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Analysis of Abdominal Strength on Heading Quality in Football Athletes of the Persela Lamongan Academy

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ABSTRACT

Heading is an important basic technique in soccer that requires abdominal muscle strength to produce an effective header. However, there is still little research that specifically examines the relationship between abdominal muscle strength on heading ability, especially in adolescent athletes. This study aims to determine the contribution of abdominal muscle strength (sit-ups with the ball) to heading ability in Persela Lamongan Academy soccer athletes aged 17 years. This study used a quantitative approach with an experimental design, while measuring abdominal muscle strength using a 30-second sit-up test, and heading ability was measured through a heading accuracy test. The study sample consisted of 16 Persela Lamongan Academy U-17 athletes. The results showed that the majority of athletes were in the 21–24 sit-up interval class, with a percentage of 93.7%. The best heading ability was also in the 15–18 interval class with a percentage of 87.5%. Data analysis showed the contribution of abdominal muscle strength to the heading ability of 91.3%. Abdominal muscle training significantly contributes to improving heading ability in adolescent soccer athletes.

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INTRODUCTION

Football is based on body movements supported by good motor skills, considering the characteristics and basic movements in football, which are essential for achieving good performance (Bujnovsky et al., 2019). In football, several basic techniques must be mastered by players, including dribbling, passing, shooting, heading, and stopping (Dasriandi et al., 2023). Mastering these basic techniques is crucial in playing football. Mastering these basic techniques requires regular practice with continuous repetition to achieve success (Yandri et al., 2019).

Football requires a strong physique as a foundation for achieving good performance (Weda, 2021). The importance of good physical condition is a crucial element in developing the techniques, tactics, and mentality of athletes in football

(Lufisanto, 2015). The importance of physical fitness in soccer encourages coaches to continuously develop training models. In our training, physical fitness is a key factor in our activities (Piyana et al., 2020). This ensures players can maintain their desired performance and achieve optimal results, namely maximum performance (Weda, 2021).

Heading essentially involves controlling the ball with the head (Triansyah & Haetami, 2022). Heading is useful for passing to teammates in short passes, scoring goals by putting the ball into the opponent's goal, and breaking up opposing attacks from the team's defensive area (Effendi et al., 2017). Other research (Atiq et al., 2019) explains that heading is one of the fundamentals of soccer, and this technique is a way to pass to teammates and score goals. To improve the quality of football games towards better performance, mastering basic heading technical skills is one of the important requirements needed to achieve team success (Triansyah & Haetami, 2022).

The ability to train the ball heading, the coach often only focuses on repetition, which makes the training look monotonous, without considering other aspects that can affect the physical and psychological condition of the athletes being trained (Setiawan, 2019). On the other hand, Muhammad Rifki (2019) stated that "the skills of SSB players related to heading are 46.55, which is in the range of 46 - 52, which means less". The usefulness of doing a heading besides scoring goals is also to pass to friends, pass the ball, and for defenders to break up the opponent's attack (clearing) and control possession of the ball (Marsuki et al., 2018). A team cannot be said to be good if there are no players in the team who can head the ball (Rahmaniar et al., 2019). Therefore, heading the ball is a fundamental technique that players must master to play well. Therefore, soccer players must not only walk and run but also have a foundation for aerial duels by heading the ball (Iftiqar et al., 2022).

The quality of heading requires not only technique, tactics, and mentality, but also supporting physical conditions, including strength (power), agility, speed, flexibility, coordination, flexibility, balance, precision, and endurance (Sidiq et al., 2022). Abdominal muscle strength is a crucial component in soccer, especially in heading. It's not just about strength, but also good balance, which is evident when a player jumps to head the ball and upon landing (Sidiq et al., 2022). There are many training methods as a basis for supporting the success of heading, one of which is the sit-up exercise with the ball where this training method is to strengthen the abdominal muscles, if the stronger the abdominal muscles that we train, the stronger the power of the body's forward whip will be in doing heading (Adi et al., 2014). Currently, many studies have been conducted on the strength of the abdominal muscles against kicks in Persela Academy football athletes, but there are still few that discuss the abdominal muscles on a player's heading ability. Therefore, researchers hope that the data collected will add to the literature on the sport of soccer, and researchers hope to make athletes and coaches aware of the importance of abdominal muscle training on the quality of athlete heading.

METHODS

This study used a correlational quantitative method designed to identify and analyze the influence or contribution of various predictor variables on the predicted

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variable. In this study, the independent variable was abdominal muscle strength, and the predicted variable, or dependent variable, was the heading quality of Persela Academy players. The population in this study was Persela Lamongan Academy players, with non-random probability sampling using a purposive sampling technique. The subjects were 16 Persela Academy football athletes, aged 17 and born in 2008, who were preparing for the Soeratin Cup. In the following study, two tests were administered: a sit-up test to measure the players' abdominal muscle strength and a heading quality test on a rebound wall, both of which lasted 30 seconds. This was to analyze and determine the contribution of abdominal muscle strength to the heading quality of adolescent athletes.

RESULTS AND DISCUSSION

Result

The data obtained by the researchers in the following study are the results of a 30-second sit-up test and a 30-second heading accuracy test on a rebound wall for 17-year-old athletes at the Persela Lamongan Academy.

The following study contains several data points, including respondent characteristics, sit-up test intervals, heading accuracy test intervals on the rebound wall, data normality test results, and hypothesis testing results. The data from the analysis of abdominal muscle strength on heading quality in Persela Lamongan Academy soccer athletes are described below.

Data Description of Respondent Characteristics

The results of the socio-demographic study of Persela Lamongan Academy respondents are shown in the following table:

Table 1.
Respondent Socio-demographics

Variables	n=16	
	n	%
Age (Years)		
15	3	18,7
16	5	31,2
17	8	50
Height (cm)		
155-158	2	12,5
159-162	7	43,7
163-166	5	31,2
166-170	2	12,5
Body Weight (kg)		
52-56	6	37,5
57-61	7	43,7
61-65	3	18,7
Body Mass Index		
Thin	0	0
Normal	10	62,5
Fat	6	37,5

This shows that there are 16 total soccer athletes from the Persela Lamongan Academy, with eight athletes aged 17 years and 7 athletes aged 159-162 cm. Seven athletes weigh 57-61 kg.

Based on the table above, 62.5% of respondents have a normal Body Mass Index (BMI), with the majority being in the 17-year-old age group (50%).

Sit-up Interval Data

The results of the sit-up test on Persela Lamongan Academy youth athletes are shown in the following table:

Table 2.
Interval *Sit-up*

Interval Class	Frequency	
	n	%
17-20	5	68,7
21-24	11	93,7

The median value was 22, the mean 21.6, and the mode 22. These results indicate that most respondents performed sit-ups on average 22 times, with a standard deviation of 1.9.

Heading Accuracy Interval Data

The results of the heading accuracy test on youth athletes at the Persela Lamongan Academy are shown in the following table:

Table 3.
Heading Accuracy Interval

Interval Class	Frequency	
	n	%
11-14	2	12,5
15-18	14	87,5

The interval results obtained were a mean of 15.9, a median of 16.5, and a mode of 17. The standard deviation was 1.7. The most frequent interval class was in the 15-18 repetition range, at 87.5%.

Data Normality Test Results

Data normality was tested using the Lillefors test, with a significance level exceeding 0.05 indicating a normal distribution. The following are the results of the data normality test in this study:

Table 4.
Data Normality Test Results

No	Variables	n	L_o	L_{tab}	Distribution
1	Abdominal muscle strength (x)	16	0,1345	0,213	Normal
2	Heading ability of Persela Academy U-17 players (y)	16	0,1635	0,213	Normal

Showing the results of a normal distribution by testing the data for normality using the Lilliefors test with two variables x and y, each with L0 = 0.134 and Ltab = 0.213. Meanwhile, the variable (y) had L0 = 0.163 and Ltab = 0.213.

Data Hypothesis Test Results

The following are the results of the data hypothesis test obtained by the researcher on the Persela Lamongan Academy youth athletes:

Table 5.
Data Hypothesis Test Results

dk (n-2)	r_o	r_{tab} $\alpha = 0,05$	r^2	r^2x 100%	*p - value*
14	0,956	0,514	0,9138	91,3%	Signifikan

Note: dk = Degrees of Freedom, ro = Level of Relationship,
rtab = Significant Test Level, r2 = Contribution

The contribution analysis results obtained from the table above show a contribution of = 91.3%. This is indicated by the acquisition of ro (0.956) > rtab (0.514) at a significance level of α = 0.05, meaning there is a significant contribution between abdominal muscle strength and the heading ability of Persela Lamongan Academy players. Therefore, the hypothesis in this study is accepted.

Discussion

Based on available data, the majority of Persela Lamongan Academy players have fairly good abdominal muscle strength, as evidenced by the results of an abdominal muscle strength test using a 30-second sit-up test. This demonstrates the players' high training enthusiasm, particularly their focus, and the robust abdominal muscle strength training program provided by the coaches and management of the Persela Lamongan Academy club.

The results of the heading accuracy test also showed positive results, with the players performing the heading accuracy test well and on target. This is influenced by the contribution of abdominal muscle strength to the success of the players in the heading accuracy test, resulting in quality heading in soccer.

The results of this study revealed that abdominal muscle strength contributed 91.3% to the heading quality of Persela Academy soccer athletes in the 17-year-old age group. This figure demonstrates the critical role of abdominal muscles in supporting effective heading technique. Strong abdominal muscles help maintain body stability, generate explosive power, and enable optimal movement coordination when heading. Therefore, nearly all good heading ability in young players is highly dependent on abdominal muscle strength. These results confirm that abdominal muscle strengthening training programs should be a top priority in developing heading ability in young soccer athletes. Coaches and coaching teams are advised to design structured and consistent core training to continuously improve players' heading skills. In addition to improving performance, abdominal muscle strengthening also plays a crucial role in preventing injuries from impacts or loss of balance during aerial duels. Therefore, investing in abdominal muscle strength training will have a significant positive impact on both individual and team performance. Related: How abdominal muscle strength can improve heading skills in U17 soccer matches at Persela Academy.

These findings align with research (Bertrando, 2018), which states that abdominal muscle strengthening training significantly improves athlete performance, including strength, balance, and agility. Physical fitness components such as abdominal muscle

strength are crucial in soccer, particularly during heading techniques. This is in line with research (Obërtinca et al., 2024) which emphasizes the importance of strengthening abdominal muscles and other physical components to improve athlete performance while preventing injury. Optimal abdominal muscle strength supports core stability, which is essential for maintaining body balance during heading. In addition, Joo & Seo (2016) also found a significant relationship between abdominal muscle strength and basic football technical skills, including heading, which shows that abdominal muscle strength training plays a very important role in supporting athletes' heading abilities.

CONCLUSION

Based on the results of the study of abdominal muscle strength on the heading quality of Persela Lamongan Academy players, it can be concluded that the contribution of abdominal muscle strength to the players' heading quality shows a relatively high level, with a contribution of 91.3%. This indicates that the players have quite good abdominal muscle strength and have adequate heading quality and accuracy. Strong abdominal muscles not only support stability and coordination of movement when performing heading but also provide the explosive power needed to produce effective and targeted heading. Therefore, strengthening abdominal muscles through structured and consistent core exercises should be a top priority in training programs to improve heading performance while minimizing the risk of injury. Investment in this aspect has been shown to have a significant positive impact on the development of individual abilities and the contribution of athletes in performing heading.

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