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THE RELATIONSHIP BETWEEN ARM MUSCLE STRENGTH, KINESTHETIC PERCEPTION AND EYE-HAND COORDINATION AND VOLLEYBALL PASSING SKILLS IN EXTRACURRICULAR MEN'S STUDENTS

Shodiq Hutomono[1*], Teguh Santosa[2], Joko Sulistyono[3]
[1]Universitas Tunas Pembangunan Surakarta (UTP), Indonesia
[2]Universitas Tunas Pembangunan Surakarta (UTP), Indonesia
[3]Universitas Tunas Pembangunan Surakarta (UTP), Indonesia
*e-mail: shodiq.hutomono@lecture.utp.ac.id

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Abstract

The purpose of this research is to determine: (1) The relationship between arm muscle strength and volleyball passing skills in extracurricular male students (2) The relationship between kinesthetic perception and volleyball passing skills in extracurricular male students (3) The relationship between eye-hands coordination. and Volleyball Passing Skills in Extracurricular Male Students (4) The Relationship Between Eye-Hand Coordination, Arm Muscle Strength and Kinesthetic Perception with Volleyball Passing Skills in Extracurricular Male Students.

This research uses a descriptive method with a correlational study approach. This research was carried out at Public Elementary School Tegalgiri 3 for extracurricular male students and this research was carried out in September. The data collection technique in this research is using test and measurement techniques. The types of tests used are: (1) Push-up test to measure arm muscle strength, (2) Vertical plane Kinesthetic Perception Test to measure kinesthetic perception, (3) Eye-hand coordination test with a ball bouncing test against a wall, (4)) The upper passing test used in this research uses the upper passing test.

Based on the data analysis and hypothesis testing that has been carried out, the conclusions that can be obtained are: (1) There is a significant relationship between arm muscle strength and upper passing, rcount = 0.493 > rtable 5% = 0.444. (2) There is a significant relationship between kinesthetic perception and overhead passing, rcount = 0.497 > rtable 5% = 0.444. (3) There is a significant relationship between hand eye coordination and overhead passing including inversion data because it is smaller than r table, rcount = 0.487 > rtable 5% = 0.444. (4) There is a significant relationship between arm muscle strength, kinesthetic perception and hand eye coordination with overhead passing, R2y(123) of 0.444 > rtable 5% at the 5% significance level of 0.444 and F0 of 4.2711 > ftable at the 5% significance level % of 2.89.

Keywords: *Arm Muscle Strength, Kinesthetic Perception, Eye-Hand Coordination, Passing Skills, Volleyball Games*

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INTRODUCTION

Sport is part of daily human activities which is useful for forming a healthy body and mind. The development of sport to date has made a positive and real contribution to improving public health (Suwirman, 2019). According to (Sistiasih, 2021) Volleyball is a game played on a rectangular field, 18 meters long and nine meters wide. Meanwhile, volleyball is a sport that is popular among people both in villages and cities. Volleyball games can be categorized into educational, recreational and achievement sports (Raihanati & Wahyudi, 2021). To be able to play volleyball well and correctly and achieve the highest level, several conditions are required. In general, players must have four basic equipment which include good physical, technical, tactical and mental abilities (Afdi et al., 2019).

The achievements of Indonesian volleyball at regional and international levels have not been satisfactory. The situation of Indonesian volleyball's achievements needs to find a solution. This will involve various related parties. The parties involved are not only players and coaches, but also problem parties, organizational and government administrators, educational institutions and other institutions who can help find a solution. Achieving achievements in the sport of volleyball is something that many athletes always want, but achieving achievements is not as easy as turning the palm of your hand (Yulifri et al., 2018). In order to achieve high achievements in volleyball, of course, persistent efforts are needed from various parties and supported by extensive knowledge and scientific study (Budiyono, 2017).

At Tegalgiri 3 Public Elementary School, volleyball is also taught to the students. And on average the students also like this volleyball game. Male students have received volleyball training and they have even been given a top passing training program for almost 2 months in order to provide treatment for experimental research based on the results of research conducted by (Era, 2020). So it can be said, the student is already adept at performing top passing skills well. This is what then makes researchers interested in conducting further research, namely correlational research in other schools. What this means is that researchers are interested in conducting research on overhead passing techniques that have been mastered by extracurricular male students at Tegalgiri 3 Public Elementary School, by connecting the elements of physical conditions that support the process of implementing overhead passing movement skills. According to (Suharno, 2005) that the elements of physical conditions that support technical abilities in volleyball skills are: strength, endurance, speed, abdominal muscle strength, flexibility, explosive power, coordination, accuracy and stamina.

In this case the researcher will focus research on the elements of physical condition, strength, as well as the classification of body movements, perceptual abilities, which are still divided into five types, namely: differentiation of sense of movement (kinesthetic), differentiation of sight (visual), differentiation of hearing (auditory), differentiation of touch (tactile), and coordination abilities. Researchers take perceptual abilities that differentiate the sense of kinesthetic movement by calling

kinesthetic perception and eye-hand coordination. According to (Kardiyanto et al., 2020) Volleyball playing techniques include: passing, set-up, serving, baiting and blocking. The overhead passing technique is a basic technique in the game of volleyball which plays a role in helping to attack well (Pranata, 2018). Without mastery of the top passing technique, the volleyball squad or team, in this case the feeder or tosser, will not be able to carry out or carry out their duties effectively, because there is no "good" ball that can be fed to the smasher (Budi et al., 2020).

Based on the explanation above, this research will be and will be more focused on "The relationship between Arm Muscle Strength, kinesthetic perception and Eye-hand Coordination with Upper Passing Skills in Extracurricular Male Students at Tegalgiri 3 Public Elementary School".

METHODS

This research was carried out on the volleyball court at Tegalgiri 3 Public Elementary School. This data collection was carried out in two tests, the implementation dates were as follows: Test and Re-test on September 29 2022, hours: 07.00 to 13.00 WIB.

The method used in this research is a descriptive method with a correlation study, where it is stated that the aim of the research is to find out whether there is a relationship between the independent variable and the dependent variable (Sugiyono, 2013). The independent variables are arm muscle strength, kinesthetic perception and hand eye coordination, while the dependent variable is overhead passing skills. The population is all students intended to be investigated. The population is limited to the number of students or individuals who at least have the same characteristics. In this study, the research population was 20 extracurricular male students at Tegalgiri 3 Public Elementary School. The sample size used in this study was 20 students. The sampling technique used the total sample.

The data collection technique used is test and measurement techniques. The tests used are from the test and measurement book (Fenanlampir, 2015) that is :

1. Push-up test to measure arm muscle strength.
2. Vertical plane Kinesthetic Perception Test to measure kinesthetic perception.
3. Test hand-eye coordination by bouncing the ball against the wall.
4. The top passing test used in this research uses the top passing test according to (Achmad, 2018).

The data analysis technique in this research is the process of simplifying the data into a form that is easier to read and interpret in this research using the help of the SPSS 21 application.

FINDINGS AND DISCUSSION

The data obtained from each variable is then grouped and analyzed statistically, as shown in the attachment. A summary of the overall data description will be presented as follows:

Table 1. Description of Test Results Data for Arm Muscle Strength, Kinesthetic Perception and Hand Eye Coordination and Upper Passing.

Variable	Test	N	*Mean*	SD	Value Highest	Rated Lowest
Arm muscle strength	*Test*	20	27.63	7.00	41	15
	Re-test	20	20.07	6.90	43	18
Kinesthetic perception	*Test*	20	2.57	1.92	7	1
	Re-test	20	4.23	1.77	7	2
Hand eye coordination	*Test*	20	19.13	3.17	25	14
	Re-test	20	20.93	3.06	27	16
Top passing	*Test*	20	6.10	2.26	9	2
	Re-test	20	7.53	1.66	9	4

1. Reliability Test

The aim of the reliability test is to determine the level of consistency of the test results for each variable carried out in the research. The results of the test and re-test reliability test. Arm muscle strength, kinesthetic perception and hand eye coordination and overhead passing were then categorized, using the correlation coefficient table guidelines from (Putra, 2013) that is:

Table 2. Range of Reliability Categories

Category	**Reliability**
Lofty	0,90 – 1,00
Tall	0,80 – 0,89
Enough	0,60 – 0,79
Not enough	0,40 – 0,59
Not significant	0,00 – 0,39

The results of the data reliability test for arm muscle strength, kinesthetic perception and hand eye coordination and overhead passing in this study are:

Table 3. Summary of Data Reliability Test Results

Variable	Reliability	Category
Arm muscle strength	0.998	Lofty
Kinesthetic perception	0.770	Currently
Hand eye coordination	0.981	Lofty
Top passing	0.960	Lofty

2. Analysis Requirements Testing

Before data analysis, an analysis requirements test was carried out. For regression analysis, it is necessary to test the analysis requirements, namely the normality of the distribution of values and the requirements for linearity of the relationship between predictors and criteria. The results of testing the analysis requirements in this research are as follows:

a. Normality Test

The data normality test in this study used chi-square. The results of the normality test used for hand-eye coordination in the results of the arm muscle strength (X1), kinesthetic perception (X2), hand-eye coordination (X3) and overhead passing (Y) in this study were:

Table 4. Summary of Data Normality Test Results

Variable	Db	M	SD	χ^2_{hitung}	$\chi^2_{tabel\ 5\%}$	Conclusion
Arm muscle strength	6 – 1 = 5	27.80	7.94	2,096	11,070	Normally distributed
Kinesthetic perception	6 – 1 = 5	2.60	1.93	3,731	11,070	Normally distributed
Hand eye coordination	6 – 1 = 5	18.70	3.16	4,231	11,070	Normally distributed
Top passing	6 – 1 = 5	5.85	2.28	2,865	11,070	Normally distributed

From the results of the normality test carried out on each of these variables, it can be seen that the chi-square value was obtained (χ^2_{count}) in the variables Arm muscle strength (X1), Kinesthetic perception (X2), Hand eye coordination (X3) and Upper passing (Y) are smaller than the chi-square value in the table ($\chi^2_{table\ 5\%}$). Thus the null hypothesis is accepted. Which means that the test results data for arm muscle strength (X1), kinesthetic perception (X2), hand eye coordination (X3) and overhead passing (Y) are normally distributed.

b. Linearity Test

The linearity test of the relationship between each predictor, namely arm muscle strength (X1), kinesthetic perception (X2), hand eye coordination (X3), with the criterion namely upper passing (Y)

was carried out using analysis of variance. A summary of the linearity test results can be seen in the following table:

Table 5. Summary of Variance Analysis Results for Testing the Linearity of the Relationship Between Predictors and Criteria

Variable	db	F_{count}	$F_{table\ 5\%}$	Conclusion
X_1Y	4:24	0.22	2,78	The linear model was accepted
X_2Y	13:15	0.80	2,43	The linear model was accepted
X_3Y	20:8	1.35	3,15	The linear model was accepted

From the summary of the linearity test results, it can be seen that the value F count The linearity obtained from each variable is smaller than the price $F_{table\ 5\%}$. Thus the null hypothesis of linearity of the three variables is accepted. This means that both correlations between X1Y, X2Y and X3Y are linear.

3. Data Analysis Results

The results of correlation analysis and regression analysis between test data for arm muscle strength (X1), kinesthetic perception (X2), hand eye coordination (X3) and overhead passing (Y) in this study are:

a. Correlation Analysis of Each Predictor

The results of the correlation analysis of each predictor with the criteria for this research are as follows:

1) Based on the correlation analysis between arm muscle strength (X1) and upper passing (Y), a correlation coefficient of 0.493 was obtained. With N = 20, the value of rtable 5% = 0.444. It turns out that rcount = 0.493 > rtable 5% = 0.444. This shows that there is a significant relationship between arm muscle strength (X1) and upper passing (Y).
2) Based on the correlation analysis between kinesthetic perception (X2) and overhead passing (Y), a correlation coefficient of 0.497 was obtained. With N = 20, the value of rtable 5% = 0.444. It turns out rcount = 0.497 > rtable 5% = 0.444. This shows that there is a significant relationship between kinesthetic perception (X2) and overhead passing (Y).
3) Based on the correlation analysis between hand eye coordination (X3) and overhead passing (Y), a correlation coefficient of 0.487 was obtained. With N = 20, the value of rtable 5% = 0.444. It turns out rcount = 0.487 > rtable 5% = 0.444. This shows that there is a significant relationship between hand eye coordination (X3) and overhead passing (Y).

A summary of the results of the correlation analysis of each predictor with the criteria for this research is as follows:

Table 6. Summary of Correlation Analysis Results for Each Predictor with Criteria

Variable	r_{hitung}	r_{tabel}	Conclusion
X_1Y	0.493	0,444	Significant correlation
X_2Y	0.497	0,444	Significant correlation
X_3Y	0.487	0,444	Significant correlation

b. Regression Analysis

The regression analysis carried out in this study used multiple regression analysis of three predictors. The results of the regression analysis between the hand-eye coordination test data (X1), arm muscle strength (X2), kinesthetic perception (X3) hand-eye coordination and overhead passing (Y) in this study are as follows:

1) The regression line equation is:

$$\hat{y} = -0.070\ X_1 + 0.071\ X_2 + 0.224\ X_3 + 3.566$$

2) Correlation and determination coefficients between predictors and criteria:

$R_{y\,(1,2,3)} = 0.666$

$R^2_{y\,(1,2,3)} = 0.444$

3) Test the significance of regression analysis.

The results of this research's regression significance test can be seen in the following table:

Table 7. Summary of Regression Analysis Results

Sources of Variation	**db**	**JK**	**RK**	**Freg**
Regression (reg)	3	43,8251	14,6084	4,2711
Residue (res)	16	54,7249	3,4203	-
Total	19	98,5500	-	-

From the results of the regression analysis it can be concluded, with db = m versus N - m - 1 = 3 versus 26, the price of Ftable 5% is 2.89. Meanwhile, the F value obtained was 4.2711, which turned out to be greater than the limit for rejecting the null hypothesis. Thus the null hypothesis is rejected, which means that there is a significant relationship between arm muscle strength (X1), kinesthetic perception (X2), hand eye coordination (X3) and overhead passing (Y). The R2 value between arm muscle strength (X1), kinesthetic perception (X2), hand eye coordination (X3) and overhead passing (Y) is 0.444.

DISCUSSION

From the research results there is a significant relationship between arm muscle strength, kinesthetic perception, hand eye coordination and overhead passing. This is in line with the research results (Dwijayanti, 2017; Legowo et al., 2022; Muryadi & Hakim, 2019).

The research results show that:

1. The relationship between arm muscle strength and upper passing

From the results of correlation analysis on data on arm muscle strength and upper passing, an r value of 0.493 was obtained, where this value was greater than the rtable value at the 5% significance level, namely 0.444. Because the rcount > rtable value, the correlation value is significant. This means that changes in the upper passing variance are influenced by the arm muscle strength variance component.

2. The relationship between kinesthetic perception and overhead passing

Based on the results of the analysis carried out on data on kinesthetic perception of upper passing, an r value of 0.497 was obtained, where this value is greater than the rtable value at the 5% significance level, namely 0.444. Because the rcount > rtable value, the correlation value is significant. This means that the variance of the kinesthetic perception element has an effect on increasing the variance of upper passing.

3. The relationship between hand eye coordination and overhead passing

Based on the results of the analysis carried out on hand eye coordination data on overhead passing, an r value of 0.487 was obtained, where this value is greater than the r table value at the 5% significance level, namely 0.444. Because the rcount > rtable value, the correlation value is significant. Thus it can be concluded that hand eye coordination has a significant relationship to overhead passing.

4. Relationship between arm muscle strength, kinesthetic perception and hand eye coordination with overhead passing

In the hypothesis, it is stated that the relationship between arm muscle strength, kinesthetic perception and hand eye coordination with upper passing is known to be R2y(123) = 0.444, while the rtable at the significance level of 0.05 and n = 20 is found to be rtable = 0.444, with these results rcount > rtable5% and fcount = 4.2711, while ftabel5% with db 3:26 = 2.89, this means F0 > Ftable5% So the hypothesis is accepted.

CONCLUSION

Based on the research results and the results of regression analysis and product moment correlation that have been carried out with eye-hand coordination, the following conclusions can be obtained:

1. There is a significant relationship between arm muscle strength and upper passing, rcount = 0.493 > rtable 5% = 0.444.
2. There is a significant relationship between kinesthetic perception and overhead passing, rcount = 0.497 > rtable 5% = 0.444.
3. There is a significant relationship between hand eye coordination and overhead passing including inversion data because it is smaller than r table, rcount = 0.487 > rtable 5% = 0.444.
4. There is a significant relationship between arm muscle strength, kinesthetic perception and hand eye coordination with overhead passing, R2y(123) of 0.444 > r table 5 % at the 5% significance level of 0.361 and F0 of 4.2711 > ft table at the 5% significance level of 2.89.

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