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Contribution of Arm Muscle Strength and Eye-Hand Coordination Towards Volleyball Passing Ability of Physical Education Students

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ABSTRACT

The purpose of this study was to determine the contribution of arm muscle strength and eye-hand coordination to the ability of underhand passing of Physical Education students in the 2024/2025 Academic Year of the Islamic University of Riau. This type of research is a multiple correlation study. The population and sample in this study were 14 male students of class 2F Physical Education at the Islamic University of Riau. The data collection instruments used in this study were arm muscle strength tests, eye-hand coordination tests, and volleyball underhand passing ability tests. Based on the results of the research that has been carried out, the conclusions in this study are: (1) There is a contribution of arm muscle strength to the results of underhand passing of physical education students with a contribution of 8.64%. (2) There is a contribution of eye-hand coordination to the results of underhand passing of physical education students with a contribution of 9.96%. (3) There is a contribution of arm muscle strength and eye-hand coordination to the results of underhand passing of physical education students with a contribution of 16.48%.

Keywords: Arm Muscle Strength, Eye-Hand Coordination, Underhand Passing Ability

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C) Analysis and interpretation of data;
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INTRODUCTION

Volleyball is a team sport that relies heavily on basic technical skills, teamwork, and good physical condition and coordination. Volleyball is a sport played by 2 teams, each team consisting of 6 people (Prayogatama, 2021). Volleyball is a game that is included in the main topic of physical education in Indonesia, and can be enjoyed by various groups, both men and women, from children to adults (Yulianti & Fadillah, 2024). One of the most important basic techniques in this game is the underhand pass, which is the technique of receiving the ball from an opponent or teammate using both lower arms to direct the ball to another player. Passing is an attempt or effort by a volleyball player by using a certain technique that aims to pass the ball played to a teammate to be played on their own court (Dupri, 2021). This technique is often used in various game situations, both when receiving a serve and blocking an opponent's smash. The success of the underhand pass determines the smoothness of the game flow and the effectiveness of the team's strategy (Lusiana et al.,

2021). However, in practice, many students, especially Physical Education students, are still unable to perform underhand passes well and consistently, which is indicated by the ball not being directed, lack of power in bouncing the ball, and failure to control the direction of the ball.

This problem is not only related to mastery of the technique, but also closely related to the physical condition and coordination ability of the player. One of the physical aspects that greatly influences the underarm passing technique is arm muscle strength. Strength is a component of physical condition, which concerns the problem of an athlete's ability when using his muscles, receiving loads at certain times (Utomo, 2019). Strength is the ability to use power to overcome resistance (Hadi & Sudijandoko, 2022). Strength is the ability of a muscle or group of muscles to overcome a load or resistance in carrying out an activity (Aprilianto, 2017). Based on the quote above, it can be concluded that muscle strength is the ability of muscles to overcome external loads or resistance. Arm muscle strength is the main factor in providing thrust to the ball so that the ball can roll in the appropriate direction and speed. Harsono in (Anggara & Witarsyah, 2019). added that weak arm muscles will produce less than maximum thrust, so that the ball cannot be directed properly for certain work. (Harsono, 2015) also explains that structured strength training can increase the explosive power of arm muscles, which is important in sports such as volleyball.

In addition, eye and hand coordination is a very crucial motor aspect in volleyball. movements that provide indications of various skills. Eye-hand coordination is the ability to coordinate hand movements based on visual information (Herdia et al., 2025). Furthermore, eye-hand coordination means a person's ability to combine their eye movements when receiving stimuli with their hand movements into certain movement patterns as a result of which their movements are coordinated, effective, and efficient (Naufal Marwan et al., 2023). Furthermore, eye and hand coordination is the ability to integrate vision with hand motor movements precisely and efficiently (Suherni & ., 2023). Furthermore, eye-hand coordination means a person's ability to combine their eye movements when receiving stimuli with their hand movements into certain movement patterns as a result of which their movements are coordinated, effective, and efficient (Naufal Marwan et al., 2023). In underhand passing, players must be able to visually read the direction the ball is coming from and move their hands at the right time so that the ball can be received and directed properly. (Karlia & Sawali, n.d.) revealed that good motor coordination is the result of a learning process involving repetition, adaptation, and proper sensory processing. Several previous studies have also shown the contribution of arm muscle strength to volleyball underhand passing ability (Azan & Sari, 2023).

METHOD

The method used in this study is a correlation study, because this study aims to find out whether there is a contribution of arm muscle strength and eye and hand coordination to the volleyball underhand passing ability of Physical Education students in the 2024/2025 academic year of the Islamic University of Riau. According to (Sugiyono, 2010) This type of research is a correlational study which aims to determine whether there is a contribution of two or several variables. The sampling technique is Total sampling with a sample size of 14 students. The data was analyzed using simple correlation and multiple correlation.

RESULTS AND DISCUSSION

This study discusses the strength of arm muscles and eye-hand coordination towards volleyball underhand passing of physical education students in the 2024/2025 academic year of Riau Islamic University. The variables in this study are arm muscle strength symbolized by X1 and eye-hand coordination with X2 as independent variables, while the ability to pass underhand volleyball is symbolized by Y as the dependent variable. The results of the data obtained after conducting the research can be seen in the following description.

Arm Muscle Strength of Physical Education Students in the 2024/2025 Academic Year at Riau Islamic University

Based on the measurement test in the field using a push up instrument which aims to measure the arm muscle components of 14 samples, namely physical education students. From the results of data collection on arm muscle strength, the highest value was 48 times, the lowest value was 5 times, the average (Mean) was 18.57 times, the middle value (Median) was 15 times, the value that often appears (Mode) was 11 times and 16 times and the standard deviation was 11.78 times. Then the arm muscle data can be seen the distribution of data in 5 interval classes with a class interval length of 9. In the first class with a class interval range of 5-14 there is an absolute frequency of 7 people with a relative frequency of 50%%, in the second class with a class interval range of 14-23 there is an absolute frequency of 3 people with a relative frequency of 21.42%, in the third class with a class interval range of 23-32 there is an absolute frequency of 2 people with a relative frequency of 14.28%, in the fourth class with a class interval range of 32-41 there is an absolute frequency of 1 person with a relative frequency of 7.14%, in the fifth class with a class interval range of 41-50 there is an absolute frequency of 1 person with a relative frequency of 7.14%. For more details, see the table below:

Table 1. Distribution of Arm Muscle Frequency of Physical Education students in the 2024/2025 Academic Year, Riau Islamic University

No	Intervals			Absolute Frequency	Relative Frequency
1	5	-	14	7	50%
2	14	-	23	3	21.42%
3	23	-	32	2	14.28%
4	32	-	41	1	7.14%
5	41	-	50	1	7.14%
Amount				14	100%

Source: Results Exercise Data Month March 2025

From the data contained in the table, it can be described through the following diagram:

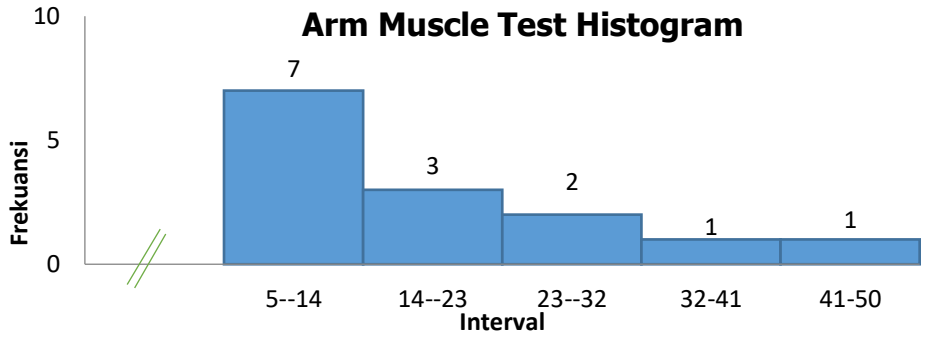


Figure 1. Histogram of Arm Muscle Test Results of Physical Education Students

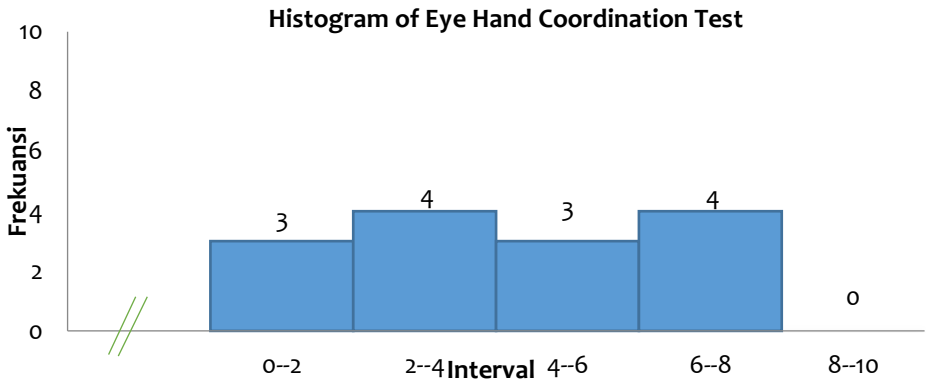
Eye and Hand Coordination of Physical Education Students of the 2024/2025 Academic Year, Riau Islamic University

Based on field measurement tests using eye and hand coordination test instruments from 14 samples of physical education students in the 2024/2025 academic year of Riau Islamic University. From the results of eye and hand coordination data collection, the highest value was obtained 8 times, the lowest value was 0, the average (Mean) was 4.71 times, the middle value (Median) was 4.5 times, the value that often appears (Mode) was 8 times and the standard deviation was 2.61 times. Then the eye and hand coordination data can be seen the distribution of data in 5 interval classes with a class interval length of 2. In the first class with a class interval range of 0-2 there is an absolute frequency of 3 people with a relative frequency of 21.42%, in the second class with a class interval range of 2-4 there is an absolute frequency of 4 people with a relative frequency of 28.57%, in the third class with a class interval range of 4-6 there is an absolute frequency of 3 people with a relative frequency of 21.42%, in the fourth class with a class interval range of 6-8 there is an absolute frequency of 4 people with a relative frequency of 28.57%, in the fifth class with a class interval range of 8-10 there is none. For more details, see the table below:

Table 2. Frequency Distribution of Eye and Hand Coordination of Physical Education Students in the 2024/2025 Academic Year of Riau Islamic University

No	Intervals			Absolute Frequency	Relative Frequency
1	0	-	2	3	21.42%
2	2	-	4	4	28.57%
3	4	-	6	3	21.42%
4	6	-	8	4	28.57%
5	8	-	10	0	0.00%
Amount				14	100%

From the data contained in the table, it can be described through the following diagram:



Picture 2. Histogram of Eye and Hand Coordination Test Results for Physical Education students in the 2024/2025 academic year of Riau Islamic University

Volleyball Underhand Passing Ability of Physical Education Students of the 2024/2025 Academic Year, Riau Islamic University

Based on the measurement test in the field using the volleyball underhand passing test which aims to measure the underhand passing ability of 14 samples of physical education students in the 2024/2025 academic year of the Islamic University of Riau, the results of data collection on underhand passing ability were obtained where the highest value was 15, the lowest value was 1, the average (mean) 6.85, the middle value (Median) 6, the values that often appear (Mode) 5 and 6, with a standard deviation of 4.00. Then the data on the ability to pass under the ball can be seen in the distribution of data in 5 interval classes with a class interval length of 3. In the first class with a class interval range of 1-4 there is an absolute frequency of 4 people with a relative frequency of 28.57%, in the second class with a class interval range of 4-7 there is an absolute frequency of 5 people with a relative frequency of 35.71%, in the third class with a class interval range of 7-10 there is an absolute frequency of 3 people with a relative frequency of 21.14%, in the fourth class with a class interval range of 10-13 there is an absolute frequency of 1 person with a relative frequency of 7.14%, in the fifth class with a class interval range of 13-16 there is an absolute frequency of 1 person with a relative frequency of 7.14%. For more details, see the table below:

Table 3. Frequency Distribution of Volleyball Underhand Passing Ability Tests for Physical Education Students in the 2024/2024 Academic Year, Riau Islamic University

No	Intervals			Absolute Frequency	Relative Frequency
1	1	-	4	4	28.57%
2	4	-	7	5	35.71%
3	7	-	10	3	21.14%
4	10	-	13	1	7.14%
5	13	-	16	1	7.14%
Total				14	100%

Then the data from the table above can also be described through the following diagram:

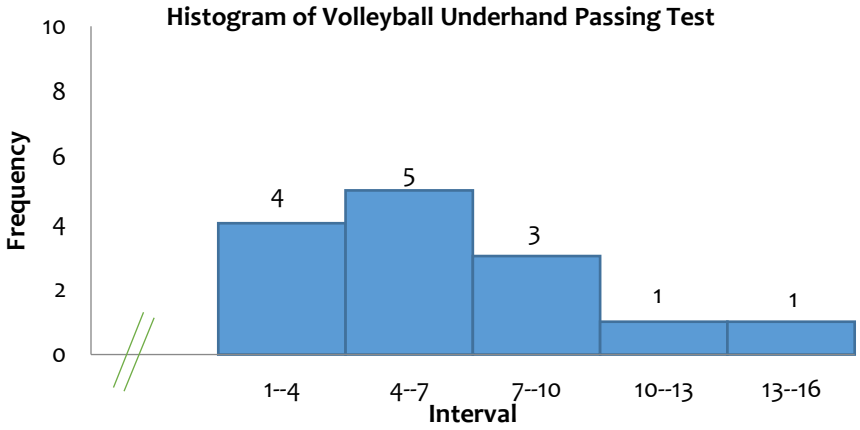


Figure 3. Histogram of the Results of the Volleyball Underhand Passing Test for Physical Education Students in the 2024/2025 Academic Year, Riau Islamic University

Based on the results of data calculations from the three tests that have been carried out, the following data analysis results were obtained:

1. Contribution of Arm Muscle Strength to Volleyball Underhand Passing by Physical Education Students in the 2024/2025 Academic Year at Riau Islamic University. Based on the correlation data from the arm muscles to the ability of Underarm Passing, then analyzed, it can be seen that for the relationship between variable X1, to Y, r count = 0.294 is obtained with a large r table of 0.532, this means that there is a contribution value from variable X to variable Y of 8.64%.
2. Contribution of Eye and Hand Coordination to Underarm Passing of Volleyball Physical Education Students in the 2024/2025 Academic Year, Riau Islamic University. Based on the calculation of correlation data from the eyes and hands to underarm passing ability, it is obtained that for the relationship between variable X2, to Y, r count = 0.998 is obtained with a large r table of 0.532, so it is known that the contribution value of variable X to variable Y is 9.96%.
3. Contribution of Arm Muscle Strength and Eye and Hand Coordination to Underarm Passing of Volleyball Physical Education Students in the 2024/2025 Academic Year, Riau Islamic University. Based on the data obtained and then analyzed, it can be concluded that for the relationship between variables X1, X2 and Y, rhitung = 0.406 is obtained with a large rtable of 0.532, so it is known that the contribution value of variables X1, X2 to variable Y is 16.48%. To find out the contribution value, the formula KD = r2 x 100% is used, so it is known that the contribution value of arm muscle strength and eye and hand coordination to the underhand passing of volleyball for Physical Education Students in the 2024/2025 Academic Year of the Islamic University of Riau. is 16.48% and the remaining 83.52% is contributed by other factors.

The results of the research that has been conducted indicate that the strength of the arm muscles and eye-hand coordination towards Underhand Passing in Volleyball for Physical Education Students in the 2024/2025 Academic Year of the Islamic University of Riau. in the volleyball game that is being played. However, these conditions have not been maximized by students. So based on the results of the tests carried out, the presentation of the product moment correlation test results shows a moderate presentation. When performing Underhand Passing in volleyball, the eye-hand coordination possessed by a student will greatly affect the accuracy of the ball falling at the desired point in a game. So

that good eye-hand coordination in contact with the ball in students will be right in accordance with the rules for performing Underhand Passing in volleyball. The arm will respond to the nerves in the muscles according to the view of the eye when thinking about which point the ball will be directed (dropped). Based on the results of the calculations and data analysis that have been carried out, it shows that the coordination of arm muscle strength and eye and hand coordination on Underhand Passing in Volleyball for Physical Education Students in the 2024/2025 academic year at Riau Islamic University. The existence of this contribution illustrates that the variables of arm muscle strength and eye and hand coordination a student will significantly affect the results of the upper serve in volleyball. However, this condition is also influenced by other factors outside of eye-hand coordination and arm muscle strength. In this condition, other factors that are meant are the explosive power of the arm muscles and the level of mastery of the lower passing technique mastered by a player (in this case, Physical Education Students of the 2024/2025 academic year, Riau Islamic University. This condition is certainly considered to also have an influence on the success of students in performing upper serves, considering that the explosive power of the arm muscles and mastery of techniques are basic things needed in volleyball.

The results of this study are relevant to the research conducted by (Abd.Muin, 2017) that there is a relationship between reaction time (X1) arm muscle strength and (X2) hand-eye coordination with Underhand Passing at the Sampang Regency Bayonet Volleyball Club with the results of the Contribution of Arm Muscle Strength to the Upper Service at the Sampang Regency Bayonet Club has a correlation of 0.400 with a contribution percentage of 5.3%, Contribution of hand-eye coordination to the Accuracy of Upper Service at the Sampang Regency Bayonet Club has a correlation of 0.142 with a contribution percentage of 1.9%. Contribution of Hand-eye Coordination and Arm Muscle Strength to the Accuracy of Underhand Passing at the Sampang Regency Bayonet Club has a correlation of 0.655 with a contribution percentage of 40.7%. Also relevant are the results of research conducted by (Saptiani et al., 2019) that there is a contribution between (X1) arm muscle strength (X2) and hand-eye coordination to Underhand Passing in female extracurricular participants at SMAN 2 Seluma with the results of the study arm muscle strength has a positive relationship with the ability of volleyball service accuracy by contributing 23%, hand-eye coordination has a positive relationship with the ability of volleyball service accuracy, contributing 48%. Thus, it can be concluded that arm muscle strength and hand-eye coordination together have a positive relationship with the accuracy of volleyball Underhand Passing.

So based on the results of the research that has been done, it can be seen that there is a significant contribution from eye-hand coordination and arm muscle strength to the ability of underhand passing of extracurricular students of SMA Negeri 2 Bangko, Rokan Hilir Regency. This contribution is when students do underhand passing in volleyball. When hitting the ball from the bottom of the ball, the arm muscles contract strongly and quickly, and eye-hand coordination works well so that it produces a hit that can direct the intended target in the opponent's field area (enemy).

CONCLUSION

Based on the results of data analysis and hypothesis testing obtained, it can be concluded that: 1) There is a contribution of arm muscle strength to the volleyball underhand passing ability of Physical Education students in the 2024/2025 Academic Year

of the Islamic University of Riau of 8.64% with a calculated r of 0.294; 2) There is a contribution of eye and hand coordination to the volleyball underhand passing ability of Physical Education students in the 2024/2025 Academic Year of the Islamic University of Riau of 9.96% with a calculated r of 0.998; 3) There is a contribution of arm muscle strength and eye and hand coordination to the volleyball underhand passing ability of Physical Education students in the 2024/2025 Academic Year of the Islamic University of Riau of 16.48% with a calculated r of 0.406.

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CONFLICT OF INTEREST

There is no conflict of interest in this article.

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