

ANALYSIS OF PHYSICAL COMPONENTS OF THE SMASH ABILITY OF THE VOLLEYBALL EXTRACURRICULAR GAME AT SMA NEGERI 16 MAKASSAR

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ABSTRAK

Penelitian ini bertujuan untuk mengetahui: (1) apakah terdapat hubungan antara koordinasi mata-tangan dengan kemampuan smash voli pada kegiatan ekstrakurikuler SMA Negeri 16 Makassar; (2) apakah terdapat hubungan antara daya ledak otot kaki dengan kemampuan smash voli pada kegiatan ekstrakurikuler SMA Negeri 16 Makassar; (3) apakah terdapat hubungan antara daya ledak otot lengan dengan kemampuan smash voli pada kegiatan ekstrakurikuler SMA Negeri 16 Makassar; (4) apakah terdapat hubungan antara koordinasi mata-tangan, daya ledak otot kaki, dan daya ledak otot lengan secara kolektif dengan kemampuan smash voli pada kegiatan ekstrakurikuler SMA Negeri 16 Makassar.

Penelitian ini merupakan penelitian korelasional. Metode yang digunakan adalah kuantitatif, dengan teknik pengumpulan data menggunakan tes dan pengukuran.

Populasi penelitian ini adalah seluruh kegiatan ekstrakurikuler SMA Negeri 16 Makassar. Sampel yang digunakan adalah 30 siswa ekstrakurikuler voli. Teknik analisis data yang digunakan dalam penelitian ini adalah analisis deskriptif, analisis korelasi, dan analisis regresi pada tingkat signifikansi $\alpha = 0,05$ menggunakan SPSS.

Hasil penelitian menunjukkan bahwa: (1) Terdapat hubungan signifikan antara koordinasi mata-tangan dan kemampuan smash dalam voli dengan nilai $r = 0,791$ ($p < \alpha = 0,05$); (2) Terdapat hubungan signifikan antara daya ledak otot kaki dan kemampuan smash dalam voli dengan nilai $r = 0,786$ ($p < \alpha = 0,05$); (3) Terdapat hubungan signifikan antara daya ledak otot lengan dan kemampuan smash dalam voli dengan nilai $r = 0,791$ ($p < \alpha = 0,05$); (4) Terdapat hubungan signifikan antara koordinasi mata-tangan, daya ledak otot kaki, dan daya ledak otot lengan bersama dengan kemampuan smash dalam voli dengan nilai koefisien determinasi $R^2 = 0,756$ ($p < \alpha = 0,05$).

ABSTRACT

This study aims to determine: (1) whether there is a relationship between hand-eye coordination and volleyball smashing ability in the extracurricular activities of SMA Negeri 16 Makassar; (2) whether there is a relationship between leg muscle explosiveness and volleyball smashing ability in the extracurricular activities of SMA Negeri 16 Makassar; (3) whether there is a relationship between arm muscle explosiveness and volleyball smashing ability in the extracurricular activities of SMA Negeri 16 Makassar; (4) whether there is a relationship between hand-eye coordination, leg muscle explosiveness, and arm muscle explosiveness collectively and volleyball smashing ability in the extracurricular activities of SMA Negeri 16 Makassar.

This study is a correlational study. The method used is quantitative, with data collection techniques using tests and measurements.

The population of this study was the entire extracurricular activities of SMA Negeri 16 Makassar. The sample used was 30 volleyball extracurricular students. The data analysis techniques used in this study were descriptive analysis, correlation analysis, and regression analysis at a significance level of $\alpha = 0.05$ using SPSS.

The results of the study show that: (1) There is a significant relationship between hand-eye coordination and smash ability in volleyball with a value of $r = 0.791$ ($p < \alpha = 0.05$); (2) There is a significant relationship between leg muscle explosive power and smash ability in volleyball with a value of $r = 0.786$ ($p < \alpha = 0.05$); (3) There is a significant relationship between arm muscle explosive power and smash ability in volleyball with a value of $r = 0.791$ ($p < \alpha = 0.05$); (4) There is a significant relationship between hand-eye coordination, leg muscle explosive power and arm muscle explosive power together with smash ability in volleyball with a determination coefficient value of $R^2 = 0.756$ ($p < \alpha = 0.05$).

A. INTRODUCTION

Sport is a systematic process consisting of all activities or endeavors that can encourage, develop, and foster the physical and spiritual potential of an individual or member of society through play. Sport, or a series of regular and planned physical movements, aims to maintain movement (sustain life) and improve movement abilities (enhance quality of life). Sport is a tool to stimulate physical, spiritual, and social growth and development (Enik Yuliantin, 2011:11).

Volleyball is a sport played by two teams of six players each on a court separated by a net. Each team has three touches to return the ball to the opposing team. A smash is a powerful shot hit into the opponent's court with the goal of making it difficult or impossible for the opponent to control. Typically, the smasher is positioned at the front. However, smashing ability in volleyball must be supported by physical components, including hand-eye coordination, leg muscle strength, and arm muscle strength.

The smash in volleyball is dominated by the swinging motion of the arm muscles, therefore, good coordination is essential. The faster the movement, the more components of the movement that must be coordinated, thus contributing to the accuracy of the volleyball hitting technique. Arm muscle strength provides the driving force for subsequent arm movements, resulting in a more powerful impact on the ball. Furthermore, muscle strength plays a role in smashing. Good leg muscle explosiveness allows a person to jump high, allowing for a higher chance of scoring when hitting the ball from a high point.

Based on observations of the extracurricular volleyball team at SMA Negeri 16 Makassar, during volleyball training, students' mastery of basic smashing techniques was still lacking. Only a few students were able to clear the net, and their smashes missed the target. This was due to poor ball and hand contact, as well as suboptimal arm and leg muscle strength. The purpose of this study was to improve the smashing skills of students at SMA Negeri 16 Makassar's extracurricular activities.

B. METHODS

This type of research is correlational. Correlational research is the relationship between two or more variables as they exist without any treatment (Ma'ruf Abdullah, 2015:321). This research was conducted at the field of SMA Negeri 16 Makassar.

A population is a general area consisting of objects/subjects that possess certain qualities and characteristics determined by the researcher to be studied and then conclusions drawn. Therefore, the population includes not only humans but also other objects and natural objects. The population is not only the number of objects/subjects studied but also includes all the characteristics/properties possessed by those objects (Sugiyono 2018; 117). Therefore, in this study, the population was all volleyball extracurricular students at SMA Negeri 16 Makassar.

According to Sugiyono (2018:118), a sample is a portion of the population and its characteristics. If the population is large and the researcher cannot study all members of the population, the sample is a portion of the population taken using certain techniques. The sample size is determined using random sampling. Because the population size in this study was too large, the researcher used a simple random sampling method by drawing lots. According to Ma'ruf Abdullah (2015:234), the sampling method used was random sampling. The sample used in this study was 30 volleyball extracurricular students at SMA Negeri 16 Makassar.

Research methods

Quantitative research can be defined as a research method based on the philosophy of positivism, used to study specific populations and samples. The sampling technique is random, data collection uses research instruments, and data analysis is quantitative/statistical with the aim of testing predetermined hypotheses (Sugiyono, 2018:14).

1. Research Variables.

There are two variables involved in this research: the independent variable and the dependent variable (Ma'ruf Abdullah, 2015:192):

a) The independent variable (the variable that is not influenced) is the variable that determines the direction or change in the dependent variable. Conversely, the independent variable is in a position that is not influenced by the dependent variable (the influencing variable).

- 1) Hand-Eye Coordination
- 2) Leg Muscle Explosive Power
- 3) Arm Muscle Explosive Power
- b) The dependent variable is the variable that is influenced by the independent variable (the influencing variable).
- 1) Smash Ability

C. RESULT AND DISCUSSION

Based on the results of statistical analysis based on research conducted at SMA Negeri 16 Makassar, the following are the results of smash ability, hand-eye coordination, explosive power of leg muscles and explosive power of arm muscles which are presented in table 1 below:

| Statistik | hand-eye coordination (X1) | explosive power of leg muscles (X2) | explosive power of arm muscles (X3) | smash ability (Y) |
|----------------|----------------------------|-------------------------------------|-------------------------------------|-------------------|
| N | 30 | 30 | 30 | 30 |
| Mean | 12,23 | 54,30 | 308,00 | 16,20 |
| Median | 13,00 | 55,00 | 315,00 | 17,00 |
| Std. Deviation | 2,223 | 3,087 | 35,370 | 4,421 |
| Variance | 4,944 | 9,528 | 1251,034 | 19,545 |
| Minimum | 8 | 48 | 230 | 8 |
| Maximum | 16 | 59 | 360 | 24 |

1. Data Normality Test

The results of the data normality test for each variable can be formulated as follows:

- a. The hand-eye coordination variable X1 in the table above shows that the data is normally distributed because (P) is greater than 0.05 (significance level), namely KS-Z = 0.921 and P = 0.364, which is greater than the α value of 0.05. Therefore, the hand-eye coordination data obtained is normally distributed.
- b. The leg muscle explosive power variable (X2) in the table above shows that the data is normally distributed because (P) is greater than 0.05 (significance level), namely KS-Z = 0.963 and P = 0.312, which is greater than the α value of 0.05. Therefore, the leg muscle explosive power data obtained is normally distributed.
- c. The arm muscle explosive power variable (X3) in the table above shows that the data is normally distributed because (P) is greater than 0.05 (significance level), namely KS-Z = 0.911 and P = 0.377, which is greater than the value of $\alpha = 0.05$. Therefore, the arm muscle explosive power data obtained is normally distributed.
- d. The smash ability variable (Y) in the table above shows that the data is normally distributed because (P) is greater than 0.05 (significance level), namely KS-Z = 0.683 and P = 0.739, which is greater than the value of $\alpha = 0.05$, or at the 95% significance level. Thus, the smash ability data obtained is normally distributed.

3. Hypothesis Testing

a. Contribution of Hand-Eye Coordination and Smashing Ability extracurricular volleyball students at SMA Negeri 16 Makassar.

The first hypothesis tested in this study was "there is a relationship between hand-eye coordination and smashing ability." Based on the results of a survey conducted in extracurricular activities at SMA Negeri 16 Makassar, correlation analysis data related to smashing ability are presented in the following table.

Table 2. The first hypothesis is the relationship between hand-eye coordination and smashing ability.

| correlation | N | r | P _{value} | Significant |
|-------------------|----|-------|--------------------|-------------|
| X ₁ .Y | 30 | 0,791 | 0,000 | Description |

Based on the results of the correlation analysis of hand-eye coordination and smash ability, the correlation value (r) = 0.791 was obtained with a probability level (0.000) less than $\alpha = 0.05$. Therefore, H₀ was rejected and H₁ was accepted, meaning that the correlation coefficient was significant, indicating that hand-eye coordination did have a significant effect on smash ability. Thus, it can be concluded that there is a significant relationship between hand-eye coordination and smash ability in volleyball extracurricular students at SMA Negeri 16 Makassar.

b. The relationship between leg muscle explosive power and smashing ability in extracurricular volleyball students at SMA Negeri 16 Makassar.

The second hypothesis tested in this study is "there is a relationship between leg muscle explosive power and smashing ability." Based on the results of a survey conducted on the extracurricular volleyball team at SMA Negeri 16 Makassar, the correlation analysis data related to leg muscle explosive power and smashing ability are presented in the following table:

Table 3. The second hypothesis is the relationship between foot-eye coordination and shooting ability.

| correlation | N | r | P _{value} | Significant |
|-------------------|----|-------|--------------------|-------------|
| X ₂ .Y | 30 | 0,786 | 0,000 | Description |

Based on the results of the correlation analysis of the data on leg muscle explosive power and smashing ability, a correlation value (r) of 0.786 was obtained with a probability level (0.000) less than $\alpha = 0.05$. Therefore, H₀ is rejected and H₁ is accepted, indicating that the correlation coefficient is significant, indicating that leg muscle explosive power does have a significant effect on smashing ability. Therefore, it can be concluded that there is a significant relationship between explosive power of leg muscles and smash ability in volleyball extracurricular students at SMA Negeri 16 Makassar.

c. The relationship between arm muscle explosive power and smashing ability of volleyball extracurricular students at SMA Negeri 16 Makassar.

The third hypothesis tested in this study is "there is a relationship between arm muscle explosive power and smashing ability of volleyball extracurricular students at SMA Negeri 16 Makassar." Based on the results of a survey conducted on volleyball extracurricular students at SMA Negeri 16 Makassar, the correlation analysis data related to arm muscle explosive power and smashing ability are presented in the following table:

Table 4. The third hypothesis is the relationship between arm muscle explosive power and smashing ability.

| correlation | N | r | P _{value} | Significant |
|-------------------|----|-------|--------------------|-------------|
| X ₃ .Y | 30 | 0,791 | 0,000 | Description |

Based on the results of the correlation analysis of the arm muscle explosive power and smashing ability data, the correlation value (r) was 0.741 with a probability level (0.000) less than $\alpha = 0.05$. Therefore, H₀ is rejected and H₁ is accepted, meaning the correlation coefficient is significant, indicating that the explosive power of the arm muscles does have a significant influence on the smash ability. Therefore, it can be concluded that there is a significant relationship between the explosive power of the arm muscles and the smash ability of the volleyball extracurricular students of SMA Negeri 16 Makassar.

d. The relationship between hand-eye coordination, leg muscle explosive power, and arm muscle explosive power with the residual smash ability of volleyball extracurricular students at SMA Negeri 16 Makassar.

The fourth hypothesis tested in this study is the relationship between hand-eye coordination, leg muscle explosive power, and arm muscle explosive power with the residual smash ability of volleyball extracurricular students at SMA Negeri 16 Makassar. Based on the results of a survey conducted at SMA Negeri 16 Makassar, data from the multiple correlation analysis related to shooting performance are presented in the following table:

Table 5. Fourth Hypothesis: There is a relationship between hand-eye coordination, leg muscle explosive power, and arm muscle explosive power with the residual smash ability of volleyball extracurricular students at SMA Negeri 16 Makassar.

| correlation | N | R | R² | P_{value} | Significant |
|--|----------|----------|----------------------|--------------------------|--------------------|
| X ₁ .X ₂ . X ₃ .Y | 30 | 0,870 | 0,756 | 0,000 | Description |

Based on the results of the correlation analysis of data on hand-eye coordination, leg muscle explosive power, and arm muscle explosive power with smash ability. The correlation value (R) = 0.870 was obtained with a probability level (0.000) smaller than $\alpha = 0.05$. Therefore, H₀ is rejected and H₁ is accepted or the correlation coefficient is significant, or hand-eye coordination, leg muscle explosive power, and arm muscle explosive power do have a significant influence on smash ability. Thus, it can be concluded that there is a significant relationship between hand-eye coordination, leg muscle explosive power, and arm muscle explosive power with the smash ability of the remaining volleyball extracurricular activities of SMA Negeri 16 Makassar.

Discussion

a. There is a relationship between hand-eye coordination and smashing ability in volleyball for extracurricular students at Makassar State Senior High School 16.

The results of the first hypothesis test indicate a significant relationship between hand-eye coordination (X₁) and smashing ability (Y). The calculation results obtained a correlation coefficient (r) of 0.791, thus proving that smashing ability significantly requires hand-eye coordination. Hand-eye coordination is one of the most important factors in a smash. The player's ability to combine several movements into a single, harmonious movement that achieves the goal is similar to that in volleyball, where players can combine hand-eye coordination when executing a smash.

According to Saiful (2021:26), coordination is the ability to execute movements or work precisely and efficiently. Coordination refers to the harmonious relationship between various factors that occur in a movement.

According to Achmad Muchlisin (2020:9), coordination is the ability to execute movements or work precisely and efficiently. Coordination refers to the harmonious relationship between various factors that occur in a movement. Coordination skills are a strong foundation for sensory learning. The better the coordination, the faster and more effectively difficult movements can be performed.

Coordination is essential for smashing. Fast and sharp eye-hand coordination allows an athlete to smash powerfully and quickly, making the resulting smash difficult for the opponent to intercept.

b. There is a relationship between leg muscle explosiveness and smashing ability in volleyball for extracurricular students at Makassar State Senior High School 16.

The results of the second hypothesis test show a significant relationship between leg muscle explosiveness (X₂) and smashing ability (Y). The calculation results obtained a correlation coefficient (r) of 0.786, thus proving that smashing ability significantly requires the component of leg muscle explosiveness. Leg muscle explosiveness is one of the most important aspects of a smash. The player's ability to combine several movements into a single, harmonious movement that achieves a goal is similar to that in volleyball, where players can combine leg muscle explosiveness during a smash.

According to Rahendi and Suwandar (2018; 48), explosiveness, as the ability to exert maximum power, is the ability of the neuromuscular system to overcome resistance through rapid muscle contraction. Explosive strength (muscular power) is the ability to perform sudden and rapid movements by exerting full force in a short period of time (Sajoto in Hanafi et al., 2019; 29).

Therefore, it can be concluded that leg explosiveness is a factor that influences and plays a crucial role in successful smashes. Someone with good leg explosiveness will achieve good and optimal smashes. Therefore, it can be concluded that there is a significant relationship between leg explosiveness and smashing ability in volleyball at the Senior High School 16 Makassar extracurricular activity.

c. The Relationship between Arm Muscle Explosiveness and Smashing Ability in Extracurricular Volleyball at Makassar State Senior High School 16.

The results of the hypothesis test for the three variables indicate a significant relationship between arm muscle explosiveness (X3) and smashing ability (Y). The calculation yielded a correlation coefficient (r) of 0.845, proving that smashing ability significantly relies on the arm muscle explosiveness component. Arm muscle explosiveness is crucial for a smash. Similarly, in volleyball, players can combine leg muscle explosiveness during a smash.

According to Widiastuti (2017:16), explosiveness is a combination of strength and speed, or the maximal muscular force exerted with maximum speed. Strength and speed are also essential for actions requiring maximum power, such as the smash technique.

Arm muscle explosiveness is related to smashing ability. When a player smashes, speed and strength dominate. When a smasher jumps with the power and speed of his hands and arms, he can make it difficult for the opponent to receive the ball, which can be advantageous for the team to score points.

d. There is a relationship between hand-eye coordination, leg muscle power, and arm muscle power and smashing ability in volleyball for extracurricular students at Makassar State Senior High School 16.

The fourth hypothesis test revealed a significant relationship between hand-eye coordination (X1), leg muscle power (X2), and arm muscle power (X3) and smashing ability in volleyball (Y). The calculation yielded a correlation coefficient of $R = 0.756$, proving that smashing ability significantly requires hand-eye coordination, leg muscle power, and arm muscle power.

The smash is one of the many basic techniques in volleyball. The smash is considered the last basic technique taught or learned by every athlete or player, as it is only after mastering all other basic techniques that the smash is refined or mastered. This is because the smash is a shot intended to kill an opponent or end a rally.

A smash is a powerful shot delivered using a specific technique. This is done to send the ball into the opponent's court, preventing the other team from receiving it, with the goal of scoring a point. A shot, also called a spike or attack, is the primary skill used to play the ball over the net. The ball can be hit in several different ways depending on the speed and height of the pass, the position of the opposing blocker and defender, and the match situation.

Therefore, the role of hand-eye coordination, leg muscle strength, and arm muscle strength in smashing is crucial because these three components significantly support the smash in volleyball. Once a player has mastered these three components, they will be able to play volleyball well, especially when smashing.

Therefore, the role of hand-eye coordination, leg muscle strength, and arm muscle strength in smashing is crucial because these three components significantly support the smash in volleyball. Once a player has mastered these three components, they will be able to play volleyball well, especially when smashing.

D. CONCLUSION

Based on the results of the hypothesis testing analysis based on the proposed problem, the following conclusions can be drawn:

1. There is a significant relationship between hand-eye coordination and smashing ability in extracurricular volleyball at SMA Negeri 16 Makassar.

2. There is a significant relationship between leg strength and smashing ability in extracurricular volleyball at SMA Negeri 16 Makassar.
3. There is a significant relationship between arm muscle strength and smashing ability in extracurricular volleyball at SMA Negeri 16 Makassar.
4. There is a significant relationship between hand-eye coordination, leg muscle strength, and arm muscle strength and smashing ability in extracurricular volleyball at SMA Negeri 16 Makassar.

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