



## **Relationship of Power, Waist Muscle Flexibility, and Power Muscle Legs Against Smash Volleyball for FIK UNM Makassar Students**

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### **Abstract**

Power Leg Muscle Power volleyball for FIK UNM Makassar students. The sample used in this study were FIK UNM Makassar students who took volleyball courses. Data analysis techniques used to test the hypothesis are normality test, linearity test, and correlation test. From the results of the first hypothesis correlation test, a significance value of  $0.046 < 0.05$  was obtained, so there was a significant relationship between power arm muscle smash. The results of the second hypothesis test have a significance value of  $0.037 < 0.05$ , so there is a significant relationship between Waist Muscle Flexibility and Smash. The results of the third hypothesis test have a significance value of  $0.032 < 0.05$ , so there is a significant relationship between Waist Muscle Flexibility and Smash. Based on the multiple correlation test in the summary model table, it is known that the magnitude of the relationship between arm muscle power, waist muscle flexibility and leg muscle power (simultaneously) on the smash results calculated by the correlation coefficient is 0.452, this indicates a moderate effect. Meanwhile, the simultaneous contribution or contribution of the arm muscle power variable with the flexibility of the waist muscles is 20.4% while 79.1% is determined by other variables.

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## INTRODUCTION

Sport is a sport that involves large muscles and is carried out regularly and planned with the aim of strengthening and nourishing the body's organs (Dewi & Verawati, 2021), (Supriadi et al., 2022) One of them is the sport of volleyball (Endriani, Akhmad, et al., 2022) Volleyball is a form of game sport played by two teams, where each team tries to bounce / volley the ball with their hands or arms three times in turn and touch each other. trying to pass the ball over the net, into the opponent's area and trying to turn it off to get points/scores.

Achievement sports must be fostered from all parties starting in stages and continuously, both through family channels, education channels, and community paths based on sports development for everyone that lasts a lifetime (Akhmad & Mesnan, 2019).

According to (Endriani, Sitompul, et al., 2022) explains that volleyball is a type of sport that relies a lot on physicality, so the physical condition of players is very important in supporting the effectiveness of the game. Physical condition is the basis for following the exercise properly and correctly (Reza Hermansyah, 2017) In this study, the physical condition factors that will be studied are power, waist muscle flexibility, and leg muscle power. In fact, the level of physical and anatomical conditions of a person is different. Meanwhile, to obtain good volleyball players, it is necessary to know how much the factors mentioned above influence the results of the volleyball game, especially the implementation of the smash and the physical component itself.

Each physical component has a different role, according to the characteristics they have. The physical components that are considered very important related to the smash are the elements of arm muscle power, waist muscle flexibility, and leg muscle power.

In this study, the physical condition factors that will be studied are arm muscle power, waist muscle flexibility, and leg muscle power. Arm muscle power, waist muscle flexibility and leg muscle power are important factors in doing a smash. Explosive power (power) is a person's ability to use the maximum force that is deployed in the shortest possible time (Aref Vai, 2018).

To achieve maximum performance, an athlete must have several important factors that can support the achievement of maximum performance. Muscle is one of the supports for an athlete to be able to achieve maximum performance. Arm muscle power is one of the important elements that affect volleyball performance. Arm muscle power is a combination of speed and strength involving the shoulder muscles, upper arm muscles, arm muscles and hand muscles (Lestari, 2020). (Antoni, 2021) explained that to increase the ability of arm muscle power, training must be carried out systematically and continuously in order to produce good results, intensive training is needed. In sports that use arm muscles such as volleyball, nowadays it has an important role, because it is impossible for an athlete to produce a deadly blow such as a smash without using the strength of his arm muscles.

In addition to the role of arm muscle power and arm muscle strength, an athlete's ability to smash is also influenced by the flexibility of his waist muscles. Waist flexibility is a person's effectiveness in adjusting to all activities by stretching the body in a wide joint area (Lestari, 2020).

Flexibility is the effectiveness of a person in adjusting himself to carry out all body activities with the widest possible stretching, especially the muscles and ligaments around the back. This will be very easily marked by the level of flexibility of the whole body, especially

the muscles, ligaments. The higher the flexibility of the waist, the angle of motion in taking the angle of the back for a whip is also greater so that the power generated also becomes greater. The elements mentioned above are the physical qualities that determine to achieve results in sports.

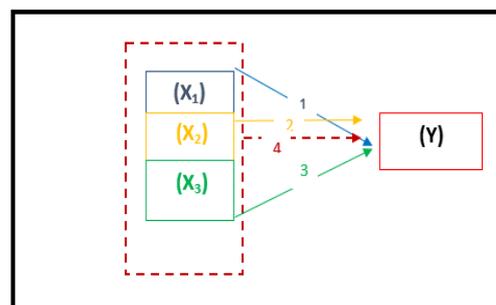
The explosive power factor is a person's ability to perform maximum strength according to (Oktariana & Hardiyono, 2020). The explosive power used in this study is the leg muscle power (leg muscle power). Leg muscle power is the ability of a group of leg muscles to perform explosive movements when jumping (Wismiarti, 2020)

Mastery of the smash is very necessary in the game, because this technique plays a role in attacking or hitting the ball into the opponent's area in every game. Smash is a hard and sharp blow that is directed at the bawah and is used to kill the opponent's game as quickly as possible (Fadhly R, 2021). Smash or spike punches are movements to hit the ball strongly and hard and the ball runs fast, sharp and dive and is difficult for the opponent to accept if the blow is done quickly and precisely (Aref Vai, 2018).

From this explanation, the author intends to apply at the same time to conduct research on the relationship between the muscles that support when doing the smash. To do smash it takes a certain courage with leg muscle power, arm muscle power, and back muscle flexibility. This is in accordance with previous research conducted by (Hedayana et al., 2016) (Wismiarti, 2020), (Fadhly R, 2021), (Pratomo et al., 2013) which explains that there is a significant influence between arm muscle power, waist muscle flexibility and leg muscle power on volleyball smash results with variables affecting the physical components of volleyball.

## METHODS

The research method used in research using correlation techniques through tests and measurements, tests and measurements in general is a way of collecting data from a number of units or individuals at the same time. This research is a descriptive study of Correlational Studies (Prof. Dr. Sugiyono, 2010) Correlation research is research to detect the extent to which variations in a factor are related to variations in one or more other factors without performing certain interventions on variations in variables. concerned. The sampling technique used was purposive sampling or a conditional sample which was determined based on the value of the basic volleyball course above the average, so that the number of samples was 10 people. The data obtained in this study came from primary data, namely data directly collected by researchers from players through tests and measurements, namely power, waist muscle flexibility, and power leg muscle smash. The research design drawings that will be used are as follows.



**Figure 1.** Forms of Relationship between Influenced Variables and Influenced Variables

The data analysis technique in this study used multiple regression analysis using SPSS Version 2.4, because in this study there were 3 independent variables with 1 dependent variable. Multiple regression analysis is an analytical tool for forecasting the value of the influence

of two or more independent variables on the dependent variable to prove whether or not there is a relationship between functions or more

## RESULT

This study aims to determine the relationship between arm muscle power, waist muscle flexibility and power leg muscle smash student FIK UNM Makassar.

### Description of Arm Muscle Power Research Results Descriptive

Statistical analysis results for the arm muscle power variable obtained the value of Mean = 2.05, Range = .36, Sum = 20.52, Minimum = 1.88, Maximum = 2.24, and Standard Deviation = 0.11

**Table 1.** Description of Results power Arm muscle

Interval	Category	Frequency	P (%)
>2.23	Very High	1	10%
2.11 – 2.23	High	1	10%
1.99 – 2.11	Medium	4	40%
1,87 – 1.99	Low	4	40%
< 1.87	Very Low		
Total		10	100%

### Description of Research Results of Waist Muscle Flexibility The

The results of descriptive statistical analysis for the variable Waist Muscle Flexibility obtained the Mean = 6.40, Range = 3, Sum = 64, Minimum = 5, Maximum = 8, and Standard Deviation = 1.075.

**Table 2.** Description of Waist Muscle Flexibility

Interval	Category	Frequency	P (%)
>8.0 cm	Very High	2	20%
7.0 - 7.9 cm	Height	2	20%
6.0 – 6.9 cm	Moderate	4	40%
4,9 – 5.9 cm	Low	2	20%
< 4.8cm	Very Low		
Total		10	100%

### Description of the Research Results of the Power Legs

The results of descriptive statistical analysis for the variable power obtained the Mean = 2.30, Range = .36 Sum = 21.33, Minimum = 1.94, Maximum = 2.30, and Standard Deviation = 0.117.

**Table 3.** Description of the results of Power Legs

Score	Category	Frequency	P (%)
> 2.30	Very high		
2.19 – 2.30	High	4	40%
2.07 – 2.19	Moderate	4	40%
1.95 – 2.07	Low	1	10%
< 1.95	Very low	1	10%
Total		10	100 %

### Description of Smash Research Results The

The results of descriptive statistical analysis for the Smash obtained the Mean = 49.90, Range = 33, Sum = 499, Minimum = 33, Maximum = 66, and Standard Deviation = 10.159.

**Table 4.** Description of Smash

Score	Category	Frequency	P (%)
> 65.13	Very high	1	10%
54.97 - 65.12	High	4	40%
44.82 – 54.96	Medium	1	10%
34.66 – 44.81	Low	3	30%
< 34.65	Very low	1	10%
Total		10	100%

Data analysis is used to answer the proposed hypothesis, namely whether there is a relationship between power, waist muscle flexibility and power leg muscle smashes of volleyball. Before data analysis is carried out, it is necessary to first test the analysis requirements, namely the normality test and linearity test. The results of the requirements test and hypothesis testing.

### Normality Test

Calculation of the data normality test is intended to determine whether the variables in the study have a normal distribution or not. In this study to test the normality of the data used a technique using SPSS Statistics 20 formula Kolmogorov-Smirnov.

**Table 5.** Normality Test

Correlation	Significance Level (p)	Description
X <sub>1</sub> with Y	0.200	Normal Distribution
X <sub>2</sub> with Y	0.090	Normal Distribution
X <sub>3</sub> with Y	0.200	Normal Distribution

Based on the results of the normality test, it can be seen that the data of all variables has a p value (Sig .) > 0.05, then all variables are normally distributed and the analysis can be continued.

### Linearity

The linearity test is used to determine whether the relationship between the independent variable and the dependent variable is linear (the graph of the relationship forms a straight line). Linearity test can be done by using SPSS Statistics 20.

**Table 6.** Table of Significance Correlation

Correlation	(p)	Description
X <sub>1</sub> with Y	0.284	Linear
X <sub>2</sub> with Y	0.796	Linear
X <sub>3</sub> with Y	0.486	Linear

Based on the results of the linearity test, it can be strengthened by the value of p (Sig.) > 0.05 so that all variables X<sub>1</sub>, X<sub>2</sub>, have a linear relationship with Y. Thus, all prerequisite analyzes are met and can be continued.

### Hypothesis Testing

#### First Hypothesis

H<sub>0</sub> : Arm muscle power has an insignificant relationship with the results of Leg Muscle Power.

H<sub>a</sub> : Arm muscle power has a significant relationship with the results of leg muscle power.

**Table 7.** First Hypothesis Testing

Correlation	rx <sub>y</sub>	Significance	Description
X <sub>1</sub> with Y	0.597	0.046	Significant

Based on the probability or significance value from the table above, it is known that the relationship between coordination (X<sub>1</sub>) and the results of Muscle Power in the Legs (Y) a significance value of 0.046 < 0.05 and the value of r<sub>xy</sub> 0.597, then H<sub>0</sub> is rejected and H<sub>a</sub> is accepted so that there is a significant relationship between arm muscle power (X<sub>1</sub>) and leg muscle power (Y).

#### Second Hypothesis Test

H<sub>0</sub> : Waist Muscle Flexibility has no significant relationship with Smash.

H<sub>a</sub> : Flexibility Waist Muscles have a significant relationship with Smash.

**Table 8.** Second Hypothesis Testing

Correlation	rx <sub>y</sub>	Significance	Information
X <sub>2</sub> with Y	0.112	0.037	Significant

#### Third Hypothesis Test

H<sub>0</sub> : power has an insignificant relationship with Smash.

H<sub>a</sub> : power muscle Smash.

**Table 9.** Second Hypothesis Testing

Correlation	rx <sub>y</sub>	Significance	Information
X <sub>3</sub> with Y	0.112	0.032	Significant

Based on the probability or significance value from the table above, it is known that there is a relationship between Waist Muscle Flexibility ( $X_3$ ) with the results of Smash ( $Y$ ) a significance value of  $0.032 < 0.05$  and a  $r_{xy}$  0.112, then  $H_0$  is rejected and  $H_{a1}$  is accepted so that there is a significant relationship between power leg muscle ( $X_3$ ) and smash ( $Y$ ).

#### Hypothesis Testing Analysis with Multiple Correlation

$H_0$ : Arm muscle power, Waist muscle flexibility and leg muscle power together have no significant relationship with the results of Power Smash.

$H_a$  : Arm muscle power, waist muscle flexibility and leg muscle power together have a significant relationship with the results of the power smash.

**Table 10.** Model Summary

Model	R	Adjusted R Square	Std. Error of the Estimate
a	.238	.152	20.815

It is known that the magnitude of the relationship between arm muscle power and waist muscle flexibility (simultaneously) on the results of leg muscle power calculated with the correlation coefficient is 0.452, this indicates the effect of which is being. While the simultaneous contribution or contribution of the arm muscle power variable with the flexibility of the waist muscles is 20.4% while 79.1% is determined by other variables.

## DISCUSSION

Based on the test results of all hypotheses that have been carried out in

the hypothesis testing section, it can be stated that:

#### The Relationship Between Arm Muscle Power and Smash Volleyball

The results of research that have been carried out show that there is a significant relationship between arm muscle power with the smash result, this result is shown based on the Pearson correlation test with an  $r_{xy}$  value of 0.597 and a significance value of  $0.046 < 0.05$  then  $H_0$  is rejected and  $H_{a1}$  is accepted so that there is a significant relationship between arm muscle power ( $X_1$ ) and smash results  $Y$ .

Based on this statement and complemented by the results of research that has been done, it shows that athletes who have good arm muscle power smash well and smoothly, but on the other hand, poor arm muscle power also affects the results of power smash. Thus, the results of this study also show that arm muscle power is important to be owned and improved by each student to improve smash.

#### The Relationship Between Waist Muscle Flexibility and Smash Volleyball

The results of the research that have been carried out show that there is a significant relationship between Waist Muscle Flexibility ( $X_2$ ) and smash results ( $Y$ ), the  $r_{0.597}$  and the significance value of  $0.037 < 0.05$ , then rejected and a significant relationship between Waist Muscle Flexibility ( $X_2$ ) and Smash ( $Y$ ).

Based on this statement and complemented by the results of research that has been carried out, it shows that athletes who have good Waist Muscle Flexibility Smash well and smoothly but on the contrary, poor Waist Muscle Flexibility also affects Smash to be not smooth and lack of Waist Muscle Flexibility will impact on Smash. Thus, the

results of this study also show that flexibility of the waist muscles is important to be owned and improved by each student to improve the results of the smash ball.

The relationship between power leg muscle The volleyball smash results in FIK UNM Makassar students

Results of the research that have been carried out show that there is a significant relationship between leg muscle power ( $X_3$ ) and smash (Y), the  $r_{xy}$  value is 0.597 and the significance value is  $0.032 < 0.05$ , then  $H_0$  rejected and  $H_{a1}$  accepted so that there is a significant relationship between leg muscle power ( $X_3$ ) and Smash (Y).

Based on this statement and complemented by the results of research that has been carried out, it shows that athletes who have good leg muscle power Smash well and smoothly, but on the other hand, poor leg muscle power also affects the results of Smash being not smooth and lack of leg muscle power will impact on Smash. Thus the results of this study also show that leg muscle power is important to be owned and improved by each student to improve the results of the smash ball

Results Smash Volleyball

Simultaneous on the Smash Results calculated by the correlation coefficient is 0.452, this indicates a moderate effect. Meanwhile, the simultaneous contribution of arm muscle power, waist muscle flexibility and leg muscle power was 20.4%, while 79.1% was determined by other variables. for example field conditions, exercise intensity, speed, flexibility, endurance, balance.

## CONCLUSION

Based on the results of the research and discussion that have been stated, the following conclusions can be drawn:

1. There is a significant relationship between arm muscle power and the results of. The volleyball smash in male athletes It is known that based on the value of  $r_{xy}$  0.597 and a significance value of  $0.046 < 0.05$ , then  $H_0$  is rejected and  $H_{a1}$  accepted.
2. There is a significant relationship between the flexibility of the waist muscles and the results. of the volleyball smash in male athletes It is known that based on the value of  $r_{xy}$  0.597 and a significance value of  $0.037 < 0.05$ , then  $H_0$  rejected and  $H_{a1}$  accepted.
3. There is a significant relationship between leg muscle power and volleyball smash results for male athletes it is known that based on the value of  $r_{xy}$  0.597 and a significance value of  $0.032 < 0.05$ , then  $H_0$  rejected and  $H_{a1}$  accepted.
4. There is a significant relationship between arm muscle power, waist muscle flexibility and leg muscle power to smash of volleyball is known that based on the magnitude of the correlation value of 0.452, this indicates a moderate effect. Meanwhile, the simultaneous contribution of arm muscle power, waist muscle flexibility and leg muscle power was 20.4%, while 79.1% was determined by other variables. for example field conditions, exercise intensity, speed, flexibility, endurance, balance.

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