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Contribution to eye-legged coordination, lumbar muscle power, and abdominal muscle strength versus shooting ability in WTW TC Grobogan U 13-15 Year-old

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ABSTRACT

The aim of this study is to find out the contribution of eye and leg coordination, limb muscle power, and abdominal muscle strength to shooting abilities in WTW football player TC Grobogan aged 13-15 years 2024. The data analysis results are presented as follows, (1) known using the Pearson product moment correlation with an eye-foot coordination significance value of $0.013 < 0.05$ meaning that there is a significant correlation. Eye-legged coordination gives an Effective Contribution of 19.3% to the Shooting ability. (2) The significance of the Node Muscle Power with Shooting capabilities is $0.037 < 0.05$, meaning there is an important correlational relationship.

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1. INTRODUCTION

Football is a team sport in which two teams compete by hitting the ball, which is contested by players on both teams. By kicking the ball contested by players of both teams with the aim of entering as many balls as possible into the opponent's goal and defending the goal so as not to concede with reference to predetermined rules. This conclusion can be drawn from the opinions expressed above. Thus, to play soccer effectively, players must be in good physical condition and understand the basics of playing soccer. According to Erdem, K (2017) "Many factors influence the outcome of football matches, and football is characterized by a combination of technical, tactical, physical, physiological, and psychological elements".

Good technique and physical condition determine a player's ability to play soccer well. Shooting accuracy in soccer is an important factor to score goals against the opposing team. Shooting accuracy comes from the words "precise" and "shot". Mahanani & Indriarsa, 2021, Shooting is kicking the ball with the inside leg, outside leg, and back. (Sarifudin et al., 2023). In addition, accuracy is the ability of individuals to guide their movements towards a predetermined target or target according to their abilities. Thus, one of the key strategies in soccer is shooting because the goal of the game is to put the ball into the opponent's goal in order to win. A soccer player must be proficient in shooting techniques because shooting techniques are the foundation of attack which is a crucial aspect of the game. Therefore, there are many internal and external factors that affect shooting ability, such as physical conditions such as leg muscle power, eye-foot coordination, abdominal muscle strength, and external factors such as infrastructure support, parental support, training discipline, and desire to practice.

There are supporting factors in performing basic shooting techniques including: 1) eye-foot coordination, is one of the physical condition factors that play an important role in shooting. When shooting, good coordination is needed between the eyes and feet to see the target and direct the ball according to the desired shooting target. According to Sukadiyanto (2011) defines "The ability to

combine the movements of two or more joints into one coordinated action is called coordination". 2) Leg muscle power, when shooting leg muscle power is one important component. Because leg muscle strength is an important part of the technique of kicking the ball to get the best kick results will help the motion or forward swing of the leg produced by the contraction of the leg muscles. 3) Abdominal muscle strength, is a component of physical condition whose role is needed when shooting because the abdominal muscles are the center of power as a support for body balance when shooting in football.

Given the importance of the role of physical condition eye-foot coordination, leg muscle power, and abdominal muscle strength when shooting. Researchers also want to find out how much the three components contribute to shooting ability, so researchers will conduct a study entitled: "Contribution of eye-foot coordination, leg muscle power, and abdominal muscle strength to soccer shooting ability in WTW TC Grobogan U 13-15 Training players in 2024".

2. METHODS

The research was conducted in Jambon Village, located in Pulokulon Sub-district of Grobogan Regency. The Jambon Village field is where the WTW TC team conducts routine training. This research design uses a quantitative descriptive approach to investigate the basic correlation between the independent variable and the dependent variable. In this study the variables contained in this study consisted of independent variables (Eye-foot coordination, leg muscle power, abdominal muscle strength. The dependent variable (Shooting ability).

The term "population" refers to a broad category that includes things or people with certain attributes and features that researchers choose to study and draw conclusions from." (Sugiyono, 2017: 61). The population in this study were 27 WTW TC Grobogan training players. The sample of this study were WTW TC Grobogan training players aged 13-15 years totaling 27 people.

This study uses the Total Sampling technique, the Total Sampling technique is a sampling method used in this study. The number of samples taken must be comparable to the population in the total sampling method. (Sugiyono, 2007). Because the population is less than 100 people, it uses total sampling, and each member of the population is sampled, totaling 27 people.

To describe the research problem and reach a conclusion, data analysis is very important. Three independent variables and one dependent variable will be correlated many times in data analysis which will be used for calculations and to find out how much contribution. To analyze the data of this study using statistical methods and SPSS Version 25 x65 Bit. The analysis used includes normality test, linearity test, correlation test, multiple regression analysis, and F test.

3. RESULT AND DISCUSSION

RESULT

This research was conducted on April 28, 2024 at the Jambon Village soccer field. There were 27 players who became research samples with total sampling technique. The data in this study consisted of eye and foot coordination data, leg muscle *power*, abdominal muscle strength, and *shooting* tests. The results of the data analysis can be described as follows:

a. Eye-foot coordination data

By using eye-foot coordination data, the aim is to find out how the coordination of both eyes and feet, as well as whole body coordination. The results of the data on the ankle coordination of WTW TC Grobogan training players are as follows:

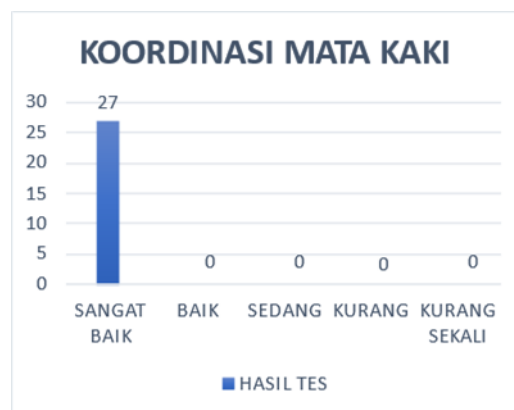


Figure 1. Eye-foot coordination diagram

Based on diagram 1, it can be seen that the eye-foot coordination data of WTW TC Grobogan Training players have "very good" abilities as many as 27 players (100%), "good" abilities as many as 0 players (0%), "moderate" abilities as many as 0 players (0%), "less" abilities as many as 0 players (0%), and "very less" abilities as many as 0 players (0%). From the data above, the mean, median, minimum, maximum, and standard deviation values are obtained as follows:

Table 1. Eye-Foot Coordination Data Description

Mean	14,85
Median	15
Mode	15
Max	17
Min	13
Std deviation	1,379

Based on Table 1 above, it can be seen that the average eye and foot coordination ability of WTW TC Grobogan Training players is 14.85 so that it falls into the "very good" category and has a median value of 15. With a maximum score of 17 and a minimum score of 13 and a standard deviation value of 1.379.

b. Leg muscle *power* data

Leg muscle *power* data aims to determine *power* (explosive *power*). The results of the data on leg muscle *power* of WTW TC Grobogan Training players are as follows:

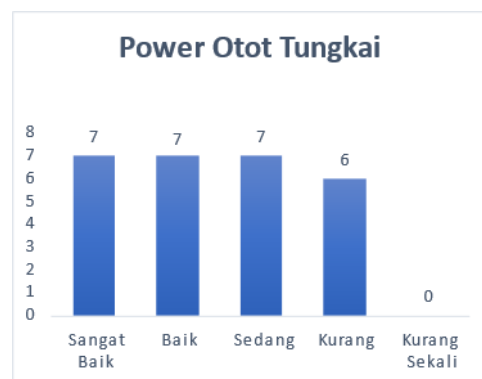


Figure 1. Limb Muscle Power Diagram

Based on diagram 2, it can be seen that the limb muscle *power* of WTW TC Grobogan Training players has "very good" ability as many as 7 players (26%), "good" ability as many as 7 players (26%), "moderate" ability as many as 7 players (26%), "less" ability as many as 6 players (22%), and "very less" ability as many as 0 players (0%). From the data above, the mean, median, maximum, minimum, and standard deviation are obtained as follows:

Table 1. Description of Limb Muscle *Power* Data

Mean	2,00
Median	2,01
Mode	1,8
Max	2,62
Min	1,29
Std Deviation	0,448

Based on Table 2 above, it can be seen that the average ability of leg muscle power of WTW TC Grobogan Training players is 2.00 so that it is included in the "good" category and has a median value of 2.01. With a maximum score of 2.62 and a minimum score of 1.29 and a standard deviation value of 0.448.

c. Abdominal muscle strength data

The sit up test data aims to determine the strength of the abdominal muscles. The results of the abdominal muscle strength data (sit ups) of WTW TC Grobogan Training players are as follows:

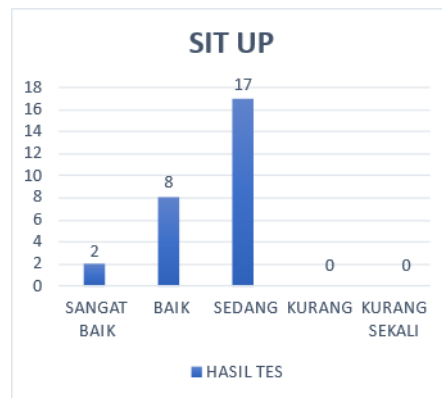


Figure 2. Abdominal Muscle Strength (Sit Up) Diagram

Based on diagram 3, it can be seen that the data on the results of Sit Up players of WTW TC Grobogan Training have "very good" abilities as many as 2 players (7%), "good" abilities as many as 8 players (30%), "moderate" abilities as many as 17 players (63%), "less" abilities as many as 0 players (0%), and "very less" abilities as many as 0 players (0%). From the data above, the mean, median, maximum, minimum, and standard deviation are obtained as follows:

Table 2. Description of Abdominal Muscle Strength Data

Mean	25,19
Median	25
Mode	25
Max	31
Min	20
Std Deviation	2,321

Based on Table 3 above, it can be seen that the average abdominal muscle ability of WTW TC Grobogan Training players is 25.19 so that it is included in the "good" category and has a median value of 25. With a maximum score of 31 and a minimum score of 20 and a standard deviation value of 2.321.

d. Shooting test data

Shooting ability test data aims to determine shooting ability. The results of the shooting ability test data for WTW TC Grobogan Training players are as follows:

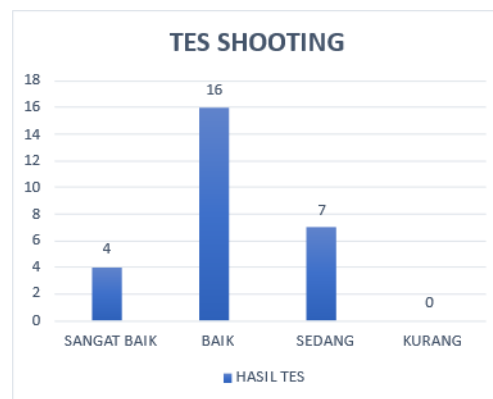


Figure 4. Shooting Test Diagram

Based on diagram 4, it can be seen that the data on the shooting ability of WTW TC Grobogan Training players have "very good" abilities as many as 4 players (15%), "good" abilities as many as 16 players (59%), "moderate" abilities as many as 7 players (26%), "less" abilities as many as 0 players (0%). From the data above, the mean, median, maximum, minimum, and standard deviation are obtained as follows:

Table 4. Description of Shooting Ability Data

Mean	16,70
Median	17

Mode	17
Max	21
Min	13
Std Deviation	2,757

Based on Table 4 above, it can be seen that the average shooting ability of WTW TC Grobogan Training players is 16.70 so that it falls into the "good" category and has a median value of 17. With a maximum score of 21 and a minimum score of 13 and a standard deviation value of 2.757.

1. Prerequisite Test

This test is carried out before the data is analyzed, the stages carried out in the prerequisite analysis test include:

a. Normality Test

The data normality test is a prerequisite test of the eligibility of data to be analyzed using parametric statistics or nonparametric statistics. The normality test was carried out with the *One-Sample Kolmogorov-smirnov* test with the decision rule if the significance > 0.05 then it can be said that the data is normally distributed. This calculation uses SPSS as follows:

Table 3. Normality Test Results		
One-Sample Kolmogorov-Smirnov Test		
		Unstandardize d Residual
N		27
Normal Parameters ^{a,b}	Mean	.0000000
	Std. Deviation	2.03724846
Most Extreme Differences	Absolute	.137
	Positive	.137
	Negative	-.096
Test Statistic		.137
Asymp. Sig. (2-tailed)		.200 ^{c,d}
a. Test distribution is Normal.		
b. Calculated from data.		
c. Lilliefors Significance Correction.		
d. This is a lower bound of the true significance.		

Based on table 5 the normality test results above show a significance value of 0.200 with a sig result of 0.200 greater than 0.05 so that this data is considered normally distributed.

b. Linearity Test

The linearity test aims to determine whether the variables between independent and dependent have a linear relationship or not significantly. Linearity analysis in this study used ANOVA in SPSS 25 using a significance level of 0.05.

Table 4. Linearity Test Results of Eye-Foot Coordination								
ANOVA Table								
				Sum of	df	Mean	F	Sig.
				Squares		Square		
SHOOTING TEST * TOE COORDINATION	Between Groups	(Combined		65.572	4	16.393	2.731	.055
		Linearity		44.358	1	44.358	7.390	.013
		Deviation		21.214	3	7.071	1.178	.341
	from Linearity							
	Within Groups			132.057	22	6.003		
Total			197.630	26				

Based on table 4.6 linearity test above, it is obtained that the significance value (Deviation from Linearity) is 0.341 > 0.05, meaning that there is a linear relationship between the two variables.

Table 5. Limb Muscle Power Linearity Test Results

ANOVA Table				Sum of Squares	df	Mean Square	F	Sig.
SHOOTING TEST * LEG MUSCLE POWER	Between Groups	(Combined)		38.868	3	12.956	1.877	.162
		Linearity		32.224	1	32.224	4.668	.041
		Deviation from Linearity		6.644	2	3.322	.481	.624
	Within Groups			158.762	23	6.903		
	Total			197.630	26			

Based on table 7 linearity test above, it is obtained that the significance value (Deviation from Linearity) is $0.624 > 0.05$, meaning that there is a linear relationship between the two variables.

Table 6. Linearity Test Results of Abdominal Muscle Strength

ANOVA Table				Sum of Squares	df	Mean Square	F	Sig.
TEST SHOOTING * ABDOMINAL MUSCLE STRENGTH	Between Groups	(Combined)		52.100	2	26.050	4.296	.025
		Linearity		52.019	1	52.019	8.579	.007
		Deviation from Linearity		.082	1	.082	.013	.909
	Within Groups			145.529	24	6.064		
	Total			197.630	26			

Based on table 8 linearity test above, it is obtained that the significance value (Deviation from Linearity) is $0.624 > 0.05$, meaning that there is a linear relationship between the two variables.

2. Hypothesis Test

This hypothesis test aims to answer the estimated hypotheses that have been made previously. In this hypothesis test using *Pearson Product Moment* correlation analysis and multiple regression analysis which can be used to determine the contribution of 2 or more variables in a study.

a. *Pearson Product Moment* Correlation Test

After conducting prerequisite tests, normality, and linearity, then tested the hypothesis through *Pearson Product Moment* correlation analysis. The following are the results of the research hypothesis test:

Table 7. Results of Product Moment Correlation Analysis

Correlations		Foot-eye coordination	Leg muscle power	Abdominal muscle strength	Shooting test
Foot-eye coordination	Pearson correlation	1	.130	.121	.474*
	Sig. (2-tailed)		.518	.548	.013
	N	27	27	27	27
Leg muscle power	Pearson correlation	.130	1	.500**	.404*
	Sig. (2-tailed)	.518		.008	.037
	N	27	27	27	27
Abdominal muscle strength	Pearson correlation	.121	.500**	1	.513**
	Sig. (2-tailed)	.548	.008		.006
	N	27	27	27	27
Shooting test	Pearson correlation	.474*	.404*	.513**	1
	Sig. (2-tailed)	.013	.037	.006	
	N	27	27	27	27

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Based on the data above can hypothesis testing is carried out by comparing the level of significance (2-tailed), if the Sig value > 0.05 then there is no significant relationship, if. value. Sig < 0.05 then there is a significant relationship. Based on table 9 above, it is obtained that the significance value between variables. Coordination Eye And Foot with Ability Shooting is equal to 0.013 < 0.05, meaning that there is a significant correlation relationship between variable X1 and Y1 the significance value between the variables. Power Muscle Limb with Shooting Ability is equal to 0.037 < 0.05, meaning that there is a significant correlation relationship between the X2 variable and Y1. Then, the significance value between the Abdominal Muscle Strength variable and Shooting Ability is 0.006 < 0.05, meaning that there is a significant correlation between the X3 variable and Y1.

b. Multiple Regression Analysis

Analysis. Regression. is. a. method. or. technik an.a.lysis of hypo.thesis pen.elitian to.test.whether.there.is.no.influence.between.one.variable.and.another.variable, which is expressed in the form of a regression equation. The analysis used to test the F Test and the Coefficient of Determination (R²).

1. F test

Table 8. F Test Analysis Results

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	89.720	3	29.907	6.374	.003 ^b
	Residuals	107.910	23	4.692		
	Total	197.630	26			

In the F test analysis if there is a sign value < 0.05 or the value of F count > F table, then there is an influence of variable X on variable Y or vice versa. In the ANOVA table above shows a sig value of 0.003 < 0.05 so it can be concluded that simultaneously there is a significant influence between mata-leg coordination, tungkai muscle power, and abdominal otot strength on shooting ability.

2. Coefficient of Determination (R²)

Table 9. Coefficient of Determination Analysis Results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.674 ^a	.454	.383	2.166

Based on table 11 above, it is known that the coefficient of determination or R Square is 0.454. This R Square value of 0.454 is the result of calculating the correlation coefficient or "R", which is 0.674 x 0.674 = 0.454. Based on the coefficient of determination (R Square) is 0.454 or equal to 45.4%. This figure means that the variable eye-foot coordination (X1), leg muscle power (X2), abdominal muscle strength (X3) simultaneously (together) affects the shooting ability variable (Y) by 45.4%, while (100% - 45.4% = 54.6%) is influenced by other variables outside this regression equation or variables that are not studied.

3. Predictor Contribution

Predictor Contribution is the value of the amount of influence contribution that is given by each independent variable to the dependent variable. Predictor contribution has 2 types, namely Relative Contribution (SR) and Effective Contribution (SE).

a. Relative Contribution (SR)

The relative contribution is a measure that shows the magnitude of the contribution of the predictor variable (independent variable) to the amount of regression squares. In calculating the relative contribution of each independent variable using the following equation:

$$SR(X)\% = \frac{SE(x)\%}{R^2}$$

Description:

R² : Coefficient of Determination

So that the Relative Contribution (SR) value for each independent variable is.

1) Relative Contribution of Eye-Foot Coordination (X1) to Shooting Ability (Y)

$$SR(X1)\% = 19.3\% / 45.4\% \\ = 42,5\%$$

2) Relative Contribution of Limb Muscle Power (X2) to Shooting Ability (Y)

$$\begin{aligned} \text{SR}(X2)\% &= 6.4\% / 45.4\% \\ &= 14,1\% \end{aligned}$$

3) Relative Contribution of Abdominal Muscle Strength (X3) to *Shooting* Ability (Y)

$$\begin{aligned} \text{SR}(X2)\% &= 19.7\% / 45.4\% \\ &= 43,4\% \end{aligned}$$

4) Total Relative Contribution can be calculated as follows:

$$\text{SR total} = \text{SR}(X1)\% + \text{SR}(X2)\% + \text{SR}(X3)\%$$

$$\text{Total SR} = 42.5\% + 14.1\% + 43.4\%$$

$$\text{Total SR} = 100\%$$

b. Effective Contribution (SE)

Effective contribution is a metric that measures the extent to which a predictor variable (independent variable) contributes to the criterion variable (dependent variable) through a regression analysis. To calculate the amount of effective contribution, the following table is made:

Table 10. Beta Value, Correlation Coefficient, and R Square

Variable	Regression Correlation (Beta)	Correlation Coefficient	R.Square
Eye-foot Coordination	0,407	0,474	45,4
Limb Muscle Power	0,159	0,404	
Abdominal Muscle Strength	0,384	0,513	

Effective Contribution is calculated using the following formula:

$$\text{SE}(X)\% = \text{Betax} \times \text{Correlation Coefficient} \times 100\%$$

Description:

Beta x : Beta value of independent variable X

Correlation coefficient : The correlation coefficient of the dependent variable X

Then the value of each effective contribution for each independent variable is as follows.

1) Effective Contribution of Leg-Eye Coordination (X1) to *Shooting* Ability (Y)

$$\text{SE}(X)100\% = 0.407 \times 0.474 \times 100\% = 19.3\%$$

2) Effective Contribution of Limb Muscle *Power* (X2) to *Shooting* Ability (Y)

$$\text{SE}(X)100\% = 0.159 \times 0.404 \times 100 = 6.4\%$$

3) Effective Contribution of Abdominal Muscle Strength (X3) to *Shooting* Ability (Y)

$$\text{SE}(X)100\% = 0.384 \times 0.513 \times 100 = 19.7\%$$

4) Total Effective Contribution can be calculated as follows.

$$\text{Total SE} = \text{SE}(X1)\% + \text{SE}(X2)\% + \text{SE}(X3)\%$$

$$\text{Total SE} = 19.3\% + 6.4\% + 19.7\%$$

$$\text{Total SE} = 45.4\%$$

DISCUSSION

The interpretation of the results of this study provides an interpretation of the results of the data analysis that has been stated. Based on hypothesis testing, it produces two analysis conclusions, namely: (a) there is a relationship between each independent variable and the dependent variable (b) there is a simultaneous relationship between the independent variable and the dependent variable. The following is a further description of the data analysis conclusions:

1. The relationship between the variable X1 Foot Eye Coordination with the variable Y *Shooting* Ability.

Based on the results of research conducted previously, it shows that the variable Coordination of Eyes and Feet has a regression coefficient value of 0.407 with a positive parameter. This means that every increase in the Eye and Foot Coordination variable, the Shooting Ability variable increases. Eye and Foot Coordination provides an effective contribution of 19.3%, this shows that Eye and Foot Coordination has a role in *Shooting* Ability. The results of the hypothesis test also show that the variable Eye and Foot Coordination is significantly related to the variable *shooting* ability of WTW TC Grobogan soccer players.

2. The relationship between the X2 Limb Muscle *Power* variable and the Y *Shooting* Ability variable.

Based on the results of research conducted previously, it shows that the Limb Muscle *Power* variable has a regression coefficient value of 0.159 with positive parameters. This means that every increase in the Limb Muscle *Power* variable, the Shooting Ability variable increases. Limb Muscle

Power Provides an effective contribution of 6.4%, this indicates that leg muscle power affects *shooting* ability. The results of hypothesis testing also show that the limb *power* variable is significantly correlated with the shooting ability variable of WTW TC Grobogan soccer players.

3. The relationship between the X3 Abdominal Muscle Strength variable and the Y *Shooting* Ability variable.

Based on the results of research conducted previously, it shows that the variable Abdominal Muscle Strength has a regression coefficient value of 0.384 with positive parameters. This means that every increase in the Abdominal Muscle Strength variable, the Shooting Ability variable increases. Limb Muscle *Power* provides an effective contribution of 19.7%, this shows that Abdominal Muscle Strength has a role in *Shooting* Ability. The results of hypothesis testing also show that the Abdominal Muscle Strength variable is significantly related to the variable *shooting* ability of WTW TC Grobogan soccer players.

Simultaneous or joint contribution (Eye and Foot Coordination, Limb Muscle *Power*, and Abdominal Muscle Strength) to Shooting Ability. The results showed that the independent variables (Eye and Foot Coordination, Limb Muscle *Power*, and Abdominal Muscle Strength) simultaneously or together contributed 45.4%.

4. CONCLUSION

In conclusion of the data analysis, research figures, research test results, and discussion of the contribution of eye and foot coordination, leg muscle power, and abdominal muscle strength to the shooting ability of soccer players at WTW TC Grobogan U Training on March 13-15, 2024, it can be concluded as follows:

Terdapat su.mban.gan, ta.ra Eye and Ka.ki Coordination with Shooting Ability on WTW TC Grobogan Training players after known by using Pearson product moment with the significance value of Eye and Foot Coordination with Shooting ability is $0.013 < 0.05$ which means there is a significant correlation relationship. Eye and foot coordination provides an effective contribution of 19.3% to shooting ability .

There is a contribution between Limb Muscle Power and Shooting Ability in WTW TC Grobogan Training players after being known by using Pearson product moment correlation with the significance value of Limb Muscle Power with Shooting Ability is $0.037 < 0.05$, meaning there is a significant correlation relationship. Limb Muscle Power provides an Effective Contribution of 6.4% to Shooting ability.

There is a contribution between Abdominal Muscle Strength and Shooting Ability in WTW TC Grobogan Training players after being known by using Pearson product moment correlation with the significance value of Abdominal Muscle Strength with Shooting Ability is $0.006 < 0.05$, meaning there is a significant correlation relationship. Abdominal Muscle Strength provides an effective contribution of 19.7% to Shooting ability.

There is a significant contribution between Eye and Foot Coordination, Limb Muscle Power, and Abdominal Muscle Strength to Shooting Ability can be seen that the significance value (Sig.) in the F test is 0.003. Because the sig value is $0.003 < 0.05$ so it can be concluded that eye-foot coordination, leg muscle power, and abdominal muscle strength simultaneously (together) affect shooting ability. Based on the coefficient of determination (R Square) is 45.4 or equal to 45.4%. This figure proves that the variables that eye-foot coordination, leg muscle power, and abdominal muscle strength simultaneously (together) affect the shooting ability variable by 45.4% while $(100\% - 45.4\% = 54.6\%)$ outside of other variables that have not been studied.

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