

The Relationship Between Abdominal Muscle Strength and Arm Muscle Strength with the Ability to Throw the Ball Inside in a Football Game

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A. Conception and design of the study; **B.** Acquisition of data; **C.** Analysis and interpretation of data; **D.** Manuscript preparation; **E.** Obtaining funding

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ABSTRACT

This study aims to determine the relationship between abdominal muscle strength and arm muscle strength with the ability to throw the ball inward in the football game of SMP Negeri 2 Makassar students. This research is a type of descriptive research. The population of this study is all students of SMP Negeri 2 Makassar with a research sample of 60 male students selected by random sampling. The data analysis technique used is a correlation analysis technique using the SPSS Version 20.00 system at a significant level of 95% or $\alpha = 0.05$. Based on the results of data analysis, this study concludes that: There is a significant relationship between abdominal muscle strength and the ability to throw the ball inward in a football game, ($r_o = 0.841$ with a probability level of $(0.000) < \alpha = 0.05$); There was a significant relationship between arm muscle strength and the ability to throw the ball inward in the game of football, ($r_o = 0.778$ with the probability of $(0.000) < \alpha = 0.05$); There was a significant relationship between the strength of the abdominal muscles and the strength of the arm muscles and the ability to throw the ball in the game of soccer ($R_o = 0.866$ with the probability level of $(0.000) < \alpha = 0.05$).

Keywords : Strength; Abdominal Muscles; Arm Muscles; Throw in; Football

INTRODUCTION

The development of sports as a game system is increasingly patterned and marked by the emergence of various sports that are pursued by their respective enthusiasts (Supriyanto et al., 2016) to create professionalism among players to achieve the desired goals (Hutajulu, 2016). Players are required to have physical potential, training strength and tenacity (Burhanuddin et al., 2022) as well as a sense of pride in participating in matches (Wibowo et al., 2016). Football is a very popular and widespread sport among the community (Hadi et al., 2016). Therefore, it is necessary to strengthen supporting techniques, one of which is mastering basic techniques in the game of football (Sari & Nurrochmah, 2021). Basic techniques to master; 1) kicking technique, 2) stopping technique/controlling the ball, 3) carrying/dribbling technique, 4) heading technique and 5) throwing technique (Aini, 2017). Meanwhile, according to Ilyas Haddade and Ismail Tola (1991), the basic techniques of the football game are limited as follows; techniques without

the ball are running, jumping, tricks, and defensive positions. Techniques with the ball are kicking, stopping the ball, carrying the ball, heading the ball, throwing the ball, goalkeeper and trick movement (Alfi et al., 2019).

The basic technique of throwing the ball in the game of football will certainly determine whether the ability to throw the ball in terms of the distance of the throw (Erfayliana & Wati, 2020), will make it easier to score goals or throwing the ball just to give the ball to a friend after the ball leaves the field (Pratama, 2019), of course not because all the basic techniques in the game of football are interrelated with each other (Samosir & Aditya, 2022). To throw as far as possible, other supporting factors are needed, such as physical abilities such as strength. Strength is the driving force of every physical activity (Sari & Nurrochmah, 2021) Besides that, it plays an important role in protecting athletes from possible injuries and can help the stability of the joints (Santoso, 2014). Muscle strength can be defined as the ability for maximum force development in maximum contraction to cope with resistance or weight (Meidiannya et al., 2021).

The abdomen or abdomen is a group of limbs in the buttocks which is a group of abdominal muscles that are axed to the buttocks joint. The abdominal muscle group includes; the inner abdominal muscles (transversus abdominis), the lateral abdominal muscles (obliquus abdominis) and the anterior abdominal muscles (rectus abdominis). In a soccer game, all the basic techniques of the movement involve abdominal muscle groups (Hammado et al., 2020). If you look at the characteristics of the basic technique of throwing the ball, the three types of abdominal muscles also play a role in it, but the more dominant is the anterior abdominal muscle (rectus abdominals) (Yulianto & Haprabu, 2021).

The arms cannot be separated because throwing as far as possible must be supported by the strength of the arm muscles (Sahabuddin, 2019). The arm is one of the upper limbs also called the "superior extremity" which consists of the upper arm and the forearm (Sudirman et al., 2022). Thus, the strength of the arm muscles includes measurements of the elbow joint (articulatio cubiti), wrist joint (articulatio carpalialis), and palm articulation (articulatio metta carpalialis), but the main problem in this study is the strength of the arm muscles that are axial to the elbow joint, namely extension movements. Considering that the strength of the abdominal muscles and the strength of the arm muscles are important factors that also determine the achievement of the throw-in in the game of football (Hasan et al., 2020). Besides that, these two strengths are also supporting factors in mastering the basic techniques in the game of football (Komarudin, 2021), because of strength and increasing abilities and skills in developing basic techniques in sports, especially in football.

METHODS

The method used in this study is descriptive. The research variables to be studied in this study consist of the independent variable consisting of abdominal muscle strength and arm muscle strength, while the bound variable is throw-in in a football game. The research design or research design used in this study is correlational. The population of this study is all students of SMP Negeri 2 Makassar. However, the population is limited to male students only so that they have the same traits in terms of gender. The sample is limited in time, energy and a large population. Thus, the sample used was 60 students of SMP Negeri 2 Makassar with a proportional sampling technique. The data collected in this study include the abdominal muscle strength test, arm muscle strength and inward throwing ability test

in football games. The data obtained through the research test instrument will be analyzed with the SPSS Version 20.00 system at a significant level of 0.05.

RESULTS AND DISCUSSION

Result

Descriptive data

Descriptive analysis of the research data consisting of the value of abdominal muscle strength and arm muscle strength with the ability to throw the ball inward in a football game can be seen in the summary of the results of the descriptive analysis listed in the table.

Table 1.

Results of descriptive analysis of data

Hypothesis Statistics	Abdominal muscle strength	Arm muscle strength	Throw-in ball
N	60	60	60
ΣX	894	1020	516,20
μ	14,90	17	8,6033
Sd	3,0124	,57332	0,5432
Min	9,00	10,00	7,51
Max	22,00	30,00	9,57
Range	13,00	20,00	2,06

Analysis requirements test results

Research data to be analyzed statistically must meet the requirements for analysis. For this reason, after the data on abdominal muscle strength, arm muscle strength and the ability to throw the ball inward in the football game in this study were collected, then before statistical analysis was carried out for hypothesis testing, a requirement test was first carried out, namely normality with the Kolmogorov-Smirnov Test. The results of the Kolmogorov-Smirnov Test can be seen in the following summary table:

Table 2.

Data normality test results

It	Variable	Probability	α	Information
1	Abdominal muscle strength	0,212	0,05	Usual
2	Arm muscle strength	0,063	0,05	Usual
3	Throwing the ball inside in a football game	0,677	0,05	Usual

Correlation analysis

Table 3.

Results of Correlation Analysis

Hypothesis	N	r/R	Rs	F	t	Sig.
Correlation of abdominal muscle strength with the ability to throw the ball inward in a football game	60	0,841	0,707	-	5,751	0,000
Correlation of arm muscle strength with the ability to throw the ball inside in a football game	60	0,778	0,605	-	3,137	0,003
Correlation between abdominal muscle strength and arm muscle strength with the ability to throw the ball inside in a soccer game	60	0,866	0,750	85,514	35,277	0,000

Hypothesis testing

Hypothesis testing was carried out using correlation coefficient analysis (r) at a significant level of 95% or $\alpha = 0.05$. This is intended to determine the relationship between abdominal muscle strength arm muscle strength and the ability to throw the ball inward in a football game in students of SMP Negeri 2 Makassar. The hypotheses that are tested for truth in this study are as follows:

There is a relationship between the strength of the abdominal muscles and the ability to throw the ball inward in a football game in students of SMP Negeri 2 Makassar.

Based on the results of the correlation analysis of abdominal muscle strength data with the ability to throw the ball inward in a football game in students of SMP Negeri 2 Makassar. The correlation value (r_0) = 0.841 with probability (0.000) < $\alpha = 0.05$, for the determination coefficient value = 0.707. This means that 70.7% of the ability to throw the ball inside in a football game is explained by the strength of the arm muscles. While the rest (100% - 70.7% = 29.3%) is explained by other causes. So H_0 was rejected and H_1 was accepted. Thus there is a significant relationship between the strength of the abdominal muscles and the ability to throw the ball inward in the football game in students of SMP Negeri 2 Makassar.

There is a relationship between the strength of the arm muscles and the ability to throw the ball inward in a football game in students of SMP Negeri 2 Makassar.

Based on the results of the correlation analysis of arm muscle strength data with the ability to throw the ball inward in a football game in SMP Negeri 2 Makassar students. The correlation value (r_0) = 0.778 with a probability of (0.000) < $\alpha = 0.05$, for the coefficient value of determination = 0.605. This means that 60.5% of the ability to throw the ball inside in a football game is explained by. While the rest (100% - 60.5% = 39.5%) is explained by other causes. So H_0 was rejected and H_1 was accepted. Thus there is a significant relationship between arm muscle strength and the ability to throw the ball inside in a football game in SMP Negeri 2 Makassar students.

There is a relationship between the strength of the abdominal muscles and the strength of the arm muscles with the ability to throw the ball inward in a football game in students of SMP Negeri 2 Makassar.

Based on the results of the regression analysis of abdominal muscle strength and arm muscle strength data with the ability to throw the ball inward in a football game in students of SMP Negeri 2 Makassar. The regression value (R_0) = 0.866, for the R Square value (coefficient of determination) = 0.750. This means that 75% of the ability to throw the ball inside in a football game is explained by the strength of the abdominal muscles and the strength of the arm muscles. While the rest (100% - 75% = 25%) is explained by other causes. From the ANOVA test or F test, the F calculation was 85.514 with a significance level of 0.000. Since the probability (0.000) is much smaller than 0.05, the regression model can be used to predict the ability to throw the ball inside a soccer game (applicable to the population where the sample is taken). As for the t-test to test the significance of the constant and dependent variable (the ability to throw the ball inside in a football game). The tcount value obtained is 35.277 as seen in the attachment of the Sig/significance column is 0.000, or the probability is far below $\alpha = 0.05$. So H_0 is rejected and H_1 is accepted or

coefficient regression is significant, or abdominal muscle strength and arm muscle strength have a significant effect on the ability to throw the ball inward in the game of football. Thus there is a significant relationship between the strength of the abdominal muscles and the strength of the arm muscles with the ability to throw the ball inward in the game of football in the students of SMP Negeri 2 Makassar.

Discussion

The results of data analysis and hypothesis testing that have been put forward previously show that of the three hypotheses proposed, all of them are accepted and show a significant relationship. From these results, the test of abdominal muscle strength and arm muscle strength with the ability to throw the ball inward in a football game in this study is relevant to the framework of thinking that has been developed based on the theories that support this research.

The first hypothesis; There was a significant relationship between the strength of the abdominal muscles and the ability to throw the ball inward in the football game of SMP Negeri 2 Makassar students. It is evident from the results of the analysis that the observation correlation value is greater than the correlation value of the table. This proves that in throwing the ball inward in a football game, the strength of the abdominal muscles is one of the supporting factors in the implementation of the throw in a football game. This contraction of the abdominal muscles occurs when the player holds a pull-back with the position of the two arms behind the head, the existing body pulls back while simultaneously releasing a throw and will contract automatically if the abdominal muscles are not strong enough to do a pull, it will greatly affect the throw. By having the strength of the abdominal muscles, the ability to throw in effectively and efficiently can be done.

The second hypothesis; There was a significant relationship between arm muscle strength and the ability to throw the ball inward in the football game of SMP Negeri 2 Makassar students. It is evident from the results of the analysis that the observation correlation value is greater than the correlation value of the table. This proves that a football player must have arm muscle strength. Although the arm is less needed in football players except for a goalkeeper (goalkeeper) and later done when the ball comes out, on the other hand, the arm muscle strength factor will greatly affect both throwing and other techniques. To achieve an accurate and strong throw, of course, the strength of the arm muscles greatly influences.

The third hypothesis; There was a significant relationship between abdominal muscle strength and arm muscle strength with the ability to throw the ball inward in the football game of SMP Negeri 2 Makassar students. It is evident from the results of the analysis that the observation correlation value is greater than the correlation value of the table. This proves that the strength of the abdominal muscles and the strength of the arm muscles are factors that support performing the basic technique of throwing the ball in the game of football. Increasing the strength of the abdominal muscles can affect the stretching of muscles, tendons and ligaments and strengthen the movement to be able to move so that it can expand the movement of the joints. So the strength of the abdominal muscles is very important for football players, especially when throwing the ball. Besides that, the abdominal muscles are an area that has 50% of the strength it has. In addition, abdominal strength training works to restore a normal range of motion, improve muscle flexibility and flexibility, improve more efficient blood flow in capillary tissue, allow relaxation and reduce the possibility of injury. Meanwhile, in throwing the ball in a football game, strength plays a very

important role in supporting when throwing the ball in particular. The strength in question is the strength of the arm muscles, where the arm is a factor that plays a role in carrying out the ball throw. With the support of physical strength, the results of throws in the game of football will be more directional and strong.

CONCLUSION

After researching the problem of the relationship between abdominal muscle strength and arm muscle strength with the ability to throw inside in the football game of SMP Negeri 2 Makassar students, the following conclusions were drawn:

1. There was a significant relationship between the strength of the abdominal muscles and the ability to throw inside in the football game of SMP Negeri 2 Makassar students.
2. There was a significant relationship between arm muscle strength and inward throwing ability in the football game of SMP Negeri 2 Makassar students.
3. There was a significant relationship between abdominal muscle strength and arm muscle strength with the ability to throw inside in the football game of SMP Negeri 2 Makassar students.

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