Analysis of Determining Anthropometry Factors Ability of Smash Salto Sepakraw

Henry Hermawan[1], Sapta Kunta Purnama[2], Haris Nugroho[3]

[1,2,3] Postgraduate Faculty of Sports, Sebelas Maret University, Surakarta

ABSTRACT: Anthropometry is a term that describes body dimensions such as height, weight, circumference and folds . In mastering the somersault sepaktakraw smash technique, there are dominant anthropometric parts. The purpose of this study was to determine the anthropometric factors that determine the ability of the sepaktakraw somersault smash. This research method uses a quantitative approach with a confirmatory factor analysis design. The data to be collected will be processed and analyzed using the Computerized Statistics Program with the SPSS (Statistical Product and Service Solutions) version 23 system and using the Kaiser-Meyer-Olkin and Barlett's Test. The population in this study were all male sepak takraw athletes from Central Java in the smash position, totaling 73 athletes. The sampling technique used was purposive random sampling as many as 15 athletes. The results of this study are anthropometric factors that determine the ability to smash the sepaktakraw somersault or those with a component value of > 0.5 are body weight with a value of 0.923, height with a value of 0.911 and foot length with a value of 0.772. The conclusion in this study is that the dominant anthropometric factors that determine the ability to smash some somersault sepaktakraw are body weight, height and foot length.

KEYWORDS: Anthropometry, Smash Salto Sepaktakraw Ability

INTRODUCTION

Sport is a physical activity or body movement that can be done by individuals or groups from the age of children, adolescents to the elderly while still able. The definition of sport from the point of view of physiology is a series of regular and planned physical movements that a person does consciously to improve his or her functional abilities, in accordance with the purpose of doing sports (Palar et al., 2015). Sport plays an important role in human survival and is considered capable of providing many benefits. Sport is a series of body activities that are carried out regularly in a conscious state. Sport will have a positive impact on sports actors because the movement activities obtained during various sports activities will provide physical fitness and spiritual satisfaction for the body (Sudiana., 2019). Today's sport has become a lifestyle that has mushroomed in all circles, especially sports is one of the physical activities that must be done during the covid-19 pandemic. The community must remain active even though they are working and studying from home.

Sports achievements are closely related to the self-esteem of a nation where one of them is when sports achievements become state assets that can foster a sense of pride and can evoke a sense of nationalism of a nation. On the other hand, to indicate that a nation is progressing or not, it can be seen from several elements, one of which is sports achievements. The achievement of peak performance in sports can only be achieved through a systematic, planned, regular and continuous coaching process (Candrawati et al., 2018) In other words, sports achievements have a high prestige value for a nation by giving rise to excellence in international competition. Sports achievements have a special place for a nation where when a match between countries is held, it becomes a moment where the national flag flutters proudly when it gets a gold medal. The goal of achieving sports achievement is influenced by various factors, both internal and external factors. If we look broadly and deeply, it will be seen that in achieving sports achievement various supporting factors are needed including technical, tactical, mental, biomotor (physical), psychomotor, anthropometric, motivation, nutrition, genetic factors (Maksum, 2005).

Sepaktakraw is a traditional sport that was first played by the Malays using a rattan ball by simply forming a circle and trying to keep the ball in the air without touching the ground. Sepaktakraw has been played from basic to professional level with different technical, physical, tactical, mental and motivational levels (Sujae et al., 2008). As the sport of sepak takraw develops, nowadays it is not only competed in 3 against three but is divided into four numbers that are competed, namely two against two, three against three, four against four and also hoop takraw (Hidayat et al., 2020).

Sepak takraw attracts the public's interest because the sport of sepak takraw can be performed or played on indoor or outdoor fields, even along with the current innovation, sepak takraw can be played on the beach or what is often called Beach

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Takraw. In this case, an active role in the community is really needed to build a centralized training ground that is able to accommodate the interests and talents of children or adults in the sport of sepak takraw (Hidayat et al., 2020)

In the game of sepak takraw, it is the same as that played in volleyball where there is a service performed by a player called tekong, a back pass made by a player called a feeder. The player who has the task of being the feeder in the sepak takraw game is positioned on the right of a tekong or also known as the right flank, the spike carried out by the player is called the smasher. Players who have a special task as a scorer of points through the smash movement in sepaktakraw occupy a position to the left of a tekong or also known as apit left, and block. It's just that in the game sepak takraw is not allowed to use hands and arms.

Although Sepak takraw is a traditional sport, it is a sport with merit. Sepak takraw is one of the many sports by contributing to efforts to increase achievement at the local to international level to make the name of the region and even Indonesia special. Aspects of the game of takraw itself cannot be separated from training and improving achievement (Murti et al., 2020)

The improvement of sepaktakraw achievement in Central Java continues to be carried out through the efforts of various supporting factors. Aspects that have not been maximized continue to be a concern as evaluation material to make improvements in order to achieve optimal performance. Based on the results of observations through an analysis of each championship, one aspect of the ability that is not maximized in the Central Java sepak takraw is the ability to smash the position.

Smash is the most important part in the game sepak takraw. That to get points at every opportunity will be done through a series of playing patterns with the last touch through a sharp smash. Various kinds of attack techniques have been used as weapons to kill the opponent. However, currently almost all teams have used the somersault smash technique as an effective attack tool and the somersault smash is the most frequently used attack technique in a match.

This technique has a high success rate in getting the numbers. However, the somersault smash technique has a high level of difficulty so that it requires a correct and tiered training approach. Therefore, as a basis for starting training, it requires the help of safe training tools to avoid injury. In addition, courage is also needed in doing the somersault smash exercise. From this side, individual factors affect the mastery of skills. One of the efforts to improve the ability to smash somersaults in sepak takraw is the need for support from good physical abilities.

In addition to the physical condition factor, there is also a body proportion factor or anthropometry which cannot be ruled out for its function on achievement (Sulaiman, 2008). Efforts to improve sports performance for an athlete are not only based on high interest, but also must meet the somatic requirements and optimum age (Hanif & Syam, 2015). Many experts argue that a person's achievement depends on the size, shape, proportion, composition, maturation and function of organs (Maulina, 2018). The term Anthropometry comes from the words "Anthropos" which means human and "Metricos" which means measure. Definitively anthropometry is stated as something that concerning physical geometry, mass, and body strength. While the notion of Anthropometry is a collection and numerical related to the physical characteristics of the human body, size, shape and strength as well as the application of these data for handling design problems (Azmi et al., 2021).

Based on the results of initial observations through interviews with resource persons (Setyo Budi, soccer takraw coach, Central Java) on 27 July 2021, several problems were found in the field, such as the absence of specific guiding instruments regarding anthropometric characteristics and physical conditions required for somersaulting smashes (Miller, 2012). Anthropometric factors and physical conditions are supporting and assisting in the ability to smash some somersault sepaktakraw. These factors have a dominant influence when performing the somersault sepaktakraw smash technique. In an effort to get the results of the somersault sepaktakraw smash technique properly, it will require anthropometric conditions that are in accordance with the needs of the technique (Bafirman & Wahyuri, 2018).

Anthropometric tests and measurements and physical condition of the somersault sepaktakraw smash ability will be conducted on male sepaktakraw athletes from Central Java. Athletes involved in these tests and measurements are athletes who act as smashers with abilities that have been trained continuously and specifically programmed and have experience competing at national and international levels. In this case, the athletes involved in the tests and measurements are PPLP athletes, former PPLP athletes, and Pelatda athletes. With the hope that the results of the tests and measurements are stronger and more valid to be a reference in determining anthropometric factors that are in accordance with the needs to support the somersault sepaktakraw smash.

METHOD

The approach taken in this research is a quantitative approach, using factor analysis. Factor analysis is an analysis to find new variables called factors whose number is less than the number of original variables. The new variable contains as much of the information contained in the original variable as possible. In the process of reducing the number of variables, the missing information should be as minimal as possible (Rumlawang & Toamain, 2007) The purpose of factor analysis itself is to reduce the amount of information from the original variables to be smaller without losing important information (Jenita Aryanti Radjah et al., 2021)

The method used in this research is confirmatory factor analysis. Confirmatory factor analysis (CFA) is a technique in which a priori, theories, and concepts have been known or determined beforehand the indicators used and which variables are included in these indicators (Nurmala Sari Putri, 2018) Confirmatory factor analysis is used to look for unmeasured indicator variables based on existing theories.

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The independent variable (independent variable) is a variable that affects or is the cause of changes in the dependent variable, and the dependent variable is a variable that is affected or is the result, due to the existence of independent variables (Sugiyono, 2011).

The population used in this study were all male sepak takraw athletes from Central Java in the smash position. The total population in this study were 73 athletes. Sampling technique used is purposive random sampling, which is a method of taking samples intentionally in accordance with the required sample requirements by taking into account the considerations made by the researcher. Based on these criteria, the number of samples in this study was 15 athletes.

Data retrieval method used observation and documentation. Observation is a way to collect research data by having a naturalistic nature that takes place in a natural context, the perpetrator participates naturally in the interaction (Zakky, 2020). Observations were made assisted by using a tool in the form of an observation blank. Documentation is a technique of collecting data by using written, printed, recorded documents or materials related to the thing to be researched. The documentation method is considered an easy method and is more efficient in time and energy and does not require too much cost.

Data processing is done by entering data into a computer program. The data that has been entered will be processed using the SPSS program with reference to the data code which will then be analyzed. The data analysis used in this study is confirmatory factor analysis technique, which is a priori factor analysis technique based on known or predetermined theories and concepts. The data will be processed using the SPSS Version 23 program.

RESULTS AND DISCUSSION
1. Data Description

Table 1. Statistical description of anthropometric

	N	Min	Max	mean	Std. Deviation
Weight	15	44.90	65.70	56.6867	4.76428
Height	15	153.20	177.10	166.2800	5.40479
Leg length	15	79.00	93.00	87.5867	4.30861
Foot length	15	22.30	27.30	24.2533	1.30869

Source: Primary data processed (2022)

Explanation :
a. Weight

Based on the statistical descriptive table above, information about the anthropometric component is obtained, namely the weight of male sepak takraw athletes from Central Java. The number of samples involved in the study were 15 athletes, the minimum score was 44.90, the maximum value was 65.70, the average value was 56,686 and the standard deviation value was 4,764.

b. Height

Based on the statistical descriptive table above, information about the anthropometric component is obtained, namely the height of the male sepak takraw athlete from Central Java. The number of samples involved in the study were 15 athletes, the minimum score was 153.20, the maximum value was 177.10, the average value was 166.28 and the standard deviation value was 5,404.

c. Leg length

Based on the statistical descriptive table above, information about the anthropometric component is obtained, namely the leg length of male sepak takraw athletes from Central Java. The number of samples involved in the study were 15 athletes, the minimum score was 79.00, the maximum value was 93.00, the average value was 87,586 and the standard deviation value was 4,308.

d. Foot length

Based on the statistical descriptive table above, information is obtained about the anthropometric component, namely the length of the feet of the male sepak takraw athletes from Central Java. The number of samples involved in the study were 15 athletes, the minimum score was 22.30, the maximum value was 27.30, the average value was 24,253 and the standard deviation value was 1,308.

2. Analysis Prerequisite Test:

The analysis prerequisite test in this study was carried out in two stages, namely the normality test and the linearity test. The results of these test stages will be described as follows:

a. Normality test :

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Table 2. Normality Test

Variable	N	asymp. Sig (2-tailed)	Probability	Conclusion
Weight (X1)	15	0.066	0.05	Normal distributed data
Height (X2	15	0.200	0.05	Normal distributed data
Leg length (X3)	15	0.131	0.05	Normal distributed data
Foot length (X4)	15	0.200	0.05	Normal distributed data

Source: Primary data processed (2022)

b. Linearity Test:
The next step is to do a linearity test using the ANOVA method to find out whether each component variable has a linear relationship or not with a significance level of 0.05 as follows:

Table 3. Summary of linearity test results

Variable	linearity	Sig.	Conclusion
$X_1 Y$	0.982	0.05	There is a linear relationship
$X_2 Y$	0.324	0.05	There is a linear relationship
$X_3 Y$	0.835	0.05	There is a linear relationship
$X_4 Y$	0.948	0.05	There is a linear relationship

Source: Primary data processed (2022)

3. Factor Analysis:
   a. Factor analysis I

Table 4. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.512
Bartlett's Test of Sphericity	Approx. Chi-Square	101.143
	df	66
	Sig.	.004

Source: Primary data processed (2022)

Based on the results of the analysis above, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy value is 0.512 > 0.5 and the significance value is 0.004 < 0.05 so it can be concluded that the variable components in the study are significant and can be processed to the next stage.

Table 5. The results of the anti-image matrix correlation I

Anti-image Correlation	Weight (X1)	Height (X2)	Leg Length (X3)	Foot Length (X4)
Weight (X1)	**.573** [a]	-.936	-.295	-.105
Height (X2)	-.936	**.587** [a]	.429	-.136
Leg Length (X3)	-.295	.429	**.456** [a]	-.673
Foot Length (X4)	-.105	-.136	-.673	**.580** [a]

b. Factor analysis II

Table 6. The results of KMO and Barlett's Test II

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.620
Bartlett's Test of Sphericity	Approx. Chi-Square	60,635
	df	21
	Sig.	.000

Source: Primary data processed (2022)

Based on the results of the analysis in the table above for 7 variables, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy value is 0.620 and a significance value is 0.000. If the Kaiser-Meyer-Olkin Measure of Sampling

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Adequacy value is > 0.5 and the significance value is < 0.05, there is a strong relationship. The table above shows that the Kaiser-Meyer-Olkin Measure of Sampling Adequacy value is 0.620 > 0.5 and the significance value is 0.000 < 0.05 so that it can be concluded that the 7 component variables in the study are significant and can be processed to the next stage.

Table 7. The results of the anti-image matrix correlation II

Anti-image Correlation	Weight (X1)	Height (X2)	Foot Length (X4)
Weight (X1)	**.560** [a]	-.964	-149
Height (X2)	-.964	**.598** [a]	.001
Foot Length (X4)	-149	.001	**.757** [a]

Based on the anti-image matrix correlation table above, it shows that there is one variable that has a measure of sampling adequacy (MSA) value below 0.5, namely cardiovascular endurance with a value of 0.207. These variables will be reduced and declared unfit for further analysis. The next step is to reduce the variable using factor analysis III by excluding the cardiovascular endurance variable because it has a measure of sampling adequacy (MSA) value below 0.5 so it does not meet the feasibility.

c. Factor analysis III

Table 8. The results of KMO and Barlett's Test III

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.723
Bartlett's Test of Sphericity	Approx. Chi-Square	56,079
	df	15
	Sig.	.000

Source: Primary data processed (2022)

Based on the results of the analysis in the table above for the 6 variables, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy value is 0.723 and a significance value is 0.000. If the Kaiser-Meyer-Olkin Measure of Sampling Adequacy value is > 0.5 and the significance value is < 0.05, there is a strong relationship. The table above shows that the Kaiser-Meyer-Olkin Measure of Sampling Adequacy value is 0.723 > 0.5 and the significance value is 0.000 < 0.05 so that it can be concluded that the 6 component variables in the study are significant and can be processed to the next stage.

Table 9. The results of the anti-image matrix correlation III

Anti-image Correlation	Weight (X1)	Height (X2)	Foot Length (X4)
Weight (X1)	**.623** [a]	-.958	.073
Height (X2)	-.958	**.640** [a]	-.217
Foot Length (X4)	.073	-.217	**.873** [a]

Source: Primary data processed (2022)

The results of the analysis in the third anti-image matrix correlation table show that the six variables, namely foot length has a value of 0.873, height has a value of 0.640, and weight has a value of 0.623 .

Table 10. The results of communalities

	Initial	Extraction
Weight	1,000	.923
Height	1,000	.911
Foot length	1,000	.772

Source: Primary data processed (2022)

The results of communalities in the table above reflect the values provided that the greater the value of the communalities of a variable, the closer it is to the variables formed. From these results, the role of the largest dimension is the variable weight of 0.923 and the role of the smallest dimension is speed with a value of 0.503. The six variables have communalities values > 0.5 so it can be concluded that they can be tested using further factor analysis.

Table 11. Result of rotated component matrix ᵃ

	Component	
	1	2
Weight	.959	.055
Height	.944	.141
Foot length	.680	.557

Source: Primary data processed (2022)

Based on the results of the rotated component matrix ᵃ analysis of anthropometric factors and physical conditions that determine the ability of the somersault takraw salto smash can be described as follows:

1) The weight factor has a variable correlation value, namely factor 1 of 0.959 and factor 2 of 0.055. Because the correlation value of factor 1 > the correlation value of factor 2, body weight is included in the factor 1 group.
2) The height factor has a variable correlation value, namely factor 1 of 0.944 and factor 2 of 0.141. Because the correlation value of factor 1 > the correlation value of factor 2, height is included in the factor 1 group.
3) The foot length factor has a variable correlation value, namely factor 1 of 0.680 and factor 2 of 0.557. Because the correlation value of factor 1 > the correlation value of factor 2, the length of the sole of the foot is included in the factor 1 group.

CONCLUSION

Based on the results of research and data analysis that has been carried out, as well as referring to the discussion in the previous chapter, it turns out that the proposed hypothesis can be accepted, thus it can be concluded that:

1. The dominant anthropometric factors that determine the ability of the somersault sepaktakraw smash are body weight, height and foot length.
2. Based on the findings in the research stages that have been carried out, there are several implications, namely anthropometric factors that can contribute to determining the ability of the somersault sepaktakraw smash. The results of research on anthropometric components can provide convenience for coaches in understanding the anthropometric aspects of athletes and their functions in the achievement of sepaktakraw athletes.
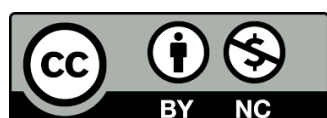
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