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Arm Length and Hand–Eye Coordination Correlates of Underhand Passing at SMA Negeri 1 Sanggau

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Abstract

Objective: To examine the relationship between arm length and hand–eye coordination with volleyball underhand passing ability among male extracurricular students at SMA Negeri 1 Sanggau.

Materials and Methods: A quantitative correlational study was conducted with total sampling of 30 male volleyball extracurricular students. Arm length, hand–eye coordination, and underhand passing performance were assessed using test and measurement instruments. Data were analyzed using Pearson correlation and multiple correlation at $\alpha = 0.05$.

Results: Arm length showed a strong significant correlation with underhand passing ($r = 0.826 > r\text{-table} = 0.631$), while hand–eye coordination was not significant ($r = 0.053 < r\text{-table} = 0.631$). Combined analysis indicated a significant relationship ($p = 0.000 < 0.05$) with $R^2 = 0.683$.

Conclusion: Arm length is a key factor associated with underhand passing ability. Although hand–eye coordination alone was not significant, both variables together significantly contributed to underhand passing performance, explaining 68.3% of the variance.

Keywords : Arm length; Hand–eye coordination; Underhand passing; Volleyball.

Introduction

Physical education is a learning process through physical activities designed to improve physical fitness, develop individual motor skills, knowledge and behaviors for a healthy and active lifestyle, sportsmanship, and emotional intelligence. The general objectives of physical education are usually stated broadly, such as the differences between boys and girls. The objectives of physical education include physical, cognitive, motor, and adaptive and social development (Mustafa, 2022) . These objectives must be achieved through carefully planned learning activities, guided by the science of education. To ensure that physical education, sports, and health can be delivered systematically and measurably, a curriculum needs to be carefully and thoroughly developed, tailored to the character of Indonesian children. The sports activities carried out are formal and have very clear objectives to meet national education targets through sports activities that have been developed through a specific curriculum. In schools, there are also activities for training for each sport that interests students, namely extracurricular activities.

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Extracurricular activities are activities outside the program written in the curriculum such as leadership training and student development (Arifudin, 2022) . Extracurricular activities have the following objectives: Students can deepen and expand their knowledge of skills regarding the relationship between various subjects, channel talents and interests, and complement efforts to develop the whole person. With these extracurricular activities, students' sports skills can also be improved, one of which is volleyball. Volleyball is played by people of various ages and groups, from children, teenagers, to adults. The establishment of many volleyball clubs is expected to foster healthy competition to achieve success.

activities in the field of sports held at SMA Negeri 1 Sangau Kapuas Regency include futsal, table tennis, badminton, basketball and volleyball which are held routinely every day according to the schedule. SMA Negeri 1 Sanggau Kapuas Regency has adequate facilities and infrastructure. SMA Negeri 1 Sanggau is one of the state high schools located in the city of Sanggau, Sanggau Kapuas Regency, West Kalimantan Province. The achievements achieved by SMA Negeri 1 Sanggau have made many students interested in joining the volleyball extracurricular, especially boys. Volleyball extracurricular activities at SMA Negeri 1 Sanggau. In extracurricular activities, there are still many students who do not master the basic techniques of volleyball. Basic techniques are the most important thing in a volleyball sport, because basic techniques will determine how to perform a good basic movement, one of the basic techniques in volleyball is the *service, passing, smash technique* .

The problem that arises during volleyball extracurricular activities at SMA Negeri 1 Sanggau Kapuas Regency is when practicing underhand *passing* using the method of massing the volleyball against the wall. Students often fail to do it well in underhand passing. Sometimes there are still many students' hand movements when massing the ball against the wall that are not good so that they affect the direction of the ball, where the direction of the ball becomes less precise. Based on the description above, the researcher wants to know whether performing passing techniques requires arm length and eye-hand coordination. So from the above factors, the researcher is interested in further seeing whether there is a relationship between arm length and eye-hand coordination in underhand *passing* volleyball at SMA Negeri 1 Sanggau Regency.

Materials and Methods

The research method used in this study is a quantitative method. Sugiyono (2020:8) states that quantitative research methods can be interpreted as research methods based on the philosophy of positivism, used to research specific populations or samples, data collection using research instruments, quantitative/statistical data analysis, with the aim of testing

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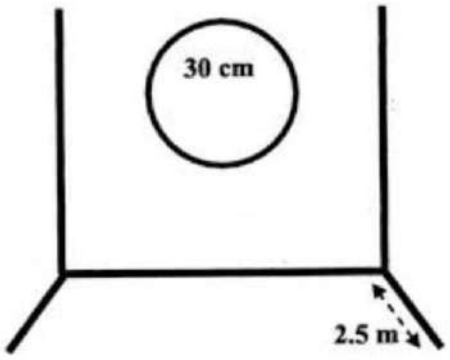
predetermined hypotheses. A research method is a technique or method used to achieve research objectives. Every research requires a method to achieve the desired objectives. In this study, a quantitative descriptive method was used. Without a clear method, research will not proceed as expected. The research method as a way to answer the formulation of research problems is important. Research methods are ways to obtain data. Sugiyono (2019:3) states that a research method is defined as a scientific way to obtain data for specific purposes and uses. This form of research is correlational research. Correlational research is research conducted to determine whether there is a relationship between two or more variables (Arikunto Dwi Alfian et al., (2022). More specifically, this research is a correlational research, because this research aims to find whether there is a relationship between one variable and another variable.

Population is the entire subject of the research to be studied. According to Sugiyono in (Aeniyatul, 2019) population is a generalization area consisting of: objects/subjects that have certain quantities and characteristics determined by the researcher to be studied and then conclusions drawn. In this study, the subjects used were 30 male extracurricular students of SMA Negeri 1 Sanggau. As with population characteristics, a sample that represents the population is a sample that is truly selected according to the characteristics of the population. The sample is a portion of the population taken using sampling techniques (Hardani, et al., 2020: 363). The sampling technique was carried out using purposive sampling by determining certain criteria, in this study, all extracurricular participants totaling 30 students of SMA Negeri 1 Sanggau.

In collecting data for measurement in this study, an arm length measurement test was used. The arm length measurement was carried out by the subject standing in an anatomical position on a flat floor without wearing footwear. Arm length was measured from the acromion to the tip of the middle finger. Hand-eye coordination was assessed using throwing and catching a ball (Putro & Anwar, 2022).



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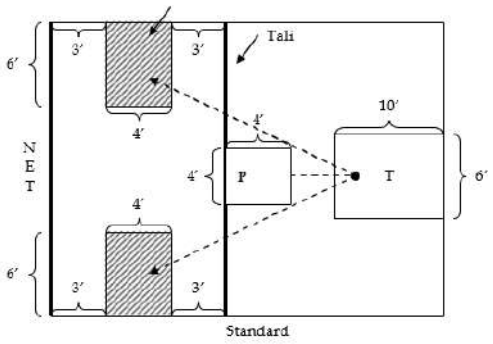
Source: Putro & Anwar, 2022

tennis and the ability to pass results using the volleyball pass test. receive the ball thrown by the thrower, then pass the ball through a rope 8 feet (2.43 m) high and directed towards the target area (shaded area). (Argantara et al., 2021).



Source: AAHPERD

This study uses quantitative descriptive analysis techniques with the intention of finding a picture of arm length & hand-eye coordination with the ability to pass under the volleyball in extracurricular male students of SMA Negeri 1 Sanggau. After all the data is collected the next step is to analyze the data. The data analysis techniques used in this study are Prerequisite Tests, namely normality tests, linearity tests and hypothesis tests using product moments and multiple correlations.

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Results

This research was conducted at Sanggau State Senior High School 1, with 30 male students participating in extracurricular volleyball. After collecting the data, the researchers analyzed the data and conducted a descriptive analysis of the research variables.

Tabel 1

Variabel	N	Mean	Min	Max	Stedev
Panjang Lengan	30	71,033	68	81	4,354
Koordinasi Mata-Kaki	30	14,333	12	17	1,445
Passing Bawah Bola Voli	30	10,6	7	15	2,134

Table 1 can be concluded that from 30 students the average arm length is 71.0333 with a minimum value of 68 and a maximum of 81, the average eye-hand coordination of students is 14.33333 with a minimum value of 12 and a maximum of 17 while the average

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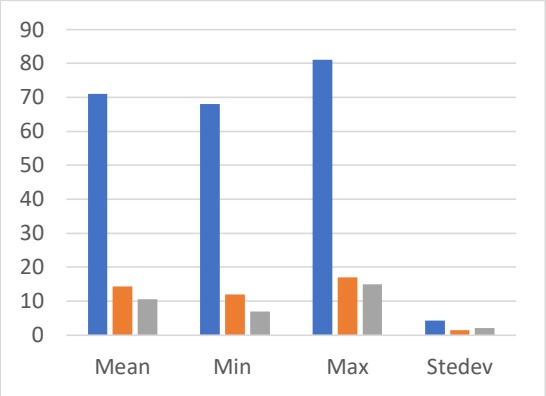
volleyball underhand pass is 10.6 with a minimum value of 7 and a maximum of 14. can be seen in the following graph.



To find out whether the data used meets the prerequisites for analysis using the specified techniques and whether the hypothesis testing can be continued or not, the prerequisite tests, namely normality tests and linearity tests, can be used.

Table 2
Normality Test

Variables	Asymp. Sig. (2-tailed)
Sleeve Length	0.200
Eye-hand Coordination	0.200

Based on Table 2 above, the normality test for arm length (X1) data with the results of underhand passing (Y) and hand-eye coordination (X2) with the results of underhand passing in volleyball. The results obtained have a significance level of 0.200 > 0.05, which means the data is normally distributed.

Table 3
Linearity Test

Variables	Deviation From Linearity
Sleeve Length	0.481
Eye-hand Coordination	0.735

Based on Table 3 above, the normality test for arm length data (X1) with the results of underhand passing (Y) and hand-eye coordination (X2) with the results of underhand passing in volleyball. The results obtained for arm length (X1) are 0.481 > 0.05 and hand-eye coordination (X2) is 0.735 > 0.05, it can be concluded that the data is linear.

After the prerequisite test, a hypothesis test will be conducted, the purpose of which is to determine whether there is a relationship between the independent variable (X) and the

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dependent variable (Y). This study uses product moment analysis. The calculated r value will be compared with the r table, where df = n-2, with a significance level of 5%, to determine whether there is a relationship. The strength of the relationship can be seen by looking at the correlation coefficient table. The results of the product moment test can be seen in Table 4 below.

Table 4
Product Moment

Variables	R_{count}
Sleeve Length	0.826
Eye-hand Coordination	0.053

Table 4 above obtained R count arm length of 0.826 while R count eye-hand coordination of 0.053 with R table of 0.361. Thus, if compared arm length of R count 0.826> R table 0.361 with a significance level of 0.00 <0.05 then it can be concluded that Ha is accepted and H0 is rejected which means there is a relationship between arm length (X1) with the results of volleyball underhand passing (Y) with a very strong relationship level and eye-hand coordination of R count 0.053> R table 0.361 with a significance level of 0.779> 0.05, then it can be concluded that Ha is rejected and H0 is accepted which means there is no relationship between eye-hand coordination (X2) with the results of volleyball underhand passing (Y) the relationship level is very low.

Hypothesis testing in this study uses multiple correlation to see whether there is a simultaneous relationship between arm length (X1) and eye-hand coordination (X2) with the results of volleyball underhand passing (Y) of extracurricular male students at SMA Negeri 1 Sanggau. The results can be seen in Table 5 as follows.

Table 5
Multiple Correlation Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.827[a]	.683	.660	5.83156	.683	29.148	2	27	.000

Table 5 above shows the multiple correlation test on the arm length data (X1) and eye-hand coordination (X2) with the results of volleyball underhand passing (Y) of extracurricular male students at SMA Negeri 1 Silat Hilir, a significance level of 0.000 was obtained with an R2 of 0.683. The decision making for the multiple correlation test is that if

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the significance level is <0.05 then Ha is accepted and H0 is rejected, which means there is a relationship, whereas if the significance level is >0.05 then Ha is rejected and H0 is accepted, meaning there is no relationship. The results obtained have a significance level of 0.000 <0.05, which means there is a relationship between arm length and eye-hand coordination with the results of volleyball underhand passing of extracurricular male students at SMA Negeri 1 Sanggau with a strong relationship level.

Discussion

Arm length is a part of the body along the upper arm and forearm measured from the acrominal point to the styloid point. The styloid point is the tip of the styloid processus radii. Anthropometry (arm length) is also a very important part in achieving perfect movement results, especially regarding the capacity of reaching or reaching skills in a particular sporting activity. Reach in this case is the skill of reaching a volleyball when doing an underhand pass. Especially in reaching a far and hard wild ball (Alimin, 2019) . After conducting the test and obtaining the calculation of arm length (X1) with the results of the volleyball underhand pass (Y) with the product moment test. With the testing criteria if Rhitung> Rtabel then there is a significant relationship and vice versa (Sugiyono, 2019: 68). From the results of the calculation of arm length with the results of the underhand pass, the Rhitung was obtained 0.826 while the Rtabel was 0.631 with a significance level of 0.000. With

Thus, Rhitung 0.826 > Rtabel 0.631 and significance level 0.000 < 0.05 so that Ha is accepted and H0 is rejected, it can be concluded that there is a significant relationship between arm length and the results of volleyball underhand passing.

Coordination is a person's ability to combine several elements of movement into one harmonious movement. Coordination is a person's ability to integrate various different movements into a single movement pattern effectively (Budiyono, 2017) . From the description, it can be stated that eye-hand coordination is a person's ability to integrate eye movements (psiswangan) with movements effectively. Coordination ability is one of the physical abilities that influences achievement in volleyball. The coordination ability that is needed in volleyball is mainly eye-hand coordination. Because technical movements in volleyball mostly use the precision of psiswangan (eyes) and the accuracy of hand movements. This is especially needed in serving, smashing and so on. (Budiyono, 2017) . After conducting the test and obtaining the calculation of eye-hand coordination (X2) with the results of the volleyball underhand pass (Y) with the product moment test. With the testing criteria if Rhitung> Rtabel then there is a significant relationship and vice versa

(Sugiyono, 2019: 68). From the calculation results of eye-hand coordination with the results of the underhand pass, the calculated R is 0.053 while the Rtable is 0.631 with a significance level of 0.779. Thus, the calculated R is 0.053 < Rtable 0.631 and the significance level is 0.779 > 0.05 so that Ha is rejected and H0 is accepted, it can be concluded that there is no significant relationship between eye-hand coordination with the results of the underhand pass in volleyball.

Passing is the most frequently used and necessary skill, without any passing. According to Hidayat (2017:43) passing is a technique of receiving the ball and swinging it back in the desired direction. This technique is a basic technique in volleyball and must be mastered by all players. Underhand passing is a fundamental technique in volleyball. Underhand passing is used as the initial step to organize an attack pattern against the opposing team. Based on calculations using multiple correlations to determine the relationship between arm length and eye- hand coordination with the results of volleyball underhand passing, a significance level of 0.000 was obtained with an R2 of 0.683. The results obtained had a significance level of 0.000 <0.05, which means there is a relationship between arm length and eye-hand coordination with the results of volleyball underhand passing of male extracurricular students at Sanggau 1 State Senior High School with a strong relationship level.

Conclusions

There is a relationship between arm length and the results of volleyball underhand passing in extracurricular male students at SMA Negeri 1 Sanggau with a relationship level of 0.826 (Very Strong). There is no relationship between eye-hand coordination and the results of volleyball underhand passing in extracurricular male students at SMA Negeri 1 Sanggau with a relationship level of 0.053 (Very Low). There is a relationship between arm length and eye-hand coordination and the results of volleyball underhand passing in extracurricular male students at SMA Negeri 1 Sanggau with a relationship level of 0.683 (Very Strong).

Acknowledgment

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Conflict of interest

If the authors have any conflict of interest to declare.

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