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The Effect of Hand Reaction Speed and Wrist Flexion on Short-Service Ability in Badminton Games

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ABSTRACT
This study aims to determine: (1) The effect of hand reaction speed on short serve ability in badminton games; (2) the Effect of wrist flexibility on short serve ability in badminton games; and (3) the Effect of hand reaction speed and wrist flexibility on short serve ability in badminton games. The population of this study were all students of SMA Negeri 5 Soppeng with a total sample of 30 students selected by random sampling. The data analysis technique used is the descriptive analysis technique, data normality test, data linearity test and regression analysis using the SPSS program. The research results show that; (1) There is an effect of hand reaction speed on short serve ability in badminton games of 68.6%; (2) There is an effect of wrist flexibility on short serve ability in badminton games of 55.4%; and (3) There is an effect of hand reaction speed and wrist flexibility on short serve ability in badminton game of 86.1%.

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INTRODUCTION

One of the efforts to make the name of the nation and country proud is through sports. Therefore, sports education and coaching must continue to be improved following the objectives of sports education, namely coaching and improving sports development directed at the formation of physically and mentally prepared humans and achievers (Falabiba, 2013). Because the success of a nation in development also depends on the physical and mental capabilities of its people.

Badminton or badminton can be said to be a sport of entertainment and competition that is favoured by young and old all over the world (Zarwan, 2012). It cannot be denied that badminton sports games in addition to sports can also be made one of the objects that have many benefits (Suratman &; Mesiyani, 2016). For example, in reality, badminton

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can be used as entertainment for a group of people who do not have much time to meet (Joseph, 2015). With badminton, the players can interact with each other so that communication will occur which can eventually become a sustainable relationship (Saputra et al., 2020) In matters off the field, for example in terms of business.

The game of badminton is one of the most famous sports in the world (Ariyanti, 2014). This sport attracts different age groups, and different skill levels, both men and women play this sport indoors or outdoors for recreation as well as competition (Hammado et al., 2020). Badminton is a sport that is played using, nets, rackets and shuttlecocks with various punch techniques ranging from relatively slow to very fast accompanied by feint movements (Putra et al., 2019).

Badminton a sport that uses a racket for a player to hit a feather ball to make it easier to direct to the opponent's court (Nurcahya, 2016). As for how to calculate points in badminton games, if the ball enters the enemy area, it will get points (Nurcahya, 2016). But if the ball goes out of the opponent's playing area, points will be obtained by the enemy. In playing badminton, players must master at least basic techniques. One of the basic techniques of playing badminton is serving. As an initial capital to win the game, a player must master serving well.

Serve as the initial capital to be able to win the match. A player who cannot serve properly will be affected by a fault. A serve shot is a racket shot that hits a shuttlecock onto another court diagonally and aims to open the game and is an important stroke in badminton. A serve shot is a shot that starts or serves the first ball at the beginning of the game (Lasmita et al., 2018). The serve is a decisive blow at the beginning of the score, because of the old rule only the player who serves can get a point. But now the rules on badminton games set by the IBF have changed, in official matches now use a rally point system. So it's not always the player who serves that gets scored. Service is a movement to start so that the shuttlecock is in a state of play, namely by hitting the shuttlecock into the opponent's field. The serve must be done with an underhand punch (motion from the bottom up), but every type of punch can be used in a rally, the long service forehand punch must be done by hitting the shuttlecock with full force (Risk, 2020). The shuttlecock that is hit must be attempted to fall downhill perpendicularly down somewhere on the back line for single-game service and the intersection between the centre line and the backline for single-game service (Triansyah, 2019). Thus, the ball is more difficult to predict the fall and difficult to hit, making the opponent's return less effective. There are several types of badminton serves. Each type of serve hits the shuttlecock in its unique way, therefore each has its advantages and disadvantages (Ardepa, 2020).

Short Service is service by directing the shuttlecock with the aim of both goals, namely: to the angle of the intersection point between the service line in front with the centre line and the service line with the edge line, while the shuttlecock runs narrowly over the net (Mulyadi, 2021). Short serve stroke in badminton or short service by back Hand is a punch that is done by placing the ball in front of the stomach and hitting using a racket moved facing opposite.

A short serve is the first stroke in a badminton game directed at the front of the court. The purpose is to force the opponent not to make an attack. Continue to practice

the technique of short-serve strokes in badminton, because this technique is very deadly and can produce points in short (Wijaya, 2017).

At SMA Negeri 5 Soppeng, badminton is one of the subjects taught in physical education subjects. This game is a complex game that is not easy for everyone to do. Required technical knowledge concerns specific skills and abilities that are closely related to fluency in playing badminton and mastery of basic techniques. The game of badminton consists of several basic techniques, one of the basic techniques that are very instrumental and determines the beginning of a game is the service technique. This problem arises because in short serves there are still many mistakes that often occur for example serves that often involve the net or do not reach the opponent's service area line.

The quality of the game of badminton depends on mastering the basic techniques. Players who master the basic techniques of badminton well will be able to display the game skillfully (Utoro, 2019). The game of badminton consists of several basic techniques (Alwin et al., 2020), one of the basic techniques that are very instrumental and determine the beginning of a game is the service technique.

Service stroke *(service)* is the first stroke that starts a badminton game. This blow can be done well with the *forehand* or with the *Backhand.* The main serve stroke in a single game is a high hit and falls backwards (Datukramat & Jusrianto, 2019), although it must be admitted that nowadays there is a tendency for single players to use short serves to avoid attacks from attack-type opponents (Mangngassai et al., 2020).

Serving which is one of the basic techniques in the game of badminton is very important, therefore service in the game of badminton will be the object of the target in this discussion (Sutari & Syahara, 2019). However, a player who wants to have a good and accurate serve, then he must have abilities that can support in producing good and accurate serves, and one of them that plays a very important role is the element of physical ability, in addition to technique, mental and skill.

Regarding the role of physical ability in supporting sports achievements such as badminton, there is no need to argue anymore, for those who have high physical abilities will certainly have more opportunities to excel (Nofrizal, 2019). This is because, without adequate physical ability, the movement techniques in badminton games such as service techniques will not be done perfectly. Vice versa if players do not have good physical abilities, it is certainly difficult to excel, especially in sports games that need adequate physical ability support (Ibrohim et al., 2022). This physical ability is especially emphasized in the limbs that play an important role in performing service strokes, such as the speed of hand reaction and wrist flexibility.

Reaction speed in actual terms of reaction time (reaction time) is the first motion made after receiving (Setiawan, 2015). In the world of sports, stimuli can be in the form of light received by the senses of the eye (Rozy, 2015), a sound or sounds received by the ear senses (Ratnasari et al., 2021), the touch received by the skin and the body position received by the balance device in the body (Kurdish & Qomarrullah, 2020). Reaction or *Reaction* is the ability of a person to act immediately, in response to stimuli coming through the senses, nerves or *feelings* (Sahabuddin et al., 2022). The speed of hand reaction is an element of physical condition and is also very supportive in badminton

games, especially serve. The speed of hand reaction in the game of badminton is the key to success in grabbing the winning number, because once the game of badminton starts or once a player serves as the opener of the game between hands, *Shuttlecock* and the eyes must always be in contact so that the punches made can be placed in a direction that is difficult to reach by the opponent, So it is difficult to be hit hard or smashed by opponents.

Flexibility is a joint movement plan that exists in one or a group of joints. With the elasticity of the muscles and the breadth of the joints, a person will more easily master motion in various sports faster, because the possibility of movement will be more free and movements that are difficult to do (Ishak &; Sahabuddin, 2018). The conclusion that can be drawn from the above opinion, then people who have good flexibility, especially wrist flexibility is a person who has wide space in their wrist joints and elastic muscles (Sahabuddin, 2020). Flexibility is divided into two types, namely: static flexibility and dynamic flexibility. Static flexibility is the extent of joint motion, while dynamic flexibility is resistance to joint motion (Krismon et al., 2022). Badminton players who have good wrist flexion will be able to direct power well when doing short serves (Qalbi et al., 2017). This is because, with good wrist flexion, badminton players can make movements elastically and flexibly when serving and other movements (Maulana et al., 2020). Thus, to get a good short serve, the wrist flex must be good (Datukramat, Z. A., &; Jusrianto, 2019). Wrist flexion is needed in short serves so that in servicing, the hands are more relaxed and not stiff (Faishal, 2019). With the speed of hand reaction and wrist flexion, the short serve can be done in a controlled manner and can direct and place *Shuttlecock* In the area near the front line of the opponent's area.

MATERIALS AND METHODS

The regression method is supported by a quantitative approach, following the problems studied, namely about ongoing events or events. The research design or research design used in this study is correlational. The population in the study was all students of SMA Negeri 5 Soppeng who participated in extracurriculars with a sample of 30 people. The sampling technique is to use "*Total sampling*" meaning that all existing populations are sampled.

Data collection is carried out to obtain empirical data as material to test the correctness of hypotheses. The data collected in this study include hand reaction speed tests, wrist flexion and badminton short serves. The collected data needs to be analyzed statistically, descriptively, or inferentially to test research hypotheses. The description used in this research is as follows: Descriptive data analysis is intended to get a general picture of the data which includes the mean, and standard deviation, and inferential analysis is used to test research hypotheses using correlation and regression tests. Overall, statistical data analysis used generally uses quantitative analysis through the SPSS program version 22.00 with a significant level of 95% or $\alpha_{0.05.}$

Statistical techniques can be used when the form of data distribution is normal. Testing the normality of the distribution using the Kolmogorof-Smirnov formula. The steps of normality testing with Kolmogorov-Smirnov (Supardi, 2013) are:

a. Determine the largest score and the smallest score
b. Determines the range (R), which is the difference between the largest score and the smallest score
c. Determine the number of interval classes, with the formula:

BK=1+3.3LogN

where N is the number of samples.

d. Specifies the length of class (i), i.e. the range divided by the number of classes.

Or i=R/BK.

e. Create a frequency distribution table from variables. The shape of the table follows the standard deviation formula or standard deviation (SD) to be used.
f. Determine the average or mean.

$$X = \frac{\Sigma Xi}{n}$$

g. Calculates the standard deviation (standard deviation) with one of the following formulas:

$$S = \sqrt{\frac{\Sigma fi\ (x1 - x)^2}{n - 1}}$$

Linearity test

Linearity testing is intended to show that the average obtained from a sample data group lies in straight lines. Data linearity testing according to Supardi (2013) can be done by following these steps:

a. Determine the sum of the squares of the regression (JKreg(a)) by the formula:

$$JKreg_{(a)} = \frac{(\Sigma Y)^2}{n}$$

b. Determine the sum of squares of regression (JKreg(b|a)) with the formula:

$$JKreg(b_{|a)} = (bXY -) \frac{(\Sigma X)(\Sigma Y)}{n}$$

from the simple regression equation Y= a + bX:

$$b = \frac{n\Sigma xy - \Sigma X\Sigma Y}{n\Sigma X^2 - (\Sigma X)^2}$$

$$a = \frac{(\Sigma Y)(\Sigma X^2) - (\Sigma X)(\Sigma XY)}{n\Sigma X^2 - (\Sigma X)^2}$$

c. Determine the sum of residual squares (JKres) by the formula:

$$JKres = Y2 - JKregIa - JKr_{(a)}$$

d. Determine the average sum of residual squares (RJKres) by the formula:

$$RJKres = \frac{JKres}{n-2}$$

e. Determine the sum of squared errors (JKE) with the formula:

$$JKE = \Sigma k(\Sigma Y^2 - \frac{(\Sigma Y)^2}{n}$$

f. Determine the square of tuna matched (JKTC) with the formula:

JKTC = JKres−JKE

g. Determine the average number of squared tuna matches (RJKTC) by using the formula:

$$RJKtc = \frac{JKtc}{k-2}$$

h. Determine the average sum of squared errors (RJKE) by using the formula:

$$RJKe = \frac{JKe}{n-k}$$

i. Determine the calculated F value by using the formula:

$$Fhitung = \frac{RJKtc}{RJKe}$$

Regression test

The double correlation coefficient of 2 or more independent variables using the formula (Supardi 2013):

$$RX1X2Y = \sqrt{\frac{r^2X1y+r^2X2y-2.rX1y.rX2y.rX1X2}{1-r^2X1X2}}$$

RESULTS AND DISCUSSION

Descriptive data analysis is intended to get an overview of research data. Descriptive analysis was performed on hand reaction speed, wrist flexion and short serve ability in badminton games. The descriptive analysis includes; Total value, average, standard deviation, range, maximum and minimum. These statistical values, it is expected to give a general idea of the state of hand reaction speed, wrist flexion and short serve ability in the game of badminton. The results of the descriptive analysis of each research variable can be seen in Table 1.

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

Statistics	Hand Reaction Speed	Wrist flex	Badminton Short Serve
N	30	30	30
Sum	381,00	4798,00	544,00
Mean	12,7000	159,9333	18,1333
Stdv	2,29166	5,23208	2,64879
Range	9,00	24,00	11,00
Min.	8,00	148,00	13,00
Max	17,00	172,00	24,00

Data Normality Test Results

For the requirement test, namely normality with *the Kolmogorov-Smirnov Test One-Sample test*. From the results of the *Kolmogorov-Smirnov Test One-Sample* test carried out, the calculation results can be seen in the following table:

Table 2. Data normality test results for each variable

Variable	Kolmogorov Smirnov		α	Information
	Statistics	P		
X1	0,087	0,200	0.05	Usual
X2	0,138	0,148	0,05	Usual
Y	0,120	0,200	0.05	Usual

Linearity Test

Linearity analysis aims to determine whether two variables have a linear relationship or not significantly linearly. One of the requirements of data is said to be linear if the P-value is greater than 0.05 (Pvalue>0.05). The results of linearity between variables in this study can be seen in Table 3 below:

Table 3. Linearity test results

	Defiation From Linearity (F)	Sig	Conclusion
X1 & Y	0,544	0,810	Linear
X2 & Y	0,602	0,828	Linear

Based on the linearity test results in data in Table 3 above:

a. The value of F *(defiation from linearity*) between the reaction speed of the hand (X1) to the ability of short serve in badminton (Y) is 0.544 at a significant 0.810 > α0.05. So, the speed of the hand's reaction to the ability of a short service in the acquired game of badminton has a relationship or linear.
b. The F (*defiation from linearity*) value between wrist flexion (X2) and short serve ability in badminton (Y) was 0.602 at a significant 0.828 > α0.05. So, the flexion of the wrist to the ability of short service in the game of badminton obtained has a relationship or linear.

Hypothesis Test Results

The effect of hand reaction speed on short serve ability in badminton

The regression analysis used is a simple regression analysis at 95% or α0.05. This is intended to determine the effect of hand reaction speed on short serve ability in badminton games obtained according to Table 4.

Table 4. Results of the first hypothesis analysis

R	R2	F	t	P	α
-0,828	0,686	61,171	-7,821	0,000	0,05

Based on the test results as shown in Table 4, the regression equation is:

$Y = a + bX1$

$Y = 30.291 + -0.957\ X1$

So what is contained in the regression equation can be explained as follows:

a. The constant of 30.291 states that if the reaction speed of the hand does not change, then the ability to serve short in the game of badminton is 30.291.
b. The regression coefficient of the hand reaction speed variable of -0.957 states that every addition of one per cent (1%) of the hand reaction speed variable will lead to an increase in short serve ability in badminton by -0.957.

There is an influence of hand reaction speed on short serve ability in the game of badminton. Based on the results of regression analysis of hand reaction speed data on short serve ability in badminton in Table 4, a regression value of 0.828 was obtained with a significant level of 0.000 < α0.05, for a coefficient of determination of 0.686. This translates to a 68.6% effect of hand reaction speed on short-serve ability in badminton. Based on the results of this analysis, it can be seen that the calculated value obtained -7.821 can be seen in the table above with a significant level of 0.000 < α0.05. So Ho was rejected and H1 was accepted or a significant regression coefficient, or hand reaction speed had a significant effect on short serve ability in badminton. Thus, there is an influence of hand reaction speed on short serve ability in badminton by 68.6%. Testing of the regression model showed an F value of 61.171 with a significant value level of 0.000 < α0.05. This means that short-serve ability in badminton can be explained significantly by the reaction speed of the hands.

The effect of wrist flexion on short serve ability in badminton

The regression analysis used is a simple regression analysis at 95% or α0.05. This is intended to determine the effect of wrist flexion on short serve ability in badminton games obtained according to Table 5 below:

Table 5. Results of the analysis of the second hypothesis

R	R2	F	t	P	α
0,745	0,554	34,846	5,903	0,000	0,05

Based on the test results as shown in Table 5, the regression equation is:

Y = a + bX2

Y = -42.157 + 0.377 X2

So what is contained in the regression equation can be explained as follows:

a. A constant of -42.157 states that if the flexibility of the wrist does not change, then the ability to serve short in badminton is -42.157.
b. The regression coefficient of the wrist flexion variable of 0.377 states that every addition of one per cent (1%) of the wrist flex variable will lead to an increase in short serviceability in badminton by 0.377.

There is an influence of wrist flexion on short-serve ability in the game of badminton. Based on the results of the regression analysis of wrist flexion data on short serve ability in badminton in Table 5, a regression value of 0.745 was obtained with a significant level of 0.000 < α0.05, for a coefficient of determination of 0.554. This translates to a 55.4% effect of wrist flexion on short-serve ability in badminton. Based on the results of the analysis, it can be seen that the calculation of 5.903 can be seen in the table above with a significant level of 0.000 < α0.05. So Ho was rejected and H1 was accepted or a significant regression coefficient, or wrist flexion had a significant effect on short serve ability in badminton. Thus, there is an effect of wrist flexion on short serve ability in badminton at 55.4%. Testing of the regression model showed an F value of 34.846 with a significant value level of 0.000 < α0.05. This means that short-serve ability in badminton can be explained significantly by wrist flexion.

The effect of hand reaction speed and wrist flexion on short serve ability in badminton

The regression analysis used is a simple regression analysis at 95% or α0.05. It is intended to determine the effect of hand reaction speed and wrist flexion on short serve ability in badminton games obtained according to the following Table 6:

Table 6. Results of the analysis of the third hypothesis

R	R2	F	P	α
0,928	0,861	83,543	0,000	0,05

Based on the test results as shown in Table 4.6, the regression equation is:

Y = a + bX1 + bX2

Y = -10.644 + -0.715 X1 + 0.237 X2

There is an influence of hand reaction speed and wrist flexion together on short serve ability in badminton. Based on the results of regression analysis of hand reaction speed data and wrist flexion on short serve ability in badminton in Table 6, a regression value (Ro) of 0.928 was obtained with a level of significance in the sig column, of (0.000) < α 0.05 for the R Square value (coefficient of determination) of 0.861. This translates to an 86.1% effect of hand reaction speed and wrist flexion together on short-serve ability in badminton. While the rest (100% - 86.1% = 13.9%) was caused by other factors not included in the study. From the ANOVA test or F test, Fcalculate is 83.543 with a signification level of 0.000. Because significance (0.000) is much smaller than α 0.05, m0del regression can be used to predict hand reaction speed, and wrist flexion on short serve ability in badminton games in SMA Negeri 5 Soppeng students (applicable to the population where the sample was taken).

Discussion

The effect of hand reaction speed on short serve ability in badminton.

The results of statistical analysis show that there is a significant influence of hand reaction speed on short serve ability in badminton. This proves that the ability to serve short in the game of badminton is greatly influenced by the reaction speed of the hands. The results obtained in SMA Negeri 5 Soppeng students have hand reaction speed categorized as good in achieving short serve ability in badminton games. It can be understood that the speed of hand reaction is a person's ability to react quickly when getting external stimuli. Short serve ability is a movement that must be mastered by badminton players with analysis of their movements, namely someone standing right in front of the service line, then making a backhand to shuttlecock and the fall of cock must be faster on the opponent's service line. In improving short serve ability in badminton games, hand reaction speed is needed, because hand reaction speed plays a very important role in hitting cocks by reacting quickly in hitting shuttlecocks. If a badminton player does not have hand reaction speed in short serve ability in a badminton game, it will be difficult to serve well well. Thus, the speed of hand reaction has a significant influence on the ability to serve short in badminton games in students of SMA Negeri 5 Soppeng.

The effect of wrist flexion on short serve ability in badminton

The results of statistical analysis show that there is a significant influence of wrist flexion on short-serve ability in badminton. This proves that wrist flexion is very supportive in performing short-serve skills in badminton. However, students of SMA Negeri 5 Soppeng have moderate wrist flexion to support short-serve ability in badminton. Wrist flexion is one of the supporting factors in achieving short-serve ability in badminton. Wrist flexion is a person's ability to flex the wrist flexibly and extend to the maximum. Short serve ability is a movement that must be mastered by badminton players with analysis of their movements, namely someone standing right in front of the service line, then making a backhand to shuttlecock and the fall of cock must be faster on the opponent's service line. So, the function of wrist flexion when doing short serves in badminton is when hitting the shuttlecock, players must have wrist flex because the wrist is very instrumental in short serves and also the results of the serve will not be hard and the fall will be thin on the service line. Thus, wrist flexion has a significant influence on short serve ability in badminton games in SMA Negeri 5 Soppeng students.

The effect of hand reaction speed and wrist flexion on short serve ability in badminton

The results of statistical analysis showed that there was a significant influence of hand reaction speed and wrist flexion on short-serve ability in badminton. This proves that these two factors, namely hand reaction speed and wrist flexibility, are mutually influential in achieving and improving short-serve ability in badminton. Students of SMA Negeri 5 Soppeng have hand reaction speed and wrist flexibility that is very good to support the achievement of short serve ability results in badminton games. It has been argued that the speed of hand reaction is needed for a badminton student. A good hand

reaction speed will have an effective and efficient impact in doing the bottom serve because, with a good hand reaction speed, the bottom serve that is done can hit the ball with a racket. In addition, maximum results can be obtained on the ability to serve short in badminton if students can master wrist flexion because by having good wrist flexibility, players will easily hit the ball with their hands so that the results of short serves are carried out following the desired target. Thus, a student who has short-serve ability in the game of badminton is good when he has both physical components, namely the speed of hand reaction and the flexibility of the wrist. However, it is not only these two physical components that are used as a benchmark or measure to produce short-serve ability in the game of badminton. Thus, the speed of hand reaction and the flexion of the wrist has a significant influence on the ability of short serves in badminton games in students of SMA Negeri 5 Soppeng.

CONCLUSION

Based on the results of research and discussion that have been presented, a conclusion can be drawn as follows hand reaction speed and wrist flexion have a significant influence on short serve ability in badminton games in SMA Negeri 5 Soppeng students

CONFLICT OF INTEREST

There is no This artikle no conflict interest in this article.

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