



Smash Skill in Table Tennis Games (A Correlational Study of Speed Reaction, Explosive Power of Muscle Arm and Hand-Eye Coordination toward Students' Smash Skills of STOK Binaguna Medan)

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Abstract

This research is aimed to know the relationship between speed reaction, explosive power of muscle arm, and hand-eye coordination of smash skills of the students of STOK Binaguna Medan. The research method used is a survey method with correlational analysis technique. This study used total sampling, in which all the population was taken as the sample, as the sampling technique. The number of the sample was 35 people. The research shows (1) there is a relationship between speed reaction with smash skill of the students of STOK Binaguna Medan as shown by $t_{obtained} = 2.58 > t_{table} = 1.70$. (2) there is a relationship between explosive power of muscle arm with smash skill of the students of STOK Binaguna Medan, as shown by $t_{obtained} = 2.74 > t_{table} = 1.70$. (3) there is a relationship between hand-eye coordination with smash skill of the students of STOK Binaguna Medan, as shown by $t_{obtained} = 3.06 > t_{table} = 1.70$. (4) there is a relationship between speed reaction, explosive power of muscle arm, and hand-eye coordination toward smash skill of the students of STOK Binaguna Medan, as shown by $F_{obtained} = 2.91 > F_{table} = 2.91$.

INTRODUCTION

Table tennis is a sport that has a lot of fans, not limited to the level of adolescence, but also children and the elderly, men or women are quite interested. This is because this one sport is not too complicated to follow because the game of table tennis does not require expensive facilities and infrastructure, even with a small room the game can be played. That is why table tennis is categorized as a sport that knows no age limit and makes a positive contribution to social development and change in forming togetherness.

According to Sutarmin (2007) and Damiri & Kusmedi (2010) in the game of table tennis, there are various strokes which are the basic techniques of table tennis, one of which is the smash. This stroke is very important to be mastered properly by every player because this shot will kill the opponent in a game. With a sharp and deadly smash, it will create confidence for the player to get a point, and vice

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versa will be something scary for his opponent. A sharp and deadly smash is a shot that every player must have, not only in single games, but also in doubles. Especially in doubles, the player must have a smash in an effort to pressure his opponent to get a point.

Another supporting element in smashing is good coordination of all movements. If the power and speed possessed by the player without the support of good movement coordination, it will be difficult to produce a high explosive power in making a smash. Therefore, coordination is a necessity that players must have in making a shot, especially in smashing. Coordination is very necessary for players to combine various movements from the start the player is preparing to hit, then the motion for making a punch to the movement at the end of the stroke, all of this must be done with a harmonious motion that is not interrupted to produce an efficient movement. Coordination in table tennis is hand eye coordination,

According to Hidayat (2003) Speed is the distance traveled in units of time. Speed means the ability to move the limb, leg, or arm and even the whole body with the greatest speed it can do. Meanwhile, according to Harsono (1988) Speed is the ability to perform similar movements in succession in the shortest possible time, or the ability to cover a distance in the shortest possible time.

In the game of table tennis, a player is required to be able to make explosive movements in making a stroke. Likewise, when doing a smash, the characteristics of this punch require very strong exertion, in addition to the speed in exerting power. Power is a combination of strength and speed or the exertion of maximum muscle force with the maximum speed of Widiastuti (2011).

Coordination in table tennis is emphasized on eye and hand coordination to complete a task of movement properly. Likewise in making a smash, the most important factor is how a player is able to position himself behind the ball in a position that is willing to make a shot. Whether or not a person's movement coordination is reflected in their ability to carry out a movement smoothly, precisely, and efficiently. Coordination is as a whole of the movement patterns of a group of muscles when performing a motion appearance which ultimately results in a person's skill level (Bompa & Haff, 2004).

Based on the theoretical study that has been presented above, reaction speed, arm muscle explosive power and eye-hand coordination, in this study are the factors that affect smash skills in table tennis, so it needs proof of the three elements in a study to produce smash skills in tennis table.

METHOD

Based on the problems and objectives to be achieved, the research in this study was carried out using a survey method with correlational analysis techniques, namely the contribution between the three independent variables and the dependent variable, so that this study did not control the treatment nor did the research change (Gunawan, 2016). The aim of this study is to determine whether there is a relationship between reaction speed and table tennis smash skills, arm muscle explosive power with table tennis smash skills, hand eye coordination with table tennis smash skills, and reaction speed, arm muscle explosive power, hand eye coordination simultaneously with table tennis smash skills (Tomoliyus, 2012; Sridadi, 2005). The variables involved in this

study consisted of: 1. Independent variable: a. Reaction speed (X1), b. Arm muscle explosive power (X2), and c. Eye-hand coordination (X3). 2. Dependent variable : - Smash skill in table tennis (Y).

The constellation of the relationship between the three variables can be described as Figure 1:

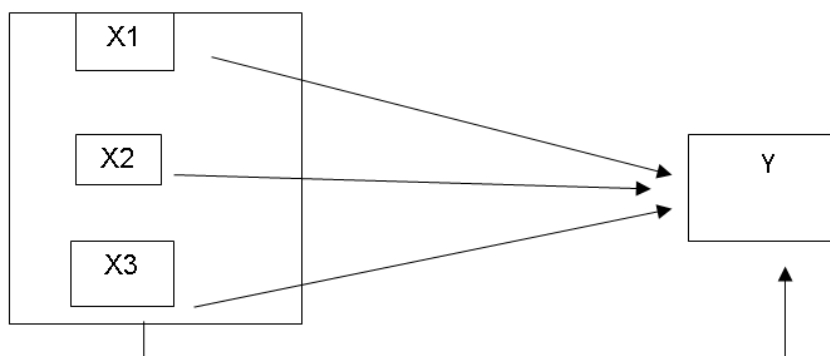


Figure 1. Constellation of the relationship between the three variables
 Information : Y: Table Tennis Game Smash Skills; X1: Reaction Speed; X2: Arm Muscles Explosive Power; X3: Eye-Hand Coordination

Data collection technique

1. Smash skills

a. Conceptual Definition

Smash it is also called the ball kill / slaughterer because it is the most powerful, fast, and dangerous shot. But this punch is very energy consuming. Smash is a progression hit from a hit and the spin type is plain.

b. Operational definition

What is meant by smash skill in this research is a forehand smash from the hull ball (lob), then the ball is hit with the maximum power and speed from the ball's impact point as high as possible, over the top of the net, hit hard, into the opponent's area with the principle of getting the distance the ball comes from the opponent's guard, the better the result. Denoted by Y, including the dependent variable.

c. Test

The test in this study, namely by calculating the score of the accuracy of the stroke multiplied by the score for the accuracy of the target.

Implementation: 1) The smasher stands behind the table, which is opposite to the part of the table that has been designated the target area; 2) The smasher makes a smash that is directed at the target area that has been scored; 3) Smasher is given the opportunity to smash 10 times.

d. Assessment

The value of each testee is to calculate the score from the accuracy of the stroke multiplied by the score for the accuracy of the target.

2. Reaction Speed

a. Conceptual Definition

The conceptual definition of reaction speed in this study is the ability to answer or respond to a stimulus received by the senses within a certain period of time. This means that speed is measured by a unit of distance divided by a unit of time.

b. Operational definition

The operational definition in this study is the time reached by the teste in speeding up the body's reaction when jumping in response to a visual stimulus using the whole-body reaction tester which is carried out 3 times. The measurement results are taken from the best results.

c. Test implementation instructions

The testee stands on the reaction mat as soon as possible when the light is visible from the stimulator, when the testee's foot jumps from the reaction mat the time will stop and show the result. Take 3 measurements and get the best result in minutes and seconds.

d. Assessment

The value of each testee is the time reached by the testee in speeding up the foot reaction in response to the stimulus using the eye reaction which is done 3 times. The measurement results are the best results in 3 repetitions, in minutes and seconds.

3. Arm muscle explosive power

a. Conceptual Definition

Power is the amount of work done in a certain unit of time. It can also be said power explosion is the amount of force that is exerted at the speed. Thus, what is meant by the explosive power of the arm muscles is the strength and speed of the arm muscles in repelling the Medicine ball in the shortest possible time.

b. Operational definition

The explosive power of the arm muscles in this study is the ability to exert force strongly from the arm muscles over the distance covered by the throwing of the medicine ball. Denoted by X₂, including independent variables.

c. Medicine ball throwing test

Test procedure: (1) The subjects sat with their backs against the wall, facing the area where the ball had to be thrown with their feet shoulder width apart and legs straight; (2) The ball is held in front of the chest, after the signal "Yes", the test subject immediately throws the ball as hard as possible towards the front. When throwing, keep your body against the wall; (3) The throw is made 3 times and the distance that can be reached is recorded.

d. Calibrate the instrument

Because the 3 times medicine ball throwing test was taken from the standard test, only a retest (test-retest) was carried out to find its reliability, using Pearson's product moment.

4. Eye-hand coordination

a. Conceptual definition

Coordination is the ability to carry out movements or work appropriately and efficiently. Coordination is defined as the interplay of muscle groups during a performance that is indicated as the same as skills.

b. Operational definition

Eye-hand coordination is the total score of the ability achieved by the test subject in throwing a catch ball against the wall for 10 repetitions, namely 10 throws of the catch ball with the same hand and 10 times throwing the catch ball with different hands. The final score achieved by the test subject is the number of throws that hit the target and can be recaptured, and during the throwing and catching of the ball the participant does not step on the boundary line.

c. Catch ball test

The test procedure is carried out as follows: 1. The targets are placed on a wall at the level of the test taker's shoulders; 2. The test taker stands behind the throw line as far as 2.5 meters; 3. The test participant is given the opportunity to throw the ball at the target, and catch the ball again in 10 repetitions, using one hand. 4. Participants are again given the opportunity to throw a catch ball using one hand, and be caught by a different hand for 10 repetitions.

d. Calibrate the instrument

Because the throw-and-catch test is taken from the standard test, only a retest (test-retest) is carried out to find its reliability, using Pearson's product moment (Dinas Olahraga dan Pemuda DKI Jakarta, 2010; Gunawan, 2010; Kirkendall, 1980).

RESULT AND DISCUSSION

Retrieval of data in this study was conducted by 35 students of STOK BINA GUNA. Before the data analysis is carried out, the data description from the research results will be presented, namely as follows:

Reaction speed

The reaction speed variable in this study is denoted by X1, after the test is carried out the fastest result is 0.031sec and the result is 0.326 second late, it is obtained an average of 0.23 and a standard deviation of 0.07, after being calculated in the T-score, the lowest score is 36 and the highest score is obtained. 78, obtained an average of 49.83 and a standard deviation of 10.21.

Arm Muscles Explosive Power

The variable of arm muscle explosive power in this study is denoted by X2, after the test the lowest result is 339 cm and the highest result is 483 cm, an average of 391.80 is obtained and a standard deviation of 39.00 after being calculated in the T-score, the lowest score is 36 and the highest score is obtained. 73 obtained an average of 49.94 and a standard deviation of 10.11

Eye-Hand Coordination

The eye-hand coordination variable in this study is denoted by X3, after the test the lowest result was 12 times and the highest result was 19 times, obtained an average of 15.14 and a standard deviation of 2.20 after being calculated in the T-score, the lowest score was 36 and the highest score was obtained. 68 obtained an average of 50.00 and a standard deviation of 10.03

Smash Skills (Y)

The smash skill variable in this study is denoted by Y, then after the test the lowest result is 182 and the highest result is 297, an average of 238.37 and a standard deviation of 32.86 is obtained. After calculating the T-score, the lowest score is 33 and the highest score is 68, obtained the mean was 49.97 and the standard deviation was 9.96.

The results of hypothesis testing of the relationship between reaction speed and smash skills can be seen in summary in Table 1.

Table 1. Hypothesis Test Results Relationship between Reaction Speed (X1) and Smash Skills (Y)

Hypothesis	t calculation result	t table (dk = 33 and $\alpha = 0.05$)	Conclusion
HO: $r_{y.1} = 0$ Hi: $r_{y.1} > 0$	2.58	1.70	Reject Ho (There is a relationship)

Information : Ho = Null hypothesis; Hi = Alternative hypothesis; $r_{y.1}$ = The relationship between reaction speed and smash skills; t table (dk = 33 and $\alpha = 0.05$) = t table

The results of the above analysis show that $t = 2.58 > t$ table (dk = 33 and $\alpha = 0.05$) = 1.70 and it means that the null hypothesis (HO) is rejected. Conclusion: there is a relationship between reaction speed (X1) and smash skill (Y) at the level of $\alpha = 0.05$.

The Relationship Between Arm Muscle Explosive Power (X2) and Smash Skill (Y).

The results of the hypothesis test for the relationship between Arm Muscle Explosive Power and Smash Skills can be briefly seen in Table 2.

Table 2. Hypothesis Test Results Relationship of Arm Muscle Explosive Power (X2) With Smash Skills (Y)

Hypothesis	t calculation result	t table (dk = 33 and $\alpha = 0.05$)	Conclusion
HO: $r_{y.2} = 0$ Hi: $r_{y.2} > 0$	2.74	1.70	Reject Ho (There is a relationship)

Information : Ho = Null hypothesis; Hi = Alternative hypothesis; $r_{y.2}$ = The relationship between the explosive power of the arm muscles and the smash skill t table (dk = 33 and $\alpha = 0.05$) = t table

The result of the analysis above turns out that t count = 2.74 > t table (dk = 33 and $\alpha = 0.05$) = 1.70 and it means that the null hypothesis (HO) is rejected. Conclusion: there is a relationship between arm muscle explosive power (X2) and smash skill (Y) at $\alpha = 0.05$.

The Relationship Between Hand Eye Coordination (X3) and Smash Skills (Y).

The results of hypothesis testing of the relationship between hand eye coordination and smash skills can be seen in summary in Table 3.

Table 3. Hypothesis Test Results Relationship between Hand Eye Coordination (X3) and Smash Skills (Y)

Hypothesis	t calculation result	t table (dk = 28 and $\alpha = 0.05$)	Conclusion
HO: $r_{y.3} = 0$ Hi: $r_{y.3} > 0$	3.06	1.70	Reject Ho (There is a relationship)

Information : Ho = Null hypothesis; Hi = Alternative hypothesis; $r_{y.3}$ = The relationship between hand eye coordination and smash skills t table (dk = 33 and $\alpha = 0.05$) = t table

The results of the above analysis show that $t \text{ count} = 3.06 > t \text{ table} (dk = 28 \text{ and } \alpha = 0.05) = 1.70$ and it means that the null hypothesis (HO) is rejected. Conclusion: there is a relationship between hand eye coordination (X3) with smash skills (Y) at the level of $\alpha = 0.05$.

Relationship Between Reaction Speed (X1), Arm Muscle Explosive Power (X2), and Hand Eye Coordination (X3), with Smash Skills (Y)

The results of the hypothesis test of the relationship between reaction speed, arm muscle explosive power, hand-eye coordination and smash skills are summarized in Table 4.

Table 4. Hypothesis Test Results Relationship Between Reaction Speed (X1), Arm Muscle Explosive Power (X2), and Hand Eye Coordination (X3), with Smash Skills (Y)

Hypothesis	F-count	F-table (dk numerator = 3, dk denominator = 31 and $\alpha = 0.05$)	Conclusion
HO: $ry.123 = 0$ Hi: $ry.123 > 0$	12.40	2.91	Reject Ho (There is a relationship)

Information : Ho = Null hypothesis; Hi = Alternative hypothesis; ry.123 = The relationship between reaction speed, arm muscle explosive power, hand eye coordination smash skills; F-count= F the calculation result; F table (dk numerator = 3, dk denominator = 31 and $\alpha = 0.05$) = F table

The results of the above analysis show that $F \text{ count} = 12.40 > F \text{ table} (dk \text{ numerator} = 3, dk \text{ denominator} = 31 \text{ and } \alpha = 0.05) = 2.91$ and it means that the null hypothesis (HO) is rejected. Conclusion: There is a relationship between Reaction Speed (X1), Arm Muscle Explosive Power (X2), and Hand Eye Coordination (X3), with Smash Skill (Y) at $\alpha = 0.05$.

Discussion on this research Based on the results of the analysis of the variable reaction speed with smash skills in STOK BINA GUNA students, the results obtained $t \text{ count} = 2.58 > t \text{ table} (dk = 33 \text{ and } \alpha = 0.05) = 1.70$ at the level $\alpha = 0.05$ and means the null hypothesis (HO) is rejected, so there is a relationship between flexibility (X1) and the long jump result (Y).

Based on the results of the analysis of the variable arm muscle explosive power with smash skills in STOK BINA GUNA students, the results obtained $t \text{ count} = 2.74 > t \text{ table} (dk = 33 \text{ and } \alpha = 0.05) = 1.70$ at the level $\alpha = 0.05$ and it means the hypothesis zero (HO) is rejected, so there is a relationship between the explosive power of the arm muscles (X2) and the smash skill (Y)

Based on the results of the analysis of the hand eye coordination variable with smash skills in STOK BINA GUNA students, the results obtained $t \text{ count} = 3.06 > t \text{ table} (dk = 33 \text{ and } \alpha = 0.05) = 1.70$ at the level $\alpha = 0.05$ and it means the null hypothesis (HO) is rejected, so there is a relationship between hand eye coordination (X3) and smash skills (Y). Based on the results of the analysis of the relationship variable between reaction speed, arm muscle explosive power, and hand eye coordination with smash skills on STOK BINA GUNA students, the results obtained are $F \text{ count} = 12.40 > F \text{ table} (dk \text{ numerator} = 3, dk \text{ denominator} = 31 \text{ and } \alpha = 0.05) = 2.91$ at

the level $\alpha = 0.05$ and it means that the null hypothesis (HO) is rejected, so there is a relationship between reaction speed (X1), arm muscle explosive power (X2), hand eye coordination (X3) with skills smash (Y).

CONCLUSION

Based on the results of data analysis and hypothesis testing, it can be concluded as follows: There is a relationship between reaction speed (X1) and smash skills in STOK BINA GUNA (Y) students. There is a relationship between the explosive power of the arm muscles (X2) and the smash skills of STOK BINA GUNA students (Y). There is a relationship between hand eye coordination (X3) and smash skills in STOK BINA GUNA (Y) students. There is a relationship between reaction speed (X1), arm muscle explosive power (X2), hand eye coordination (X3) with smash skills among students STOK BINA GUNA (Y).

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