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# Smash Techniques in Volleyball Games (Correlation Study of Explosive Power and Coordination)

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***A.*** *Conception and design of the study;* ***B.*** *Acquisition of data;* ***C.*** *Analysis and interpretation of data;* ***D.*** *Manuscript preparation;* ***E.*** *Obtaining funding*

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**ABSTRACT**

This research aims to determine the relationship between arm explosive power, leg explosive power, and hand-eye coordination with smash ability in volleyball. The population in this study were all FIK UNM sports coaching education students with a total research sample of 30 students selected by random sampling. The data analysis technique used is correlation and regression analysis techniques using the SPSS Version 21.00 system at a significance level of 95% or α 0.05. Based on the results of data analysis, this study concluded that: (1) there is a significant relationship between arm explosive power and smash ability in volleyball, proven to be r0 = 0.955 (P < α 0.05), (2) there is a significant relationship between power leg explosiveness and smash ability in volleyball, proven to be r0 = 0.957 (P < α0.05), (3) there is a significant relationship between hand-eye coordination and smash ability in volleyball, proven to be r0 = 0.852 (P < α0.05 ), (4) there is a significant relationship between arm explosive power, leg explosive power and hand-eye coordination with smash ability in volleyball, proven to be R0 = 0.970 (P < α 0.05).

**Keyword:** Explosion power; Coordination; Smash; Volleyball.

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## INTRODUCTION

One of the sports taught in the sports coaching education curriculum is volleyball. The game of volleyball is a type of sport, this game is played by two teams facing each other, each team consisting of six players, each team tries to hit and drop the ball into the field over a net or net and prevent the opponent from being able to hit it. dropped the ball into his court.

In its development, the game of volleyball has become increasingly accepted and popular with students, this phenomenon occurs because the game of volleyball is quite an interesting sport (Noviardila, 2018). Even though the form of the game is simple, a person can only play volleyball well if they can carry out movement techniques that comply with the rules of the game (Marsiyem et al., 2018). The game will be more interesting if students can master arm explosive power, leg explosive power, and hand-eye coordination toward smash ability in volleyball (Vai et al., 2018).

The ball is played by starting with a serve and each team is allowed to touch a maximum of three times by different players and to return the ball to the opponent over the net (Jahrir, 2019). The team that can drop the ball in the opponent's area and succeed in collecting points is the winner in the volleyball game (Utomo, 2019). Volleyball is a big ball game played by two teams competing against each other (Baqer & Bawono, 2019). Volleyball is a game that requires good coordination of movements, strength, speed, agility, power, arm strength, and leg power (Suaidah et al., 2020). In connection with the coordination of movements in the game of volleyball, the obstacles faced by students in mastering skills are the lack of ability in their body condition (Maulana et al., 2020), including strength, speed, agility, reaction resistance, power, arm explosive power, explosive leg power, hand-eye coordination and others (Wismiarti & Hermanzoni, 2020). There are several basic skills or techniques that a student needs to master in playing volleyball, including down passes, up passes, serves, smashes, and blocks.

Smash is a basic technique that is always used to attack produce points and achieve victory (Karmida et al., 2017). Because volleyball is a fast game, attacking techniques are more dominant than defensive techniques (Indrayana, 2018). Several factors that influence mastering the smash technique in volleyball are accuracy when starting, accuracy when jumping, and accuracy when hitting the ball (Putra, 2018b). Meanwhile, the supporting factors for smashing are giving the ball to the smasher concerned and blocking. Blocks are the main defensive fortification to repel enemy attacks (Srianto, 2018). In positions four and two attacks are generally made with high balls, effectively producing points. High ball passes to create a wider target area (Suriatno & Yusuf, 2018) making it easier for the smasher to place the ball into the desired target area. Meanwhile, in the third position, attacks made with medium and short balls are more effective in producing points because the attack pattern becomes faster and makes it difficult for the opponent to anticipate the arrival of the ball (Aulia & Hermanzoni, 2018).

Smash can be done from any position. Positions four, three, and two, these positions are often used to attack (Zakaria et al., 2018). Of these three positions, a coach/teacher must pay attention to the level of difficulty and the most effective position for producing numbers (Permdani Andi Gilang, 2018) so that he can organize a team based on the types of players appropriately (Aulia & Hermanzoni, 2018). The types of players in the game of volleyball include the attacking player type, the defensive player type, the feeder type player, and the all-round player type (Permdani Andi Gilang, 2018).

Smash is the act of hitting the ball downwards with great force, usually jumping upwards, into the opposite part of the court (Suriatno & Yusuf, 2018). This can be seen from the hardness of the ball produced, that the smash technique when the ball arrives is harder and more difficult for the recipient of the ball (Zakaria et al., 2018). All stances of hitting the ball into the opponent's area except serves and blocks are attacks (Indrayana, 2018). There are three methods of attack, all of which are effective, namely tipping: spike, slow and smash, hard. The smash technique is used as a weapon to attack and collect points in volleyball games (Putra, 2018a). Considering the importance of this, the implementation of smash techniques in matches must be effective.

## METHODS

The method used in this research is descriptive correlational. The population of this study was 60 active male FIK UNM students with sports coaching education. Thus, the sample used was 30 active FIK UNM students who were part of the population of FIK UNM sports coaching education students. The technique for taking or determining samples in this research is based on "Random sampling" meaning that all populations choose the same opportunity to be the sample. Data collection is carried out to obtain empirical data as material for testing the truth of the hypothesis. Data collected in the research included: Arm explosive power tests, leg explosive power, hand-eye coordination, and smash ability tests in volleyball. The collected data needs to be analyzed with descriptive and inferential statistics to test research hypotheses. The descriptions used in this research are as follows: (1) descriptive data analysis is intended to get a general picture of the data including the average and standard deviation, and (2) Inferential analysis is used to test research hypotheses using correlation tests. So the overall statistical data analysis used generally uses SPSS 20 program analysis with 95% or α = 0.05.

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## RESULTS AND DISCUSSION

### Results

Descriptive analysis was carried out for arm explosive power data, leg explosive power data, and hand-eye coordination data on smash ability in volleyball. A summary of the analysis results is listed in **Table 1** as follows.

**Table 1.**
Results of descriptive analysis of data for each variable

| Variable | Statistical Value | | | | | |
|---|---|---|---|---|---|---|
| | N | Mean | Sd. | Min. | Max. | Range |
| X1 | 30 | 2,0940 | .37553 | 1,30 | 2,54 | 1,24 |
| X2 | 30 | 59,2667 | 5,68685 | 51 | 70 | 19 |
| X3 | 30 | 24,9667 | 4,95833 | 17 | 31 | 14 |
| Y | 30 | 2,4667 | 1,25212 | 1 | 4 | 3 |

To find out whether the data in this study is normally distributed, a test was carried out using the Kolmogorov-Smirnov test the test results can be seen in **Table 2**.

**Table 2.**
Data normality test results for each variable

| Variable | Normal Parameters | | SD | Most Extreme Differences | | | KS – Z | Asym p. Sig. |
|---|---|---|---|---|---|---|---|---|
| | N | Mean | | Absolute | Positve | Negative | | |
| X1 | 30 | 2,0940 | .37553 | .208 | .150 | -.208 | 1.141 | .148 |
| X2 | 30 | 59,2667 | 5,68685 | .189 | .189 | -.118 | 1.038 | .232 |
| X3 | 30 | 24,9667 | 4,95833 | .269 | .179 | -.269 | 1.475 | .026 |
| Y | 30 | 2,4667 | 1,25212 | .246 | .246 | -.232 | 1.347 | .053 |

Data analysis was carried out to determine the relationship between each independent variable and the dependent variable. The analysis used is correlation analysis (r) and regression (R) at a significance level of 95% or α 0.05. The results of the analysis are listed in the following table:

**Table 3.**
Results of correlation and regression analysis of arm explosive power

| Hypothesis | N | r/R | Rs | T | Sig. |
|---|---|---|---|---|---|
| The relationship between arm explosive power and volleyball smash ability | 30 | .955 | .912 | 17,059 | 0.000 |

**Table 4.**
Results of correlation and regression analysis of leg explosive power

| Hypothesis | N | r/R | Rs | T | Sig. |
|---|---|---|---|---|---|
| The relationship between leg explosive power and volleyball smash ability | 30 | .917 | .840 | 12,127 | 0.000 |

**Table 5**
Results of correlation and regression analysis of hand-eye coordination

| Hypothesis | N | R | Rs | T | Sig. |
|---|---|---|---|---|---|
| The relationship between hand-eye coordination and volleyball smash ability | 30 | .852 | .727 | 8,625 | 0.000 |

**Table 6**
Results of correlation and regression analysis of arm explosive power, leg explosive power, and hand-eye coordination

| Hypothesis | N | r/R | Rs | F | Sig. |
|---|---|---|---|---|---|
| The relationship between arm explosive power, leg explosive power, and hand-eye coordination on volleyball smash ability | 30 | .970 | .940 | 135,860 | 0.000 |

**There is a relationship between arm explosive power and smash ability in volleyball.**

Based on the test results of arm explosive power data analysis on volleyball smash ability, a regression value (r) = 0.955 was obtained with a probability level of (0.000) or α 0.05, for an R square value (coefficient of determination) = 0.912. This means that 91.2% of the smash ability is explained by the explosive power of the arm. From the t-test, it was obtained at 4.439 with a significance level of 0.000. Therefore the probability (0.000) is much smaller than α 0.05. So H0 is rejected and H1 is accepted or the regression coefficient is significant. Thus, it can be concluded that arm explosive power has a significant relationship to volleyball smash ability.

**There is a relationship between arm explosive power and smash ability in volleyball.**

Based on the test results of arm explosive power data analysis on smash ability, a regression value (r) = 0.917 was obtained with a probability level of (0.000) or α 0.05, for an R square value (coefficient of determination) = 0.840. This means that 84.0% of the smash ability is explained by the explosive power of the legs. From the t-test, it was obtained 17.554 with a significance level of 0.000. Therefore the probability (0.000) is much smaller than α 0.05. So H0 is rejected and H1 is accepted or the regression coefficient is significant. Thus, it can be concluded that arm explosive power has a significant relationship with volleyball smash ability.

**There is a relationship between hand-eye coordination and smash ability in volleyball.**

Based on the test results of hand-eye coordination data analysis on smash ability, a regression value (r) = 0.852 was obtained with a probability level of (0.000) or α 0.05, for an R square value (coefficient of determination) = 0.727. This means that 72.7% of smash ability is explained by hand-eye coordination. From the t-test, it was obtained at 8.625 with a significance level of 0.000. Therefore the probability (0.000) is much smaller than α 0.05. So H0 is rejected and H1 is accepted or the regression coefficient is significant. Thus, it can be concluded that eye-hand coordination has a significant relationship with volleyball smash ability.

**There is a relationship between arm explosive power, arm explosive power, and hand-eye coordination, with smash ability in volleyball.**

Based on the test results of hand-eye coordination data analysis on smash ability, a regression value (r) = 0.970 was obtained with a probability level of (0.000) or α 0.05, for an R square value (coefficient of determination) = 0.940. This means that 94% of smash ability is explained by arm explosive power, arm explosive power, and hand-eye coordination. From the ANOVA test or F test, the calculated F was 135.860 with a significance level of 0.001. Because the probability (0.000) is much smaller than α 0.05, the regression model can be used to predict smash ability (can be applied to the population from which the sample was taken). Thus it can be concluded that arm explosive power, arm explosive power, and hand-eye coordination have a significant relationship to smash ability.

**Discussion**

The results of data analysis and hypothesis testing that were stated previously show that all of the four hypotheses proposed are accepted and show a relationship. These results reveal that arm explosive power, arm explosive power, and hand-eye coordination on smash ability in volleyball in this study are relevant to the theories that support this research.

1. The first hypothesis H0 is rejected and H1 is accepted, namely; There is a significant relationship between arm explosive power and smash ability in FIK UNM students. The results obtained are linked to the underlying theories the results of this research support the existing theories. This can be explained by the fact that if a student has good explosive arm power, they will be good at smashing abilities.
2. The first hypothesis H0 is rejected and H1 is accepted, namely; There is a significant relationship between leg explosive power and volleyball smash ability among FIK UNM students. The results obtained are linked to the framework of thinking and the underlying theories. The results of this research support the existing theory. This can be explained by the fact that if students have good wrist flexibility, they will be good at their volleyball smash shooting abilities.
3. The second hypothesis H0 is rejected and H1 is accepted, namely; There is a significant relationship between hand-eye coordination and smash ability in FIK UNM students. The results obtained are linked to the framework of thinking and the underlying theories. The results of this research support the existing theory. This can be explained by the fact that if students have good hand-eye coordination, they will be good at smashing abilities
4. The fourth hypothesis H0 is rejected and H1 is accepted, namely; There is a significant relationship between arm explosive power, leg explosive power, and hand-eye coordination on smash ability in FIK UNM students. The results obtained are linked to the framework of thinking and the underlying theories. The results of

this research support the existing theory. This can be explained by the fact that if a student has explosive arm power, explosive leg power, and good hand-eye coordination then his smash ability will be good.

## CONCLUSION

Based on data analysis with statistical calculations and test results as well as discussion, the results of this research are concluded as follows:

1. Arm explosive power is related to the volleyball smash ability of FIK UNM students.
2. Leg explosive power is related to the volleyball smash ability of FIK UNM students.
3. Hand-eye coordination is related to the volleyball smash ability of FIK UNM students.
4. Arm explosive power, leg explosive power, and hand-eye coordination provide a relationship to the volleyball smash ability of FIK UNM students.

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