International Journal of Advanced Educational Research
ISSN: 2455-6157; Impact Factor: RJIF 5.12
Received: 10-09-2019; Accepted: 11-10-2019
www.educationjournal.org
Volume 4; Issue 6; November 2019; Page No. 39-43

Relationship between leg muscle explosion power and arm muscle strength on open spike ability in semester VI students of the department of coaching education

Supriadi IM[1], Betrix Podung[2], F Dj Sumarauw[3]
[1, 2, 4] Student of Master Program, Study Program of Sports Education, Postgraduate Program, Manado State University, Indonesia
[2, 3] Postgraduate Program, Manado State University, Indonesia

Abstract
This study aims to analyze how much the relationship: (1) leg muscle explosive power, (2) arm muscle strength, (3) between leg muscle explosive power and arm muscle strength together with open spike ability in the sixth semester students of the Department of Coaching Education, Faculty of Sports Science, Manado State University. The method in this research is descriptive method. The results of the multiple correlation coefficient test were obtained = 0.958 with the coefficient of determination Rsquare = 0.918. Based on the calculation of the coefficient of determination that the contribution of leg muscle explosive power and arm muscle strength together with the open spike ability of semester VI students of the Department of Coaching Education, Faculty of Sports Science, Manado State University is equal to Kd = r2 x 100% = (0.958) 2 x 100% = 91.8%. Furthermore, the remaining 8.2% is determined by other variables or external factors that are not the target of the study and is not explained one by one in this study. It turns out that the explosive power variables of leg muscles and arm muscle strength together have contributed 91.8% to the ability to open spike VI semester students of the Department of Coaching Education, Faculty of Sports Science, Manado State University. So the relationship between leg muscle explosive power and arm muscle strength to the ability of open spike together in semester VI students of the Department of Coaching Education, Faculty of Sports Science, Manado State University.

Keywords: explosive power, leg muscles, arm muscles, open spike

1. Introduction
Sport is a human need which is a basic element that is very influential in the formation of the soul (spiritual) and physical (physical or bodily). So that every human who often does sports activities will have better spiritual and physical health than humans who rarely or never do sports activities.
Sports is also an activity that is mostly done in the community is the volleyball sport. Volleyball has developed into a very popular sport in the world. Volleyball game was created by William G. Morgan in 1895 which was named mintonette, then proposed by prof. H. T. Halsted in 1896 with the name Volleyball.
Volleyball games have been known in Indonesia since 1928, brought by Dutch teachers who teach at H.B.S. and H.M.S., but at that time this game was not popular in the community. After the era of independence, many former Dutch army troops joined the NKRI army, these were those who helped popularize volleyball games in the community.
In Indonesia there is a volleyball management organization which all are based on P.B.V.S.I (All Indonesia Volleyball Association), established on January 22, 1955 in Jakarta. Basically the game of volleyball is passing the ball to the opponent through the net and trying to kill the ball in the opponent's area. The main purpose of people playing volleyball is to look for fun and free time. Not only that, volleyball games also improve physical fitness and health.
One of the capital to be able to play volleyball properly and correctly is needed to know the basic techniques of volleyball game one of which is spike/smash and supported physical exercise that is the explosive power of leg muscles for jump strength and arm muscle strength to hit the ball.
Strength is one of the physical requirements that is useful to make a volleyball player have good techniques, such as being able to jump high because of the leg muscle explosive power and can hit the ball hard and well because it is supported by the strength of the arm muscles.
However, to get good strength a volleyball player must do a regular physical exercise program programmed by the sports researcher. Based on the statement above, it aims to teach about the basic techniques of playing volleyball how to play and train physical strength with the help of tools that will be used to increase muscle strength for volleyball players.
On the Manado State University Campus volleyball games are carried out in lecture activities, now volleyball is not only recreational but has become a part of various sports majors. As a sports major, apart from being a means of achieving educational goals, the main thing is as a researcher playing a role in forming cooperation with students, as well as fostering sportsmanship and the development of other traits. The campus is also equipped with a physical education curriculum which includes volleyball courses as a compulsory curriculum.
Based on observations from writers in the field, the sixth semester of FIK coaching students at Manado State University who took volleyball courses, most of them can play volleyball, but many cannot spike especially open spikes properly. So that gave rise to the idea for the author as research material to the extent of the sixth semester of FIK coaching students at Manado State University in conducting open spikes with the donation of leg muscle explosive power and arm muscle strength.

In this study the physical condition factors that will be examined are the strength of the leg muscle explosive power using a vertical jump tool and arm muscle strength using push up. Thus, is there a specific relationship between muscle explosive power and arm muscle strength a volleyball player can do open spike well.
But the level of a person's anatomical physical condition varies. Meanwhile, to know a good volleyball player needs to know how much the relationship of the factors mentioned above also influence the volleyball game results, especially in the implementation of open spike.

2. Research Methods

This research is a descriptive study. According to Nazir (1988) in the book Research Methods, the descriptive method is a method of examining the status of a group of people, an object, a set of conditions, a system of thought or a class of events at the present time [1].
The method used is a survey method with data collection techniques using tests and measurements. This study aims to determine whether there is a relationship between leg muscle explosive power (X1), arm muscle strength (X2) and the ability to open spike volleyball (Y) in Semester VI Department of Coaching Education, Faculty of Sports Science, Manado State University.

3. Result and Discussion

Research Result

The description of the data description of the results of the study aims to look at a general description of the characteristics of the variables that have been examined in this study. The intended variables are: leg muscle explosive power, arm muscle strength, and open spike ability. The description of research data can be seen in the table below.

Table 1: Recapitulation of basic statistics for variables X1, X2, and Y

Variable	N (number of samples)	Mean (average)	Standard Deviation (sd)	Minimum Score	Maximum Score
leg muscle explosive power (X1)	30	45.63	4.18	38	53
arm muscle strength (X2)	30	45.33	4.01	38	52
open spike ability (Y)	30	15.56	3.46	9	22

From the results of the descriptive analysis in the table above, it shows that the leg muscle explosive power has the highest score of 53 and the lowest score of 38 and from the calculation results an average score of 45.63 and standard deviation or standard deviation 4.18. Then the arm muscle strength has the highest score of 52 and the lowest score of 38 and the standard deviation or standard deviation is 4.01. Furthermore, the ability of open spike has the highest score of 22 and the lowest score of 9 and the standard deviation or standard deviation of 3.46.

Variable Linearity Testing

Linearity Equation between X1 and Y

The results of testing the linearity equation between X1 and Y can be seen in the following table.

Table 2: Results of Linearity Test Variables X1 with Y

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	317.552	1	317.552	298.222	.000[b]
	Residual	29.815	28	1.065		
	Total	347.367	29			
a. Dependent Variable: Y						
b. Predictors: (Constant), X1						

Based on the calculation of the analysis in the table above it can be seen that the calculated F value of 298.222 > from the F table of 4.00. With these results reject Ho and accept Ha which states that the leg muscle explosive variable can affect the results of the ability to open spike.
Furthermore, the significance value of the leg muscle explosive power variable with the open spike ability obtained a significance value = 0.000 less than the significance level α = 0.05. Thus, the pattern of the relationship between leg muscle power variable with open spike ability has a linear relationship. Then for linear equations between variables Y (open spike ability) on X1 (muscle explosive power) can be illustrated in the graph diagram below.

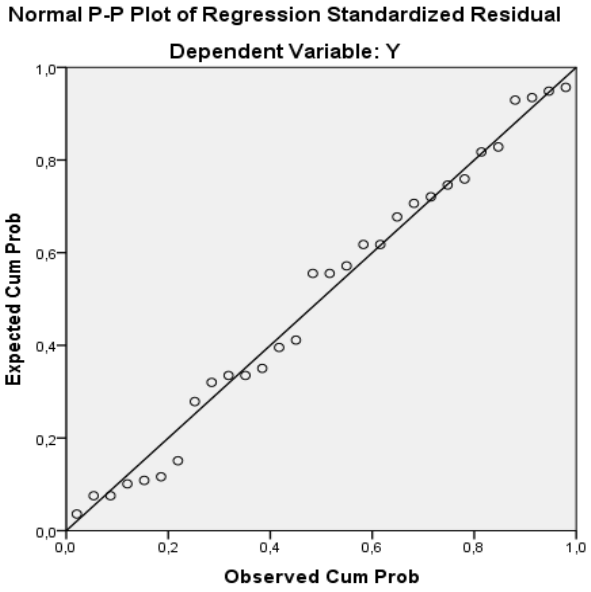

Fig 1: Equation of linear regression line Y over X1

Linear Regression Equations between X2 and Y

The results of testing the linearity equation between X2 and Y can be seen in the table below.

Table 3: Results of Linearity Test Variables X2 with Y

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	282.881	1	282.881	122.828	.000[b]
	Residual	64.486	28	2.303		
	Total	347.367	29			
a. Dependent Variable: Y						
b. Predictors: (Constant), X2						

Based on the calculation of the analysis in the table above it appears that the calculated F value of 122.828 > from the F table of 4.00. With these results reject Ho and accept Ha

which states that the leg muscle explosive variable can affect the results of the ability to open spike.
Furthermore, the significance value of the leg muscle explosive power variable with spike ability obtained a significance value = 0.000 less than the significance level α = 0.05. Thus, the pattern of the relationship between the leg muscle power variable with spike ability has a linear relationship. Then for linear equations between variables Y (open spike ability) on X2 (arm muscle strength) can be illustrated in the graph diagram below.

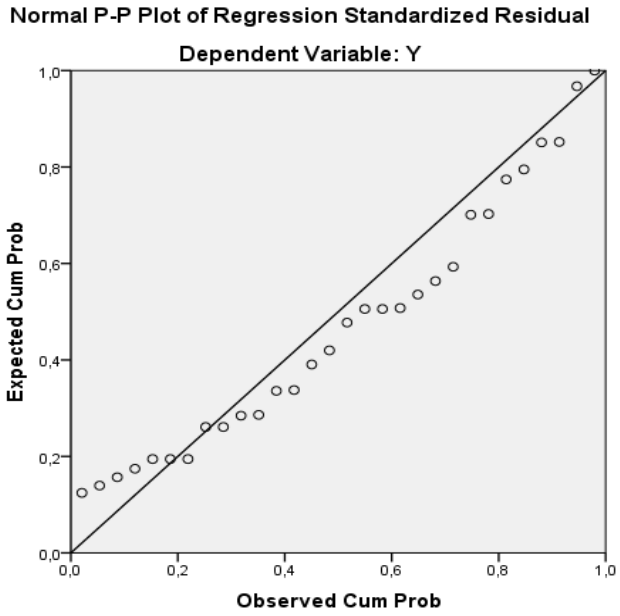

Fig 2: Equation of the regression line Y over X2

Linear Regression Equations between X1 and X2 with Y
The results of testing the linearity equation between X1 and X2 together with Y can be seen in the following table.

Table 4: Results of Linearity Test Variables X1 and X2 with Y

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	318.872	2	159.436	151.070	.000[b]
	Residual	28.495	27	1.055		
	Total	347.367	29			
a. Dependent Variable: Y						
b. Predictors: (Constant), X2, X1						

Based on the calculation of the analysis in the table above it appears that the calculated F value of 151.070 > from the F table of 4.00. With these results reject Ho and accept Ha which states that the variable explosive power leg muscles and arm muscle strength together can affect the results of the ability to open spike.
Furthermore, the significance value of the leg muscle explosive power variable with the open spike ability obtained a significance value = 0.000 less than the significance level α = 0.05. Thus the relationship pattern between the leg muscle power variable with the open spike ability has a linear relationship. Then for linear equations between variables Y (open spike ability) on X1 (leg muscle explosive power) and X2 (arm muscle strength) can be illustrated in the following graphic diagram.

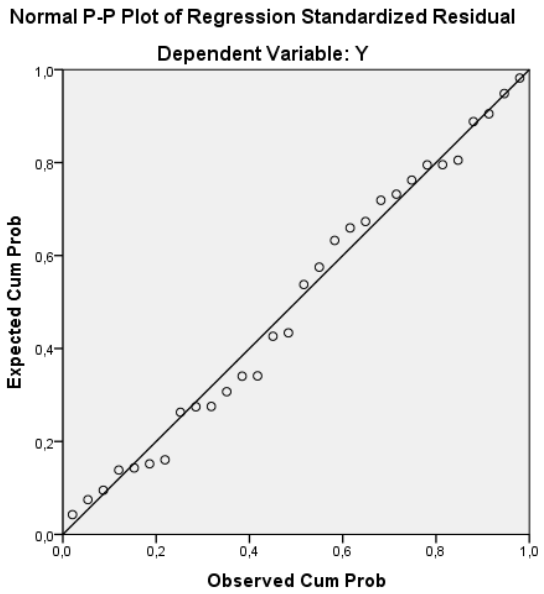

Fig 3: Equation of the regression line Y over X1 and X2

Research Hypothesis Testing
The results of testing the requirements analysis showed that the sample came from populations that were normally distributed and linear regression models. Thus, hypothesis testing can be continued. Testing the hypothesis of this study using a simple correlation test and multiple correlation test (multiple correlation) with the help of SPSS version 21.

Relationship Analysis of Leg Muscle (X1) Explosion with Spike (Y) Ability
Testing the relationship between leg muscle explosive power (X1) and open spike ability (Y) was done with the help of SPSS version 21. The results of the analysis calculations can be seen in the following table.

Table 5: Correlation Coefficients X1 and Y

Model	R observation (r x1y)	R Square	R table	Adjusted R Square	Std. Error of the Estimate
1	0.956	0.914	0.361	0.911	1.03190

Based on the calculation in the above table, r x1y observation values obtained for r_{ob} = 0.956 and r_{table} is 0.361 at the significance level α = 0.05. From the calculation results, it appears that the value of r_{ob} = 0.956 > r_{tab} = 0.361. This means rejecting Ho and accepting Ha which states there is a significant relationship between arm muscle strength and spike ability. Thus, it can be concluded that there is a relationship between leg muscle explosive power and open spike ability.

Relationship Analysis of Arm Muscle Strength (X2) and Open Spike (Y) Ability
Testing the relationship between arm muscle strength (X2) with the ability to open spike (Y) is done with the help of SPSS version 21. The results of the analysis calculations can be seen in the table below.

Table 6: Correlation Coefficients X2 and Y

Model	R observation (r x2y)	R Square	R table	Adjusted R Square	Std. Error of the Estimate
1	0.902	0.814	0.361	0.808	1.51758

Based on the calculation in the above table, r x2y observation values obtained for r_{ob} = 0.902 and r_{table} is 0.361 at the significance level α = 0.05. From the calculation results, it appears that the value of $r_{ob} = 0.902 > r_{tab} = 0.361$. This means rejecting Ho and accepting Ha which states there is a significant relationship between arm muscle strength and the ability to open spike. Thus, it can be concluded that there is a relationship between arm muscle strength and open spike ability.

Analysis of Sevara Relationship between Leg Muscle Explosion Power (X1) and Arm Muscle Strength (X2) with Open Spike (Y) Ability

Testing the relationship between leg muscle explosive power (X1) and arm muscle strength (X2) with open spike ability (Y) was carried out with the help of SPSS version 21. The results of the analysis calculations can be seen in the table below.

Table 7: Correlation Coefficients X1 and X2 with Y

Model	R observation (r x1x2y)	R Square	R table	Adjusted R Square	Std. Error of the Estimate
1	0.958	0.918	0.361	0.912	1.02731

Based on the calculation in the above table, r x1x2y observation values obtained for r ob = 0.958 and r table is 0.361 at a significance level α = 0.05. From the calculation results, it appears that the value of $r_{ob} = 0.958 > r_{tab} = 0.361$. This means rejecting Ho and accepting Ha which states that there is a significant relationship between leg muscle explosive power and arm muscle strength and open spike ability. Thus, it can be concluded that there is a relationship between leg muscle explosive power and arm muscle strength together with the ability to open spike.

4. Discussion

Based on the results of the study it turns out that the first, second and third hypotheses were accepted. The results of testing the hypothesis will be further examined in the discussion section below.

The relationship between leg muscle explosion power and open spike ability

Based on the results of the analysis of research data concludes that there is a significant relationship between leg muscle explosive power (X1) and the ability to open spike (Y). These results can be seen in the partial correlation test results obtained by 0.956.

In addition, the results of the calculation of the coefficient of determination between the variables of leg muscle explosive power with the ability to open spike obtained R Square = 0.914 this result means that the contribution of leg muscle explosive power variable to the spike ability of the research subjects was 91.4% while the remaining 8.6 % was determined by other variables not examined in this study.

The contribution of leg muscle explosive power variables as tested through this research is so significant. The significant relationship between leg muscle explosive power and spike ability is caused by explosive power as one of the most dominant physical conditions to spike in volley ball. The power itself is a combination of strength times speed (Sukadiyanto, 2011) [2].

The explosive power of the leg muscles is required when a player or speaker jumps while doing an open spike, the higher the jump is the higher the power needed is therefore needed to stretch from the flexion of the leg at a smaller angle as a form to jump.

Sudarminto (1992) states that with a long stretch will have the maximum thrust of repulsion when the foot is stretched so that it can be changed into an upward motion. This can be done if the explosive power of leg muscles is in the good category [3].

The better the leg muscle explosive power of a speaker, the higher the jump will make it easier for him to do open spikes. Conversely, a speaker who has poor leg muscle explosive power will have difficulty when jumping when doing an open spike.

Relationship between Arm Muscle Strength and Open Spike Ability

Based on the results of the analysis of the research data concluded that there is a significant relationship between arm muscle strength (X2) with the ability to open spike (Y). These results can be seen in the partial correlation test results obtained by 0.902.

Besides that, from the calculation of the coefficient of determination between the variables of arm muscle strength and open spike ability, the amount of R Square = 0.814 was obtained. This result means that the contribution of arm muscle strength variables to the open spike ability of the study subjects was 81.4%. While the remaining 18.6% was determined by other variables not examined in this study.

The contribution of arm muscle strength variables as has been tested through this study seems to be significant. The significant correlation between arm muscle strength and open spike ability is caused by strength as one of the most dominant physical conditions for spike swaps in volleyball.

Strength rather than arm muscles is needed when a player or speaker is doing an open spike. A speaker usually tries to hit the ball with a strong style (Sudarminto 1992) [3]. Therefore he must pull his arm back as far as possible before the hitting motion begins, and the direction of his style must be at an angle to the floor so that the fall of the ball remains within the limits of the field.

Because the ball is on the net when it is hit and the punch occurs near the net, there is no need to add lift to cross the net. This can be done by the speaker if the arm muscle strength is in the good category. The better the arm muscle strength of a speaker, the smash will be stronger so he can get a point for his team when attacking with a spike. Conversely, a speaker who has poor arm muscles will have difficulty when taking open spikes.

Relationship between leg muscle explosion power and arm muscle strength together with the open spike ability

Based on the results of analysis of research data which states that there is a significant relationship between leg muscle explosive power (X1) and arm muscle strength (X2) together with the ability to open spike (Y). These results can be seen in the double correlation test results obtained at 0.958.

From the results of these tests can be sure that both the leg

muscle power variable strength and arm muscle strength are physical components that are very important in supporting in improving the ability of open spike. Besides that, from the calculation of the multiple correlation coefficient between the leg muscle explosive variables and the spike ability, the magnitude of R x 1 x 2 = 0.958 with a coefficient of determination equal to R Square = 0.918. This result means that the contribution of leg muscle explosive power variables to the open spike ability of the study subjects was 91.8%. While the remaining 8.2% was determined by other variables not examined in this study.

Thus from the results of this study it turns out that the leg muscle power and arm muscle strength variables together contributed 95.8% to the ability of open spike in volleyball games on the subject of this study. Based on the results of the analysis of the test gives direction that jointly the leg muscle power and arm muscle strength become physical components to be able to improve the ability of technical skills in sport that is the ability of open spike in volleyball games. Because without having a good physical condition it will not be possible for an athlete to improve technical skills, especially the ability of spikes.

This is in accordance with what was said by Sajoto (1995) [4] that physical condition is one of the indispensable conditions in efforts to improve athlete's achievement, it can even be said to be the basis of the starting point of an achievement other than technical factors, tactics, intelligence, psychic, and supporting environment [4]. However, it is realized that for one sport with other sports where physical needs are not necessarily the same. That is, there are sports that are dominant strength and speed and there are also sports that are dominant endurance and agility and many more variations.

With this understanding, a trainer before designing a physical training program, must first know which physical components are dominantly needed by a particular branch of sport, and which physical components are only as a support.

In this research, efforts have been made to be scientifically justified. However, it is realized that this research is inseparable from the weaknesses and limitations that need attention. Prior to measuring all subjects were given an explanation of the importance of this measurement. However, it is suspected that the awareness of the importance of this measurement varies for each subject so that in the implementation of measurements cannot be avoided the existence of a subject who has not done according to maximum ability.

In addition this study only involved as many as 30 men as a research sample. Women should also be used as samples, because in the case of volleyball competitions in the section of women also competed, so the results of this study can be generalized to groups of students in which there are men and women.

5. Conclusion

1. There is a significant relationship between leg muscle explosive power and open spike ability.
2. There is a significant relationship between arm muscle strength and open spike ability
3. There is a significant relationship between leg muscle explosive power and arm muscle strength together with the open spike ability of the sickle kick ability of semester VI students, Department of Coaching Education, Faculty of Sports Science, Manado State University.
4. The relationship between leg muscle strength and endurance and joint ankle coordination are the same as the ability to kick sickle in semester VI students, Department of Coaching Education, Faculty of Sports Science, Manado State University.

6. References

1. Nazir. Metode Penelitian. Jakarta: Ghalia Indonesia, 1988.
2. Slamet R. Hubungan Kekuatan Otot Lengan, Kekuatan Otot Tangan Dan Kekuatan Otot Tungkai Terhadap Kemampuan Passing Atas Siswa Peserta Ekstrakurikuler Bolavoli Putra SMA N 3 Wonogiri. Skripsi. FPOK.UNY, 2013.
3. Sajoto M. Peningkatan dan Pembinaan Kondisi Fisik. Jakarta: Depdikbud, 1995.
4. Sajoto M. Pembinaan Kondisi Fisik Dalam Olahraga. Semarang: FPOK IKIP, 1988.