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Physical Component Analysis of Smash Ability in Volleyball Game

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ABSTRACT
This study aims to determine; (1) Is there a relationship between eye-hand coordination and smash ability; (2) Is there a relationship between arm muscle explosive power and smash ability; (3) Is there a relationship between arm muscle strength and smash ability; (4) Is there a simultaneous relationship between eye-hand coordination, arm muscle explosive power, arm muscle strength and smash ability. The population of this study was all male students of SMKN 1 Makassar. The sample used was 30 people. The sampling method used a simple random sampling technique where the sample was taken randomly. The data analysis techniques used in this study were descriptive analysis, correlation analysis, and regression analysis at a significance level of α = 0.05. The results of the study showed that; (1) There is a relationship between eye-hand coordination and smash ability with a value of r = 0.770 (P <α = 0.05). (2) There is a relationship between arm muscle explosive power and smash ability with a value of r = 0.830 (P <α = 0.05). (3) There is a relationship between arm muscle strength and smash ability with an r value of 0.803 (P < α = 0.05). (4) There is a significant relationship between hand-eye coordination, arm muscle explosive power, arm muscle strength and smash ability with an R value of 0.736 or 73.60%.

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INTRODUCTION

Physical education is part of education as a whole, which is essentially a process of interaction between students and the environment that is managed through systematic physical activities towards the formation of a whole person. With its position as an integral part of education, physical education is an educational process, both as individuals and members of society.

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To provide a clearer picture and understanding, several definitions of physical education will be presented from various literatures that certainly have their own opinions about what is meant by physical education. In general, physical education is an integrated part of the overall educational process, the fields and targets that are pursued are physical, mental, emotional, and social development for healthy citizens, through efficient physical activity media, improving the quality of their work (performance), their learning abilities and their health.

Sport is a systematic process in the form of all activities or efforts that can encourage the development and fostering of physical and spiritual potentials of a person or member of society in the form of games. Sport or a series of regular and threatened physical movements to maintain movement (maintain life) and improve movement abilities (improve quality of life). Sport is a tool to stimulate physical, spirit ual, and social growth and development.

Volleyball is a sport played by two teams, each consisting of 6 players on the field, separated by a net, each team has 3 touches to take the same ball to the opposing team, the match can be played 5 sets which means the match can last around 90 minutes, where a player can do 250-300 actions that are dominated by explosive arm muscle strength. Volleyball is an intermittent sport to compete in fast attacks and followed by low intensity and high intensity that occurs repeatedly during the match so that players need speed and agility in both the upper and lower body to the maximum.

In volleyball there are several basic techniques that need to be considered, namely: service, passing, blocking, smashing. Spike is a hard and sharp hitting technique that is done by jumping over the net so that it produces a diving hit. The spike technique is practiced by starting by stepping closer to the direction the ball is going down. Volleyball is one of the ball games that is very popular with all groups, both among young people and adults. However, in the implementation of the teaching and learning process, there are still some students who have difficulty in doing several techniques in volleyball, one of which is the smash technique.

Based on the results of observations that have been made, volleyball is a sport that is widely favored by students of SMKN 1 Makassar. The results of observations also show that students still have not shown good smash skills, many smash results are not right because they are not calm enough so that they still deviate from estimates, besides that the hand position is still not right, the contact between the ball and the hand is not right so that the smash ability is not optimal. So, this research is very important to be applied at SMKN 1 Makassar. while in volleyball, smash is the most decisive thing to win each set in a volleyball game. Therefore, the researcher is interested in taking the research title "Analysis of physical components on the smash ability of the volleyball game at SMKN 1 Makassar".

MATERIALS AND METHODS

Type of Research

This type of research is descriptive. Descriptive is a method in researching an object to create a description, picture, or painting systematically, factually and accurately regarding the facts, properties and relationships between phenomena being investigated. The method used in this study is a survey method with test and measurement techniques. Research variables are symptoms/objects that are the focus of researchers to observe and the data will be collected.

Time and Place of Research

This research was conducted in January 2025. This research was conducted at the SMKN 1 Makassar Field.

Operational Definition of Variables

To avoid broad interpretation of the variables involved in this study, the variables need to be defined as follows:

1. The hand-eye coordination intended in this study is to measure the maximum hand-eye coordination against the ability to smash in volleyball.
2. The explosive power of the arm muscles intended in this study is to measure the maximum explosive power of the students' hand muscles to the extent of the students' ability to smash in volleyball.
3. The strength of the arm muscles intended in this study is to measure the maximum strength of the students' arm muscles against the ability to smash in volleyball.
4. The ability to smash for the act of hitting the ball hard and using certain techniques so that the ball can enter the opponent's field with the hope that it cannot be blocked by other teams as opponents in the game, so that they can win points.

Research variables

According to Suharsimi Arikunto (1992:54) said that: variables are objects of research or the focus of a study. In this study, the independent variables are eye-hand coordination, arm muscle explosive power and arm strength, the dependent variable is smash ability, which is the object of research of SMKN 1 Makassar student players.

Population and Sample

1. Population

The population provides the following definition: Population is a generalization area consisting of objects/subjects that have certain qualities and quantities and characteristics determined by researchers to be studied and then conclusions are drawn.

Of course, every study always uses objects to be studied or referred to as a population. Population is all individuals who are used as research objects. The population of a study must have the same or almost the same characteristics. Therefore, the population in this study is all students of SMKN 1 Makassar

2. Sample

Arikunto (2006) The sample is a part or representative of the population being studied. Because the population in this study is relatively large, the researcher limited it by conducting a random selection using the "Simple Random Sampling" technique by drawing lots, so that a sample size of 30 SMKN 1 Makassar students was obtained.

Data Analysis Techniques

After all the assessment data has been collected, namely hand-eye coordination data, arm muscle explosive power and arm muscle strength, volleyball smash ability. The collected data needs to be analyzed descriptively and inferentially for the purposes of testing the assessment hypothesis. The descriptions used in this assessment are as follows:

1. Descriptive data analysis is intended to obtain a general description of the data including the average, standard deviation, minimum value, and maximum value.
2. Inferential analysis is used to test the research hypothesis using correlation and regression tests.

So, the overall statistical data analysis used generally uses the SPSS program.

RESULTS AND DISCUSSION

Data Description

The description of the research data aims to provide an overview of the distribution of hand-eye coordination data, arm muscle explosive power, arm muscle strength and smash ability. The prices presented after being processed from raw data using descriptive statistics, namely the average price, standard deviation, mode, median, and frequency distribution. A summary of the results of the descriptive statistical calculations is presented as follows:

Table 1. Summary of research results

Statistics	Hand eye coordination	Arm muscle explosive power	Arm muscle strength	Smash ability
Sampel	30	30	30	30
Mean	14.1000	333.0000	25.7667	24.7333
Median	15.0000	315.0000	26.0000	25.0000
Standard Deviation	3.03258	35.85411	3.97998	3.12866
Variance	9.197	1285.517	15.840	9.789
Range	12.00	110.00	14.00	12.00
Minimum	9.00	190.00	18.00	18.00
Maximum	20.00	400.00	32.00	30.00

The empirical data collected were then analyzed using descriptive and inferential statistical techniques. First, descriptive analysis was conducted to obtain a general overview of the research data. After that, it was continued with testing the analysis requirements through data normality tests.

the results of the data normality test using the Kolmogorov-Smirnov Test can be seen the results for each variable as follows: The hand-eye coordination variable (X1) in the table above shows that the data is in a normal distribution, because (P) is greater than 0.05 (significant level) namely KS-Z = 1.389 (P = 0.042 > 0.05). The arm muscle explosive power variable (X2) in the table above shows that the data is in a normal distribution, because (P) is greater than 0.05 (significant level) namely KS-Z = 1.600 (P = 0.012 > 0.05). The arm muscle strength variable (X3) in the table above shows that the data is in a normal distribution, because (P) is greater than 0.05 (significant level) namely KS-Z = 0.617 (P = 0.841 > 0.05). Meanwhile, the smash ability variable (Y) in the table above shows that the data is in a normal distribution, because (P) is greater than 0.05 (significant level), namely KS-Z = 0.782 (P = 0.574 > 0.05).

Correlation Analysis

Correlation analysis is conducted to determine each relationship between independent variables and dependent variables. The correlation analysis used is a single correlation (r). at a significance level of 95% or 0.05.

The relationship between hand-eye coordination and smash ability in volleyball games of students at SMK Negeri 1 Makassar

Table 2. Significance Test of Correlation Coefficient between hand-eye coordination and smash ability

Number of Observation (n)	Correlation Coefficient (r_{y1})	F_{tab} α=0,05	Description
30	0.770	4.17	Significant

Based on the results of the correlation analysis of hand-eye coordination data on smash ability in volleyball, the value (r) = 0.770 is obtained with a probability level (p) = 0.000 smaller than α = 0.05, then H0 is rejected and H1 is accepted (significant correlation coefficient), or hand-eye coordination has a significant relationship with smash ability in volleyball. Thus, it can be concluded that there is a relationship between hand-eye coordination and smash ability in volleyball at SMK Negeri 1 Makassar

The relationship between arm muscle explosive power and smash ability in volleyball games of students at SMK Negeri 1 Makassar

Table 3. The second hypothesis is the relationship between arm muscle explosive power and smash ability in volleyball games of students at SMK Negeri 1 Makassar.

Number of Observation (n)	Correlation Coefficient (r_{y1})	F_{tab} α=0,05	Description
30	0.830	4.17	Significant

Based on the results of the correlation analysis of the explosive power of the arm muscles against the smash ability in volleyball, the value (r) = 0.830 is obtained with a probability level (p) = 0.000 smaller than α = 0.05, then H0 is rejected and H1 is accepted (significant correlation coefficient), or the explosive power of the arm muscles has a significant relationship with the smash ability in volleyball. Thus, it can be concluded that there is a relationship between the explosive power of the arm muscles and the smash ability in volleyball games of students at SMK Negeri 1 Makassar

The relationship between arm muscle strength and smash ability in volleyball games of students at SMK Negeri 1 Makassar

Table 4. The third hypothesis is the relationship between arm muscle strength and smash ability in volleyball.

Number of Observation (n)	Correlation Coefficient (r_{y1})	F_{tab} α=0,05	Description
30	0.803	4.17	Significant

Based on the results of the correlation analysis of arm muscle strength data on smash ability in volleyball, the value (r) = 0.803 is obtained with a probability level (p) = 0.000 smaller than α = 0.05, then H0 is rejected and H1 is accepted (significant correlation coefficient), or arm muscle strength has a significant relationship with smash ability in

volleyball. Thus, it can be concluded that there is a relationship between arm muscle strength and smash ability in volleyball games at SMK Negeri 1 Makassar

The relationship between hand-eye coordination, arm muscle explosive power and arm muscle strength together with smash ability in volleyball game at SMK Negeri 1 Makassar

Table 5. The fourth hypothesis is the relationship between eye-hand coordination, arm muscle explosive power and arm muscle strength together with smash ability in volleyball.

Correlation	Number of Observation (n)	Correlation Coefficient (r_{y1})	F_{tab} α=0,05	Description
X_1, X_2, X_3, Y	30	0.736	4.17	Significant

Based on the results of the correlation analysis of hand-eye coordination data, arm muscle explosive power and arm muscle strength together with the ability to smash in volleyball, the value (r) = 0.736 is obtained with a probability level (p) = 0.000 smaller than α = 0.05, then H0 is rejected and H1 is accepted (significant correlation coefficient), or hand-eye coordination, arm muscle explosive power and arm muscle strength together have a significant relationship with the ability to smash in volleyball. Thus, it can be concluded that there is a relationship between hand-eye coordination, arm muscle explosive power and arm muscle strength with the ability to smash in volleyball of students at SMK Negeri 1 Makassar.

DISCUSSION

This study aims to investigate the physical components among vocational school students, focusing on two variables, namely independent variables including eye-hand coordination, arm muscle explosive power, arm muscle strength and dependent variables volleyball smash ability. Coordination is a person's ability to integrate various different movements into a single movement pattern effectively or the body's ability to perform movements precisely, carefully, and efficiently. Coordination includes:
eye-hand, eye-foot, hand-foot, eye-hand-foot, ear-eye-foot and so on (Sumaryoto and Nopembri, 2017:153).

Budiwanto (2012) explains that coordination is the ability of several muscles to work together to produce certain movements. In the field of exercise knowledge, coordination is known as the body's ability to organize two or more patterns to achieve the goal of a specific movement. Coordination is a series of complicated and complex activities. In simple terms, these activities include reacting to stimuli, choosing and processing appropriate movement programs based on learned skills and deciding to move. The process of learning movement can be divided into four steps. 1) muscles move by stimulating the senses. 2) the senses send information to the central nervous system as an information processor. 3) the central nervous system decides, organizes and develops the information. 4) the central nervous system sends it back to the muscles that need it through the nerve channels.

Power or explosive power is also called explosive strength (Pyke and Watson, 1978) power concerns the strength and speed of dynamic and explosive muscle contractions and involves the expenditure of maximum muscle strength in the fastest possible time (Fenanlampir and Faruq, 2015:141).

According to Sajoto (Bambang and Lukmanul, 2015:93) strength is a component of a person's physical condition regarding their ability to use muscles to receive loads while working. Muscle strength is the most basic element of physical condition that is needed to achieve sports achievements. Physiologically, muscle strength is the ability of a muscle or group of muscles to perform one maximum contraction against resistance or load. Mechanically, muscle strength is defined as the force that can be produced by a muscle or group of muscles in one maximum contraction. Muscle strength is important for everyone. There are several types of strength that must be known, namely: general strength, specific strength, maximum strength, strength endurance, absolute strength, and relative strength (Ngatman and Andriyani, 2017:87).

From several opinions of the experts above, the researcher concluded that each sport has its own advantages, just like the 10 physical components needed in each technique performed in all sports. On this occasion, the researcher chose three physical components that the researcher considered to have contributed to performing the smash technique which was the center of the research that the researcher chose, including hand-eye coordination, arm muscle explosive power and arm muscle strength. Here, the researcher concluded that these three physical components provide maximum support in performing the smash technique.

CONCLUSION

There is a relationship between hand eye coordination, with smash ability with r value = 0.770 (P <α = 0.05). There is a relationship between arm muscle explosive power with smash ability with r value = 0.830 (P <α = 0.05). There is a relationship between arm muscle strength with smash ability with r value = 0.803 (P <α = 0.05). There is a significant relationship between hand eye coordination, arm muscle strength and arm muscle strength to smash ability with R value of 0.73 or 73.60%. This shows that hand eye coordination, arm muscle strength and arm muscle strength have a very significant relationship to volleyball smash ability. Based on the conclusions of the research that have been described, the following suggestions can be emphasized. Coaches are expected to be able to provide reinforcement and maintain hand-eye coordination, arm muscle explosive power and arm muscle strength, so that they can improve smash abilities. Coaches are expected to be able to provide reinforcement for smash abilities in volleyball games by paying attention to the position of the hand with the ball so that they can improve smash abilities in volleyball games at SMKN 1 Makassar.

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