. Each participant is given three chances and the best score is taken from the last two attempts. The assessment is based on the number of shots that successfully enter from each shooting point.

Descriptive analysis is used to describe the characteristics of data from each variable through the average value (mean), standard deviation, median, mode, maximum value, and minimum value. After descriptive analysis, it is continued with correlation analysis to test the strength and direction of the relationship between leg muscle explosive power and jump shoot ability. This test is carried out because the data is interval scaled and the data distribution is assumed to be normal. The correlation coefficient value (r) will indicate whether there is a significant relationship and the extent of the strength of the relationship between variables.

RESULTS AND DISCUSSION

Findings

This study uses two variables, consisting of independent variables, namely leg muscle power (X) and dependent variables, namely jump shoot ability in basketball. This study aims to determine the relationship between leg muscle power and jump shoot ability of the SMAN 1 Unaaha men's basketball team. The results of the descriptive statistical analysis in question are the mean, standard deviation, minimum value, maximum, mean, standard deviation of each research variable. The results of the descriptive statistics of the research variables can be seen in the following table:

Table 1. Descriptive Statistics of Research Variables

Research Variable	Minimum	Maximum	Average	Standar Deviation
X	201	236	219,32	6,675
Y	2	8	4,16	1,724

Based on 25 respondents, the vertical jump value ranged from 201 cm to 236 cm, with an average of 219.32 cm. The standard deviation of 6.675 indicates a relatively low variation among the participants' vertical jump values, meaning that most participants have fairly homogeneous performance in this aspect. Jump shoot ability ranged from 2 to 8 points (out of a total of 10 maximum score opportunities). The average score was 4.16, indicating that the participants' performance was below half of the maximum score, with a standard deviation of 1.724 indicating a wider spread of scores compared to variable X. Through this average and standard deviation, it can be seen that increasing leg explosive power does not necessarily automatically increase jump shoot ability. This is an important foundation in further correlation analysis.

Table 2. Frequency Distribution of Leg Muscle Explosive Power (Vertical Jump)

Value Interval (cm)	Frequency (f)	Percentage (%)
201 – 207	1	4%
208 – 214	1	4%
215 – 221	15	60%
222 – 229	6	24%
230 – 236	2	8%
Total	25	100%

As many as 60% of students had vertical jump results in the range of 215–221 cm, which indicates a moderate and most common level of leg muscle explosive power. Most participants were concentrated in the middle (moderate range), while very low and very high scores were only achieved by a small number of students (only 1–2 people each). This reflects a distribution pattern that is close to normal. The concentration of participants at the "moderate" level and some others in the higher category indicates sufficient variability in muscle explosive power, which allows for further testing of its relationship with jump shooting ability.

The highest jump shoot score was 4, with a frequency of 10 students or 40% of the total respondents. This shows that most basketball players are in the medium category in jump shoot skills. Scores 2 and 6 have the same frequency, namely 7 people (28%), indicating variations in ability levels between players. Only 1 student (4%) achieved the maximum score (8), meaning that optimal ability is still rare. Because 68% of students are still in the low to medium category (scores 2 and 4), this

signals the need for shooting technique training interventions, especially jump shoot techniques. The distribution of values forms a distribution that is close to symmetrical, which is suitable for further correlation or regression analysis. This strengthens the validity of the data for testing relationships with other variables such as leg muscle explosive power.

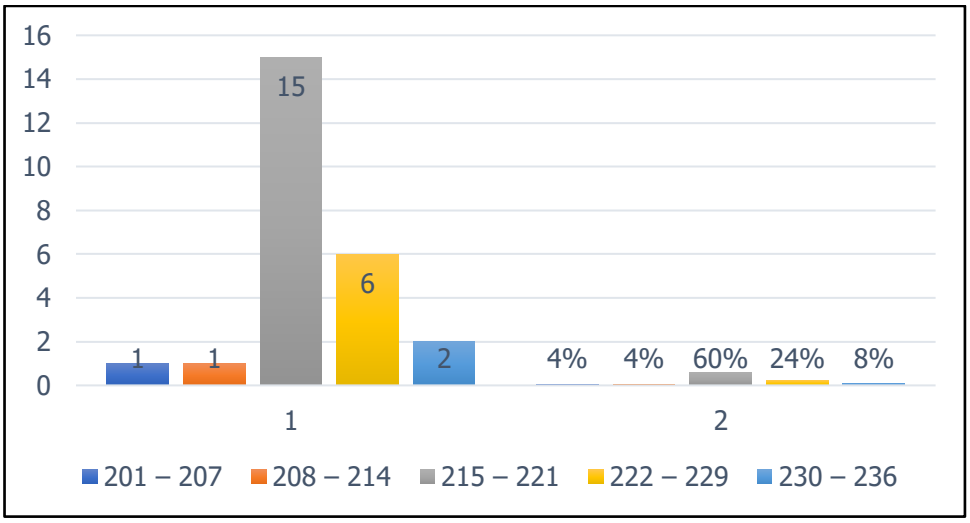

Figure 1. Distribution of Explosive Power of Leg Muscles (X)

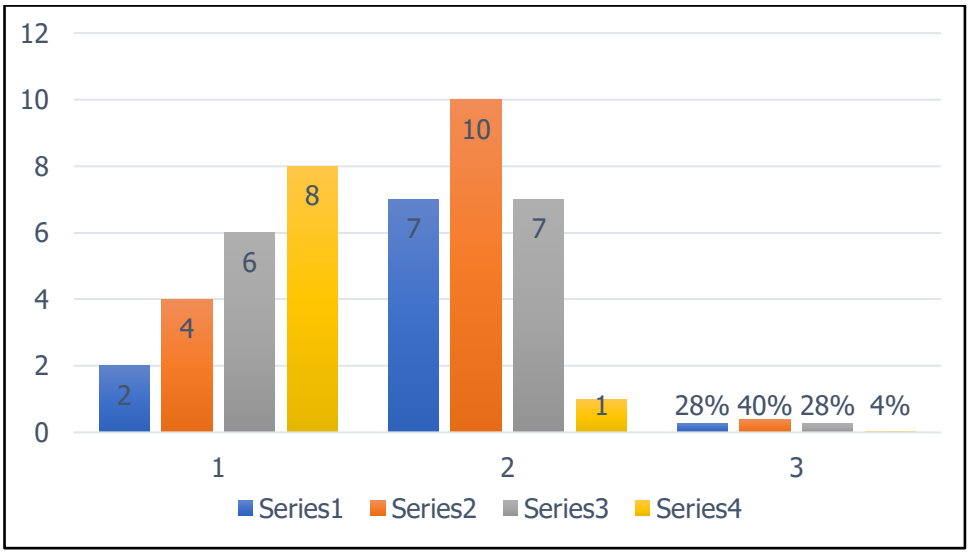

Figure 2. Distribution of Jump Shoot Ability (Y)

Table 3. Frequency Distribution of Jump Shoot Ability of Basketball Players

Jump Shoot Score Frequency	Frequency (f)	Percentage (%)
2	7	28%
4	10	40%
6	7	28%
8	1	4%
Total	25	100%

Table 4. Normality Test of Leg Muscle Explosive Power Data (X)

Variable	Kolmogorov-Smirnov Test	Sig. (p-value)	Distribution
Vertical Jump (X)	0.179	0.068	Normal

Based on the results of the normality test using the Kolmogorov-Smirnov method, it is known that the significance value for the variable of leg muscle explosive power (vertical jump) is 0.068. This value is greater than the standard significance level of α = 0.05, so it can be concluded that H_0 is accepted, meaning that the data is normally distributed. The Kolmogorov-Smirnov statistical test = 0.179, which shows no significant deviation from the normal distribution. This normal distribution meets the prerequisites for parametric correlation testing such as Pearson Product Moment. The validity of the correlation results between variables X and Y can be said to be quite strong, because of the basic assumptions.

Table 5. Normality Test of Jump Shoot Ability Data (Y**)**

Variable	Normality Test	Sig. (p-value)	Distribution
Jump Shoot (Y)	0.221	0.060	Normal

Based on the test results using the Kolmogorov-Smirnov test, a significance value (p-value) of 0.060 was obtained, which is greater than α = 0.05. This means: H_0 is accepted, namely the jump shoot data is normally distributed. The K-S value of 0.221 indicates that the data distribution does not deviate significantly from the normal distribution. The jump shoot data meets the normality assumption, so it is feasible to be analyzed using parametric statistical methods. The correlation test using the correlation technique was continued with the belief that the normal distribution assumption had been met.

Table 6. Linearity Test of Leg Muscle Explosive Power on Jump Shoot Ability

Relationship of Variables	Significance Value (p-value)	Criteria α (0.05)	Conclusion
Leg Muscle Explosive Power with Jump Shoot Ability	0.063	0.05	Linear

The results of the linearity test show that the significance value (p-value) is 0.063 > 0.05, meaning that there is no deviation from linearity between the independent variable (leg muscle explosive power) and the dependent variable (jump shoot ability). Thus, it can be concluded that the relationship between the two variables is linear, so it is feasible to be tested with Pearson correlation analysis (which requires a linear relationship between variables). Fulfillment of this linearity assumption is important because if the relationship is not linear, then the parametric correlation analysis is not valid. This finding strengthens that the use of the Pearson test in the analysis of the relationship between variables is methodologically correct.

Table 7. Results of the Correlation Test of Leg Muscle Explosive Power and Jump Shoot Ability

Variable X	Variable Y	r Calculate (Pearson)	r^2 (Coefficient of Determination)
Leg Muscle Explosive Power	Jump Shoot Ability	0,61	0,32

Based on table 7 which shows the results of the correlation test between leg muscle explosive power and jump shoot ability, the calculated r correlation value (Pearson) is 0.61. This coefficient indicates a positive relationship between the two variables, meaning that the higher the leg muscle explosive power of a player, the better his jump shoot ability. The r^2 value (coefficient of determination) of 0.32 means

that 32% of the jump shoot ability can be explained by leg muscle explosive power. While the remaining 68% is influenced by other factors not examined in this study, such as shooting technique, balance, coordination, or psychological factors. So the r value = 0.61 should be in the strong category. These results indicate that leg muscle explosive power has a fairly large and significant relationship to jump shoot ability.

Discussion

The results of the study showed that there was a very low positive correlation between leg muscle explosive power and jump shoot ability in adolescent male basketball players. Although the correlation found was small, namely 0.075 with a contribution of 6%, this finding provides an understanding that physical leg strength still plays a role, although not as a dominant factor in jump shoot success. Leg muscle explosive power is often associated with the ability to jump higher, which in the context of jump shooting can provide an advantage over opponents, especially in avoiding blocks or achieving optimal shooting angles. This theory is in line with the views of Gulo & Ilham, (2023), who stated that leg muscle explosiveness is an important component in sports with intense and fast movements such as basketball. However, the low correlation value indicates that technical and coordinative factors may play a greater role.

These findings reinforce the results of previous research by Saharullah et al., (2023), which showed that although leg muscle strength is important, the success of jump shooting is more determined by eye-hand coordination, shooting technique, and decision-making ability in game situations. Research by Patterson et al., (2025), also showed that the success of jump shooting is more influenced by aspects of shooting technique, focus, and accuracy than leg strength alone. Thus, the results of this study can be said to provide partial support for the theory that muscle strength components contribute to sports performance, but need to be complemented by other factors. One aspect of the novelty of this study is its application to the local context, namely adolescent players, who have not received much attention in research in the field of achievement sports. The use of standardized instruments such as vertical jump tests and speed spot shooting also provides a quantitative approach that can be replicated in other school settings.

In terms of practice, this study has implications for basketball training strategies at the school level. Coaches and physical education teachers cannot only focus on physical strengthening. Training programs should emphasize a comprehensive approach, including strengthening basic shooting techniques, motor coordination, and mental consistency (Andriyani & Wijayanti, 2025; Sitinjak & Mustaqim, 2025). A combination of technical and physical training tailored to individual needs will provide more optimal results in developing students' shooting skills. Furthermore, this study reveals the importance of evaluating the effectiveness of existing training programs. If training only emphasizes muscle explosiveness training, then the increase in jump shooting ability may not be optimal maksimal (Huang et al., 2024; Putro et al., 2024; Yuliandra & Fahrizqi, 2019).Therefore, coaches need to conduct regular assessments of shooting technique progress, as well as integrate coordination and decision-making training into the routine training menu. However, there are several limitations in this study that are worth noting (Lestari et al., 2022; Alexander et al., 2023). First, the limited sample size of only 25 students from one school limits the generalizability of the findings. Second, the correlational research design cannot explain cause-and-effect

relationships. Third, many factors were not controlled in this study, such as arm muscle strength, core stability, concentration, and psychological aspects such as motivation and self-confidence. Another limitation is the use of a purely quantitative approach. In the context of sports performance, a qualitative approach can provide a deeper understanding of how players understand shooting techniques, how they adapt in matches, and how they respond to pressure. Interviews with coaches and direct observation of players' techniques during matches can enrich the results of the quantitative analysis.

This study opens up opportunities for further exploration. Further research should involve more schools and larger samples so that the results are more representative. The use of an experimental approach is also recommended so that causal relationships can be traced. For example, a shooting technique training intervention program combined with leg muscle explosiveness training can be tested for its effect on improving jump shoot ability. In addition, the integration of quantitative and qualitative approaches or a mixed methods approach is highly recommended. This will allow researchers not only to measure performance objectively, but also to understand the subjective experiences of athletes and the training strategies carried out by coaches. Future research can also consider factors such as body posture, playing experience, and individual learning styles in developing shooting skills. Overall, this study shows that although leg muscle explosiveness plays a role in jump shooting, the role is limited and must be complemented by technical and psychological training. These findings emphasize the need for integrative and multidimensional training in coaching basketball athletes at the student level. This study provides a useful initial basis for the development of more effective and contextual training models, especially in efforts to improve sports achievements in regional schools.

CONCLUSION

Based on the results of research conducted on the role of leg muscle explosiveness in the jump shooting ability of adolescent basketball players, it can be concluded that there is a significant and positive relationship between leg muscle explosiveness and jump shooting ability. The higher the leg muscle explosiveness a player has, the better their jump shooting ability. The results of measuring leg muscle explosiveness using a vertical jump test show variations in explosive ability in each player. Meanwhile, jump shooting ability, which is assessed based on the number of successful shots from a number of attempts, also shows differences in performance relevant to leg muscle strength. Pearson correlation analysis shows that the correlation between the two variables is in the strong category and is statistically significant. This finding supports the theory that leg muscle explosiveness is a physical component that greatly influences technical skills such as the jump shoot, which requires fast and accurate jumping power. Therefore, increasing leg muscle explosiveness through plyometric training, squat jumps, and other explosive exercises is highly recommended in youth basketball training programs. This study also provides practical implications that coaches should pay more attention to the development of specific physical components such as leg muscle explosiveness to support the achievement of optimal performance in shooting skills, especially the jump shoot technique. Furthermore, this research is expected to be a reference for broader follow-up research, involving other

variables that influence the success of jump shoot, such as coordination, balance, and concentration.

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CONFLICT OF INTEREST
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