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Relationship Between Arm Muscle Endurance and Hand Eye Alignment with Lower Passing Proficiency of Male Volleyball Extracurricular Participants of SMAN 1 Karangdowo Klaten

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ABSTRACT

The purpose of this study was to evaluate the relationship between arm muscle stamina and visual-motor alignment with lower passing skills for male members of extra volleyball activities at SMAN 1 Karangdowo, Klaten. This study utilized a survey method using a correlational quantitative approach. The research subjects involved 20 male students who actively participated in volleyball extracurricular training. Measurements were taken using three instruments: first, the push and pull dynamometer test to assess arm muscle strength; second, the hand-eye coordination test was conducted through throwing and catching tennis balls; and third, the Brumbach Forearms Pass Wall-Volley test was used to calculate lower passing skills. The findings of this study showed a significant correlation between the two physical variables and students' lower passing performance.

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B. Acquisition of data;
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INTRODUCTION

Sport is an important part of human life, not only a means of recreation, but also a medium for character building, improving the quality of human resources, and achieving achievements (Ekrima, 2019). In the school environment, one of the sports that is quite attractive and developed through extracurricular activities is volleyball. This activity not only channels students' interests and talents but also becomes a means of fostering potential from an early age. (Brionanda, 2021). One indicator of the success of this coaching is the mastery of basic techniques, especially the lower passing technique.

Lower passing is a vital basic technique in volleyball because it is the initial foundation in building an attack (Karim & Ikadarny, 2020). Success in performing this technique is greatly influenced by two main physical components, namely arm muscle

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resistance and eye-hand alignment. Arm muscle resistance is needed to control the ball precisely, while eye-hand coordination is important to direct the ball accurately. Without the synergy between these two components, the lower passing technique is difficult to execute optimally. (Loliza et al., 2022).

SMA Negeri 1 Karangdowo, as one of the leading schools in Klaten Regency, has volleyball extracurricular activities that are quite active and in demand. However, based on field observations and interviews with extracurricular coaches, it was found that many students experienced difficulties in performing lower passes. Some of the problems that often arise include less than optimal arm movements, uncontrolled ball direction, and delays in responding to the arrival of the ball. This is thought to be closely related to the low resistance of the arm muscles and the weak coordination between the eyes and hands of the students.

According to the initial test, it is known that students' lower passing ability is still relatively low. Based on data from 20 students who were tested within 60 seconds, only 3 students (15%) were in cause of the good category (scores 31-35), 8 students (40%) in the medium category (scores 21-28), and 9 students (45%) in the poor category (scores 16-20). These results indicate that the majority of students have not mastered the lower passing technique effectively.

One of the main factors suspected to be the cause of the low ability is the lack of intensity and quality of training focused on the lower passing style. Extra volleyball activities at SMAN 1 Karangdowo are conducted once a week, on Thursday at 16.00-17.30 WIB. The training activities applied have not maximally emphasised the mastery of basic techniques specifically, and the physical exercises provided are still general.

This is reinforced by the statement of the volleyball extracurricular coach, Dhimas Prabowo Mukti, S.Pd, who said that the current training program includes general physical training and basic techniques as well as sparring with surrounding schools or clubs, but there is no focused training approach. In other words, the lack of focused training is the dominant the low ability of volleyball players students in mastering the lower passing technique.

In addition to technical factors and training intensity, students' physical condition, particularly arm muscle resistance and eye-hand alignment, also ensures success. Although students understand the technique in theory, if this physical aspect is weak, then implementation in the field remains ineffective.

Based on the exposure of the problem background, the researcher understands the need to conduct further research to investigate the relationship between the skill of executing the lower pass with eye-hand alignment and the arm muscle resistance of SMA Negeri 1 Karangdowo students. The researcher hopes that the results of this study can improve the effectiveness of extracurricular volleyball training activities in learning and mastering basic volleyball skills.

METHODS

The approach used in this research is quantitative correlation to explore the relationship between 2 or more variables without any form of intervention (Selviana et al., 2024). The purpose of conducting this quantitative correlation research is to explore

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the relationship between hand-eye alignment and arm muscle stamina with student performance to carry out lower passes in volleyball.

The population in this study was 20 male volleyball extracurricular students at SMAN 1 Karangdowo. The entire population was used as a sample, and using total sampling technique was used (Sulistiyowati, 2017).

Data collection instruments in the form of quantitative tests, which include: arm muscle strength tests using push and pull dynamometers, tennis ball throwing and catching tests for alignment between eyes and arms, and Brumbach forearms pass wall-volley tests to train lower passing skills.

According to Sugiyono (2020), validity is an indicator that shows that the measurement instrument really measures according to the predetermined objectives. In this study using instrument validity is used as follows:

1. The level of validity in the eye-hand alignment test reached a value of 0.976. (Hermawan, 2018)
2. Push and Pull Dynamometer. It measures in kilograms and has a validity of 0.63.
3. The validity level of the lower passing ability test is 0.733. (Ummah, 2019).

Quantitative data analysis techniques include test instrument analysis, preliminary data analysis, then hypothesis testing. Initial data analysis to determine whether extracurricular students experience problems in the use of lower passing techniques. Hypothesis testing includes multiple linear regression tests and the coefficient of determination. Before conducting hypothesis testing, prerequisite tests are carried out first, such as the normality test using the Kolmogorov-Smirnov test and the linearity test using the ANOVA test with the help of SPSS 27.0. (Rachmayani, A.N., 2015).

RESULTS AND DISCUSSION

Result

The results of the research through the physical strength test of the arm muscles of the male volleyball extracurricular members at SMAN 1 Karangdowo, obtained from 20 students, are described in the table below using the push and pull dynamometer obtained descriptively as follows.

Table 1.

Descriptive statistics of arm muscle endurance test

Variable	Passing Bawah Bolavoli
N	20
Mean	9.75
Median	9.5
Mode	9
Std. Deviation	1.915999121
Range	6
Minimum	7
Maximum	13

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Table 2.
Frequency distribution of arm muscle endurance test results

Interval Kelas	Frekuensi	Persen
12 – 13	4	20%
10 – 11	6	30%
8 – 9	8	40%
6 – 7	2	10%
4 – 5	0	0%
Total	**20**	**100%**

The results of the research through the alignment test between the eyes and hands of members of the men's volleyball extracurricular at SMAN 1 Karangdowo, from 20 students, can be seen in the table below by applying the tennis ball catch and throw test obtained descriptive results as follows.

Table 3.
Descriptive statistics of hand eye coordination test results

Variable	Koordinasi Mata Tangan
N	20
Mean	9.85
Median	10
Mode	10
Std. Deviation	1.598519051
Range	7
Minimum	7
Maximum	13

Table 4.
Frequency distribution of eye-hand alignment test results

Interval Kelas	Frekuensi	Persen
13 – 14	1	5%
11 – 12	5	25%
9 – 10	10	50%
7 – 8	4	20%
5 – 6	0	0%
Total	**20**	**100%**

The statistical results of research on the skills of lower passing by male students who participate in extra volleyball activities at SMAN 1 Karangdowo using the Brumbach Forearms Pass Wall-Volley technique obtained the following results, namely:

Table 5.
Descriptive Statistics of Lower Passing Test Results Teknik Brumbach Forearms Pass Wall-Volley

Variable	Passing Bawah Bolavoli
N	20
Mean	27.45
Median	27
Mode	26
Std. Deviation	4.019361039
Range	15
Minimum	21
Maximum	36

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Table 6.
Frequency Distribution of Lower Passing Test Results

Interval Kelas	Frekuensi	Persen
35 – 36	2	10%
32 – 34	1	5%
29 – 31	4	20%
26 – 28	8	40%
23 – 25	2	10%
Total	**20**	**100%**

The results of the hypothesis testing of multiple linear regression equations are shown in the table, namely:

Table 7.
Simple regression test results

	B	Sig.
	4.713	0.001
X_1	1.017	0.001
X_2	1.301	0.001

Based on the table above, information can be obtained that:

Arm Muscle Strength Regression Equation: Y^=4,713+1,017X_1. Based on the regression equation, it can be interpreted that if X1 = 0, the value of Y = 4.713, while if the X1 score increases by 1 unit, the Y score will increase by 1.017 to 5.730.

Regression Equation for Alignment between Eyes and Hands: $\hat{Y}$=4,713+1,301X_2. Based on this statement, it means that if there is no influence from variable X_2 (eye and hand alignment is zero), the initial value of Y is estimated at 4,713. If the X_2 variable increases by one unit, the Y value will also increase by 1.301 points, bringing it to 6.014. (Mutmainah et al., 2022).

The results of the F test, namely:

Table 8.
Simultaneous relationship test results

F	4.713
Sig.	0.001

Referring to the previous table, the sig number of 0.001, < the standard alpha level of 0.05, shows that the independent variables significantly affect the lower passing skill (Y) in volleyball at the same time, for male students who participate in extra volleyball activities at SMAN 1 Karangdowo.

The t-test results are shown in the table, viz:

Table 9.
t-test results

	B	Sig.
	4.713	0.001
X_1	1.017	0.001
X_2	1.301	0.001

According to the results in the table, it is known that the Sig. The number of the arm

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muscle strength variable X1 is 0.001 < 0.05 probability, and in the variable coordination between the eyes and hands, X2 < 0.05 probability. So it can be concluded that there is an influence between the variable arm muscle strength X1 on the ability to pass under volleyball Y, and there is an influence between the variable alignment between the eyes and hands X2 on the ability to pass under volleyball (Y).

The test results appear in the table, namely:

Table 10.
Results of the determination coefficient test of the summary model

R	0.981
R-Square	0.962

The adjusted coefficient of determination (Adjusted R^2) listed in the table indicates the extent to which the variance in the dependent variable can be explained by the simple regression model. The R-squared value of 0.962 or 96.2% means that arm muscle resistance (X1) and eye-hand alignment (X2), when combined, explain 96.2% of the Y-hand underhand passing proficiency in volleyball.

Discussion

This study examined the interaction between arm muscle resistance and eye-hand alignment on underhand passing proficiency of students in the boys' volleyball extracurricular of SMAN 1 Karangdowo Klaten. After empirical testing of several hypotheses, the results show that all independent variables are proven to have a significant relationship to the dependent variable. A more detailed discussion of the relationship between each variable X and Y will be discussed in the next chapter.

The Relationship between Arm Muscle Power and Lower Passing Proficiency in Volleyball Game among Male Extracurricular Members at SMAN 1 Karangdowo, Klaten.

The findings of this study revealed that arm muscle power (X_1) holds a significant and important role in supporting the effectiveness of lower passing performance (Y) in volleyball games. This information is shown through the results of a simple regression test, which produces the equation $\hat{Y}$=4.713 + 1.017X_1. This means that every 1 unit increase in arm muscle resistance will increase the ability to pass down by 1.017 units. The t-test results show a significance number of 0.001, < the significance level of 0.05, thus it can be concluded that arm muscle resistance has a significant influence on lower passing proficiency. Good arm muscle resistance allows participants to carry out a stronger, more stable, and targeted lower passing style.

The Relationship between Hand-Eye Alignment and Lower Passing Skills in Volleyball Sports of Male Extracurricular Members at SMAN 1 Karangdowo, Klaten.

Hand-eye coordination (X_2) was also found to be a statistically significant variable affecting ability in underhand passing (Y). Simple linear regression produced the equation $\hat{Y}$ = 4.713 + 1.301X_2, which supports the conclusion that for every one unit (1) increase in hand-eye coordination, a player is expected to experience a 1.301 unit

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increase in underhand passing performance. This variable has a significant effect on underhand passing proficiency, as seen from the t-test results, with a significance figure of <0.05. There is no doubt that good hand-eye alignment has a statistically significant influence on the timing and direction of the ball during underhand passing. As a player's hand-eye alignment improves, they will be better able to control the ball during successful underhand passing and, as a result, have better passing ability.

The Relationship between Arm Muscle Endurance and Eye and Hand Alignment with Lower Passing Skills in Volleyball for Male Extracurricular Participants at SMAN 1 Karangdowo, Klaten.

Simultaneously, the 2 independent variables, namely arm muscle resistance (X_1) and eye-hand alignment (X_2), were shown to contribute significantly to the increase in lower passing proficiency (Y) in volleyball games. This is evidenced through the F test, which produces a significance number of 0.001, < the significance level of 0.05. Thus, the two variables together contribute to the improvement of lower passing skills. The coefficient of determination (R^2) of 0.962 indicates that 96.2% of the variation in lower passing skills can be explained by the combination of eye-hand alignment and arm muscle strength. This means that these two factors are the main components that influence the skill of lower passing in volleyball, and this needs attention during the technical training process.

CONCLUSION

According to the results of the research that has been carried out, it can be concluded that hand muscle resistance has a positive and significant relationship with the skill of underhand passing in volleyball, as evidenced by the results of the t test which shows a significance figure of 0.001, < the significance level of 0.05. Having strong arm muscles allows players to execute the various underhand passing techniques required to perform successful underhand passing in volleyball.

Hand-eye alignment also plays an important role in underhand passing, and the significance value for this variable in the t-test was (0.001) and well below the 0.05 significance level, showing that hand-eye alignment has a strong influence. Hand-eye alignment even allows players to time and control their movements, and such coordinated movements indicate the player's level of control over the ball, resulting in healthier and more confident passing.

In conclusion, both independent variables of arm muscle resistance (X_1) and eye-hand alignment (X_2) significantly predict underhand passing ability (Y). Based on the F test, the significance value is 0.001, and below 0.05. So the odds ratio indicates that arm muscle resistance and eye-hand alignment affect the overall improvement of underhand passing skills. For this reason, the coefficient of determination (R^2) value of 0.962 indicates that 96.2% of the variation in underhand passing performance can be explained through arm muscle resistance and eye-hand alignment. From this result, it is very clear

that these two factors are an important part of technical training related to lower passing in volleyball.

The researcher's suggestion for schools, schools strengthen volleyball extracurricular programs by providing adequate facilities and resources, and support from schools can improve volleyball games. For extracurricular coaches, pay attention and focus on training, especially in the basic skills of playing volleyball for extracurricular participants and motivate extracurricular participants to be more diligent in training independently and together. For students, they should do various forms of additional related exercises to support the improvement of lower passing skills in volleyball and be serious.

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