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Correlation of Physical Condition Components with Volleyball Smash Ability (Overview of Arm Explosive Power, Leg Explosive Power, and Eye-Hand 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 study aims to determine the correlation of arm explosive power, leg explosive power, and hand-eye coordination with smash ability in volleyball games of FIK UNM students. The population in this study was all sports coaching education students of FIK UNM with a total research sample of 30 students selected by random sampling. The data analysis techniques used are correlation and regression analysis techniques using the SPSS Version 16 system at a significant level of 95% or α 0.05. Departing from the results of data analysis, this study concluded that: (1) the correlation of arm explosive power with smash ability in volleyball games, proven r0 = 0.955 (P < α 0.05), (2) the correlation of leg explosive power with smash ability in volleyball games., proven r0 = 0.957 (P < α0.05), (3) correlation of hand-eye coordination with smash ability in volleyball games., proved r0 = 0.852 (P < α0.05), (4) correlation of arm explosive power, leg explosive power and hand-eye coordination with smash ability in volleyball games., proven R0 = 0.970 (P < α 0.05). It can be explained that if a student is supported by a good correlation of arm explosive power, leg explosive power, and hand-eye coordination, the student can smash volleyball games well too. Based on the results of the above research can be concluded: 1) There is a significant correlation between arm explosive power with smash ability in volleyball games, 2) There is a significant correlation between leg explosive power with smash ability in volleyball games, 3) There is a significant correlation of hand-eye coordination with smash ability in volleyball games, and 4) There is a significant correlation of arm explosive power, Leg explosive power and hand-eye coordination with smash ability in volleyball games at FIK UNM Students.

Keyword: Physical Condition; Explosive Power; Coordination; Smash; Volleyball

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INTRODUCTION

Volleyball games in their development are increasingly acceptable and favoured by students, this symptom occurs because the game of volleyball is a sport that is quite interesting. Although simple in the form of a game, a person can only play volleyball well if he can perform movement techniques that follow the rules of the game (Sahabuddin et al., 2020). The game will be more interesting if students can master the explosive power of the arms, the explosive power of the legs and the coordination of the hands of the eyes to smash the ability in the game of volleyball (Indrayana, 2018). One of the sports taught in the sports coaching education curriculum is the game of volleyball (Education et al., n.d.). Volleyball is a type of sport this game is played by two teams facing each other consisting of six players, each team trying to hit and drop the ball into the court passing over the net or net and preventing the opponent from hitting and hitting the ball into the court (Z, 2019). The ball is played by starting a serve and each team is given a maximum of three touches by different players to return the ball to the opponent over the net (Sahabuddin &; Hakim, 2019). The team that can hit the ball in the opponent's area and manage to collect points, is the winner in the game of volleyball (Sahabuddin, 2018).

Volleyball is one of the big ball games played by two teams that compete against each other (Giriwijoyo, 2007). Volleyball is a game that requires good coordination of motion, strength, speed, agility, power, arm explosive power, and leg explosive power (Sahabuddin et al., 2023). In connection with motion coordination in volleyball games, the obstacles faced by students in mastering skills are the lack of ability of body conditions possessed, among others, strength, speed, agility, resistance to reaction, power, arm explosive power, leg explosive power, hand-eye coordination and others (Pranopik, 2017). Several basic skills or techniques need to be mastered by a student in the game of volleyball including bottom passing, top passing, serve, smash and block (Sahabuddin, 2019).

Smash is a basic technique that is always used to attack generate numbers and achieve victory (Suarsana &; Baan, 2013). Because volleyball is a fast game, the attacking technique is more dominant than the defensive technique (Rifán, 2013). Some influencing factors in mastering the smash technique in the game of volleyball (Hidayat et al., 2018) are accuracy when starting, accuracy when jumping and accuracy when hitting the ball (Rahman et al., 2014). The supporting factor of the smash is the giving of the ball to the smasher concerned and the block. Blocks are the main defensive fortress to fend off enemy attacks (Zulhermandi et al., 2015). In positions four and two attacks are generally carried out with high balls, effectively producing numbers (Fallo &; Hendri, 2016). High ball passes form a wider target area (Sahabuddin et al., 2022) making it easier for the smasher to place the ball into the desired target area (Iskandar &; Satrio, 2016). In the third position, attacks carried out with medium and short balls are more effective in producing numbers (Son, 2018) Because the attack pattern becomes faster and makes it difficult for the opponent to anticipate the arrival of the ball (Srianto, 2018b).

Smashes can be performed from all positions. Positions four, three and two, these positions are often used to attack (Aulia &; Hermanzoni, 2018). Of the three positions, a coach/teacher must pay attention to the level of difficulty and the most effective position to generate numbers to be able to arrange teams based on the types of players appropriately (Zakaria et al., 2018). The types of players in the game of volleyball include the type of attacking player, the type of defensive player, the type of feeder player, and

the type of versatile player (Suriatno &; Yusuf, 2018). Smash is the act of hitting the ball down with great force (Aulia &; Hermanzoni, 2018), usually jumping up, into the opposite part of the field (Srianto, 2018a). It can be seen from the hardness of the ball produced that the smash technique makes the ball harder and more difficult for the recipient of the ball (Paradise et al., 2018). All attitudes of hitting the ball into the opponent's area except serve and block are attack blows (Permdani andi Gilang, 2018). There are three methods of attack that all become effective: tip: spike, slow and smash, hard. The smash technique is used as a weapon to attack and collect numbers in volleyball games (Indrayana, 2018). Given the importance of this, the implementation of smash techniques in matches must be effective.

METHODS

The method used in this study is correlational descriptive. In this study, some variables are the main things in the problem that are the centre of attention in solving this research problem as follows: independent variables, namely: arm explosive power, leg explosive power, and hand-eye coordination, while the dependent variables are: smash in volleyball games. The population is FIK UNM students of active sports coaching education numbering 60 boys class of 2018. Thus, the sample used is 30 active FIK UNM students who are part of the population of FIK UNM sports coaching education students. The sampling technique in this study is based on "Random sampling" meaning that all populations choose the same opportunity to be sampled. The data collected in the study include the Arm explosive power test, leg explosive power, hand-eye coordination and smash ability test in volleyball games. The collected data needs to be analyzed as well as descriptive statistics, as well as inferential to test research hypotheses. The description used in this study is as follows: (1) Descriptive data analysis is intended to get a general picture of the data including the mean, 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 22.0 program analysis with 95% or α = 0.05.

RESULTS AND DISCUSSION

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

Table 1.
The results of descriptive analysis of data for each variable.

Variable	Statistical Value					
	N	Mean	Sd.	Min.	Max.	Range
Arm explosive power	30	2,0940	.37553	1,30	2,54	1,24
Leg explosive power	30	59,2667	5,68685	51	70	19
Hand-eye coordination	30	24,9667	4,95833	17	31	14
Volleyball smash ability	30	2,4667	1,25212	1	4	3

Data Normality Test

To find out whether the data in this study were normally distributed, testing was carried out using the Kolmogorov-Smirnov test. A summary of the test results can be seen in **Table 2.**

Table 2.
The results of the data normality test for each variable.

Variable	Normal Parameters		SD	Most Extreme Differences			KS – Z	Asymp. Sig.
	N	Mean		Absolute	Positive	Negative		
Arm explosive power	30	2,0940	.37553	.208	.150	-.208	1.141	.148
Leg explosive power	30	59,2667	5,68685	.189	.189	-.118	1.038	.232
Hand-eye coordination	30	24,9667	4,95833	.269	.179	-.269	1.475	.026
Volleyball smash ability	30	2,4667	1,25212	.246	.246	-.232	1.347	.053

Correlation and regression analysis

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

Hypothesis	N	r/R	Rs	T	Sig.
Correlation of arm explosive power to volleyball smash ability	30	.955	.912	17,059	0.000

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

Hypothesis	N	r/R	Rs	T	Sig.
Correlation of leg explosive power to volleyball smash ability	30	.917	.840	12,127	0.000

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

Hypothesis	N	R	Rs	T	Sig.
Correlation of Hand-eye Coordination to 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.
Correlation of arm explosive power, arm explosive power and hand-eye coordination to volleyball smash ability	30	.970	.940	135,860	0.000

Hypothesis testing

There is a correlation between arm explosive power and smash ability in volleyball games.

Statistical hypothesis:

H0 : βx1y = 0

H1 : βx1y ≠ 0

Based on the results of the analysis of arm explosive data on volleyball smash ability, a regression value (r) = 0.955 was obtained with a probability level (0.000) or α 0.05, for the value of R square (coefficient of determination) = 0.912. This means that 91.2% of the

smash ability is explained by the explosive power of the arm. The t-test obtained 4.439 with a significance level of 0.000. Therefore the probability (0.000) is much smaller than α 0.05. Then H0 is rejected and H1 is accepted or the regression coefficient is significant. Thus, it can be concluded that the explosive power of the arm correlates significantly with the smash ability of the volleyball.

There is a correlation between arm explosive power and smash ability in volleyball games.

Statistical hypothesis:
H0 : βx2y = 0
H1 : βx2y ≠ 0

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

There is a correlation between hand-eye coordination, with smash ability in volleyball.

Statistical hypothesis:
H0 : Rx1,2,y = 0
H1 : Rx1,2,y ≠ 0

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

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

Statistical hypothesis:
H0 : Rx1,2,y = 0
H1 : Rx1,2,y ≠ 0

Based on the results of the analysis of hand-eye coordination data on smash ability, a regression value (r) = 0.970 was obtained with a probability level (0.000) or α 0.05, for the value of R square (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 F count is 135.860 with a significance level of 0.001. Because the probability (0.000) is much smaller than α 0.05, regression models can be used to predict smash ability (applicable to the population in which the sample was taken). Thus, it can be concluded that arm explosive power, arm explosive power and hand-eye coordination have a significant correlation with smash ability.

CONCLUSION

Based on data analysis with statistical calculations and hypothesis testing results as well as from the discussion, the results of this study are concluded as follows:

1. The explosive power of the arm has a significant correlation to the ability to smash volleyball in FIK UNM students.
2. The explosive power of the legs correlates significantly with the ability to smash volleyball in FIK UNM students.
3. Hand-eye coordination correlates significantly to volleyball smash ability in FIK UNM students.
4. Arm explosive power, leg explosive power, and hand-eye coordination correlate significantly with volleyball smash ability in FIK UNM students.

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