

Effect of Arm Muscles and Long Arm Power Exercises on the Results of Accuracy in Forehand Smash Blows in Table Tennis Games at Silaberanti Club, Palembang

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Abstract

This study aims to analyze the method of arm muscle power training with the results of the accuracy of the forehand smash to Silaberanti athletes, Palembang, to find out the difference between athletes who have long arms and short arms with the results of the forehand smash in table tennis at Silaberanti club, Palembang, to analyze the interaction between the training method of arm muscle power and arm length with the results of the accuracy of the forehand smash in table tennis athletes at Silaberanti club, Palembang. This study used a quasi-experimental method using a 2x2 factorial design. Data analysis techniques used variant Analysis (ANOVA) at a significant level of $\alpha = 0.05$. The subject of this research was the table tennis athlete at Silaberanti club, Palembang, South Sumatra. The results of this study show: there is the influence of high swing dumbbell training method and push-ups on the results of the accuracy of the forehand smash in table tennis at Silaberanti club, Palembang, there is no difference in influence between athletes who have a short arm and long arm category on the results of the forehand smash in table tennis at Silaberanti club, Palembang, there is an interaction effect between the method of high swing dumbbell training and push-up with arm length on the results of the accuracy of the forehand smash in table tennis at Silaberanti club, Palembang. Suggestions for sports coaches can be to use the dumbbell high swing training method and push-ups for arm muscle power by combining strength at speed, and for similar studies can develop further research with broader coverage.

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INTRODUCTION

Sports are all systematic activities to encourage, foster, and develop physical, spiritual, and mental potential. Sport has an essential role in efforts to improve the quality of human resources. According to Law Number 3 of 2005 Article 4 concerning National Sports aims to maintain and improve health and fitness, achievement, human variety, instill noble moral and moral values, sportsmanship, discipline, social condition, instill noble ethical and moral values, sportsmanship, discipline, strengthening and fostering national unity and integrity, strengthening national security, and lift the dignity, dignity, and honor of the nation.

The goals to be achieved by a person to do sports activities are different, and many types of sports can be chosen in sports activities, and the selection of these sports depends on the interests of each.

A reality that can be observed in the world of sports shows the tendency and increase in sports achievements that are rapid from time to time both at the Regional, National and International levels, with the increasing trend of achievement, then to participate and compete among athletes in sports activities. According to Syafrudin (2011) mastery of a sport technique besides being determined by physical conditions, also requires the repeated practice of the techniques being studied. Achievements must be developed with the physical, technical, and psychological qualities demanded by specific sports.

Table tennis is one of the small ball games, and table tennis is often known as Pimpong. Rihtiana, and Tomoliyus (2014); Rachman, Sulaiman, and Rumini (2017) suggests that in a table tennis coaching, many factors are needed in the coaching process. The process of fostering a game of good table tennis is when the infrastructure is sufficient, an effective training method, an effective training program. In the table tennis game it is also influenced by the intensity of repetitive training with the model, even the different training methods that can be done namely by drill muscle training, playing

exercises, weight training, target training, and so on, from several training methods to improve the accuracy of forehand smash in the table tennis game. Because when you hit the ball, the player must first see the direction of the arrival of the new ball then place the hit position to put the ball to the desired target then. Physical condition or physical ability is one of the primary components for achieving sports achievements in addition to the technical components, tactics components, and mental components. Exercise is a process of practicing systematically and done repeatedly (Tangkudung, 2016; Manullang, Soegiyanto, and Sulaiman, 2014)

Harsono (2017) exercise intensity refers to the amount of work done in a given unit of time, and more is done in a given unit of time, then the higher the intensity of the exercise. The intensity of the exercise depends on several factors, namely the exercise load, the speed of movement, the duration of the interval between reps, and mental stress required in the exercise. Asri, Soegiyanto, and Mukarromah (2007) reveal that the method of training is a way of training where athletes carry out training activities so that athletes have dexterity and skills that are higher than what has been obtained.

Syafruddin (2012) training is a process of action or action and complex actions from designed and objective influences to increase sports performance. In a strict sense, training is the preparation of athletes physically, technically, tactically, and mentally with the help of physical exercise (physical loading). In another sense, it is also stated that training is the process of processing or applying training materials such as movement skills in the form of repetitive implementation and through varied demands.

From the observations at Silaberanti club, which is located at Gotong Royong 8, Ulu District, Seberang Ulu 1, Palembang City, related to the process of implementing table tennis exercises. In the table tennis game requires a fast rhythm of the game to welcome and return the ball, so that a player needs to have excellent playing skills. Players sometimes can return difficult balls, and return it in a difficult place too. Kertamanah (2003) a smash is also called a ball

killer or a ball killer with the most excellent attack power, a loud smash often seen in forehand smash blows. Salim (2008) a smash is a high-speed forehand drive where bats hit the ball with a hitting motion upward which is often called a killer punch, so that table tennis players need good arm muscle power that is supported by the length of the arm to be able to receive and move towards the arrival of the ball. In this case, the method for exercising arm muscles is one of them with the technique of swing dumbbell training and push-up training methods.

Power of the arm muscles is often referred to as explosive power (Ismaryati, 2008) concerning power and speed of dynamic and explosive muscle contraction and involves spending the maximum strength of muscle strength in the fastest time possible. Sukardiyanto (2001) power is the product of strength and speed. In other words, the element of power is strength and speed. Widiastuti (2015) power is a series of working several aspects of muscle motion in producing explosive power if the power works simultaneously.

FIK Anatomy Team Universitas Negeri Yogyakarta (2003) arm length is the distance from the acromial point to the styloid acromion point on the humerus to the styloid point on the ulna. The length of the arm, according to the general Indonesian dictionary, is the distance between the tip to end of the limb from the wrist to the shoulder. Therefore, based on the above description, it is necessary to research the effect of arm muscle strength and arm length on the accuracy of the smash forehand results in table tennis at Silaberanti club, Palembang.

Based on the description above, the formulation of the problem in this study can be described as follows: (1) How is the difference between the method of high swing dumbbell training and push-up exercises with the accuracy of the results of the forehand smash at the Silaberanti club, Palembang? (2) What is the difference between the category of long sleeves and short arms to the results of the accuracy of the forehand smash in the Silaberanti club, Palembang? (3) What is the interaction between the training method and arm length when doing

the accuracy of the forehand smash at the Silaberanti club, Palembang?

METHODS

This research is a quantitative study with a quasi-experimental method which aims to compare two different treatments to the research subjects with factorial design techniques. Sudjana (2005) factorial experiments are experiments that almost/all levels of a factor are combined/crossed with all the levels of each other in the experiment.

The design of the study was pre-experimental (Sugiyono, 2015). The design of this study is a two-factor design. The treatment is arranged so that each can be a subject together in two different factors, each of which consists of several levels (Dantes, 2012). The data in this study are arranged in a research design framework with a 2x2 factorial design, which can be described as table 1.

Table 1. Research Design Framework with 2x2 Factorial Design

Exercise method	Power of the arm muscles (A)	
	High swing dumbbell (A ₁)	Push up (A ₂)
Arm length (B)		
Short arm (B ₁)	A ₁ B ₁	A ₂ B ₁
Arm long (B ₂)	A ₁ B ₂	A ₂ B ₂

Information:

- A₁B₁ = a group of players with arm-length is given a forehand smash training treatment using high swing dumbbell training method
- A₁B₂ = a group of players who have arms-length given a forehand smash training treatment using the push-up method
- A₂B₁ = a group of players with short arms is given a forehand smash training treatment using high swing dumbbell training method
- A₂B₂ = a group of players with short arms is given a forehand smash training treatment using the push-up method

Arikunto (2010) population is the whole subject in population research in terms of all table tennis athletes at the Silaberanti club, Palembang, which amounted to 36 athletes consisting of 12 male athletes and 24 regional and national level female athletes. The sample size used in this study amounted to 24 female athletes obtained by purposive sampling technique. Sugiyono (2015) purposive sampling technique that is sampling

technique based on specific considerations. The independent variable consists of two treatments, namely the manipulative variable with high swing dumbbell training and push-up training methods. The attributive variable is the length of the arm. The length of the arm is divided into two, namely long arm and short arm. The dependent variable is the accuracy of the forehand smash result with 50 balls performed by the athlete when doing a forehand smash. The research instrument uses administration instrument techniques, namely with sports test and measurement, arm length test, and exercise program. Data collection techniques before conducting research, then some must be prepared for study.

The preliminary test data collection technique analysis with the normality test is intended to show that the sample comes from a population that is normally distributed. Data normality testing with SPSS was carried out by applying the Kolmogorov Smirnov technique (Candiasa, 2010) which was assisted by the SPSS 21 computer program with a significant level of $\alpha = 0.05$. Furthermore, the homogeneity test is intended to show that two or more sample groups are from populations that have the same variance.

Data analysis techniques used to test the hypothesis of this study, namely by using two-way variance analysis (ANOVA) is an analysis of data analysis techniques with a factorial design with two factors. The criteria used in concluding if the probability of error is $\rho < 0.05$, then H_0 is rejected and H_1 is accepted with the chance of error $\rho < 0.05$.

RESULTS AND DISCUSSION

This study aims to determine the results of the accuracy of the forehand smash in table tennis athletes at Silaberanti club, Palembang, find out the influence between high swing dumbbell training methods and push-ups on the results of the forehand smash, find out the influence between the categories of long arms and short sleeves on the results of the forehand smash in table tennis athletes at Silaberanti club, Palembang. This study provides benefits and

scientific information in an exercise and competition as well as training in the field of sports science, which relates to the influence of arm muscle power training consisting of methods of high swing dumbbell training and push-up of table tennis athletes in Silaberanti club, Palembang amounting to 24 female athletes.

Classification research data into seven groups were (1) pre-test results of a high swing dumbbell (per one minute), (2) post-test results of high swing dumbbell (per one minute), (3) pre-test results of push-up, (4) post-test results of push-up, (5) pre-test results of forehand smash (50 balls), (6) post-test results of forehand smash (50 balls), (7) arm length.

From the results of pre-test high swing dumbbell, respondents (n) = 24, minimum score = 16, maximum score = 33, average = 28.083, standard deviation = 3.933. The description is displayed in figure 1.

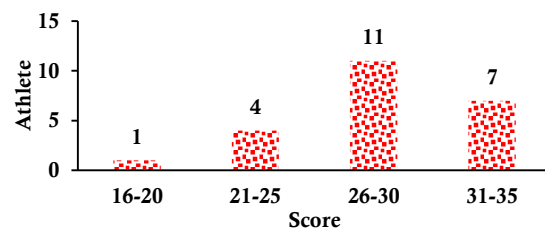


Figure 1. Pre-test High Swing Dumbbell

From the data in figure 1, it can be seen the results of pre-test high swing dumbbell, athletes who achieve a score of 16-20 = 1 athlete, a score of 21-25 = 4 athletes, a score of 26-30 = 11 athletes, and a score of 31-35 = 7 athletes.

Post-test high swing dumbbell data, respondents (n) = 24, minimum score = 33, maximum score = 41, average = 36.58, standard deviation = 2.165 The description is displayed in figure 2.

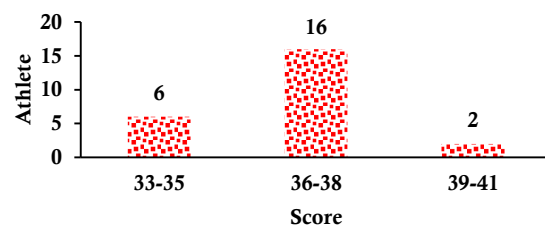


Figure 2. Post-test High Swing Dumbbell

From the data in figure 2, it can be seen the results of post-test high swing dumbbell, athletes who achieved a score of 33-35 = 6 athlete, a score of 36-38 = 16 athletes, a score of 39-41 = 2 athletes.

The data from the one-minute push-up pre-test are as follows: respondent (n) = 24, minimum value = 21, maximum value = 38, average = 29.25, standard deviation = 3.836, can be illustrated in figure 3.

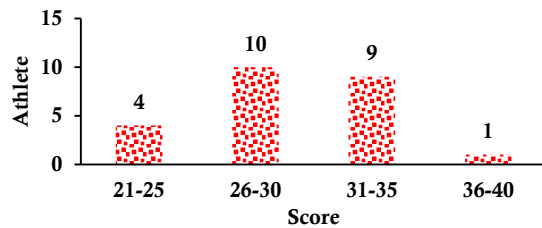


Figure 3. Pre-test Push-up

It can be seen from the data in figure 3 the pre-push-up test. There are 4 athletes achieving a score of 21-25, a score of 26-30 = 10 athletes, 31-35 = 9 athletes and 36-40 = 1 athlete.

From the push-up post-test data there are respondents = 24, minimum value = 33, maximum value = 38, average = 36.21, standard deviation = 2.536. Can be seen in figure 4 post-test push-ups.

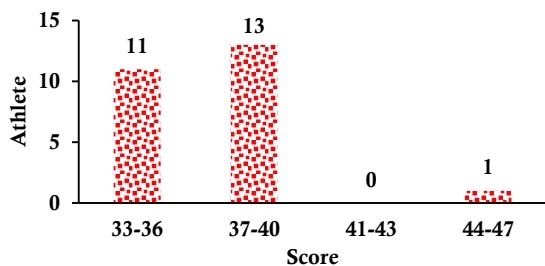


Figure 4. Post-test Push-up

The results of post-test push-up athletes with a score of 33-36 = 10 athletes, 37-40 = 12 athletes and 44-47 = 2 athletes.

Data from the results of pre-test forehand smash as follows: respondents (n) = 24, minimum value = 21, maximum value = 55, average = 36.96, standard deviation = 7.262, can be seen in figure 5 pre-test forehand smash as follows:

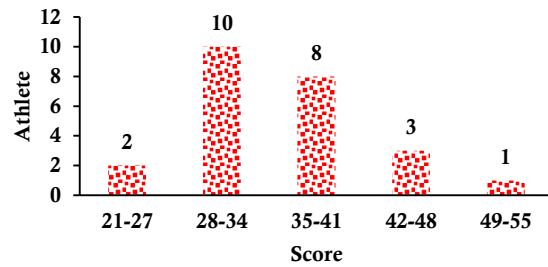


Figure 5. Pre-test Forehand Smash

It is known that the results of pre-test forehand smash show that athletes, with a score of 21-27 = 2 athletes, 28-34 = 7 athletes, 35-41 = 9 athletes and 42-48 = 5 athletes, 49-55 = 1 athlete, with respondents (n) = 24.

From the data known for post-test forehand smash, respondents = 24, minimum value = 32, maximum = 64, average = 48.88, standard deviation = 9.181, can be seen in figure 6 post-test forehand smash.

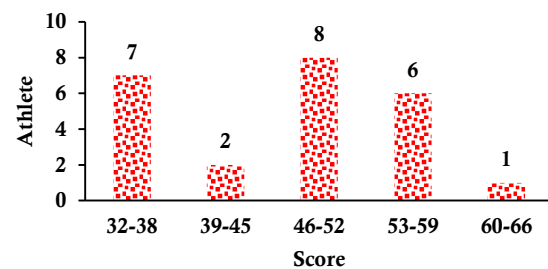


Figure 6. Post-test Forehand Smash

It can be seen figure 6 from the results of the post-test forehand smash for table tennis athletes at Silaberanti club, Palembang, athletes who achieved a score of 32-38 = 7 athletes, 39-45 = 2 athletes, 46-53 = 8 athletes, 53-59 = 6 athletes, and a score of 60-66 = 1 athlete.

For the data normality test, it can be said to be normal if it meets the criteria, if a significant value is higher than $\alpha = 0.05$. The basic concept of the normality test, if the points on the curve image spread around the diagonal and follow the direction of the line, normally distributed.

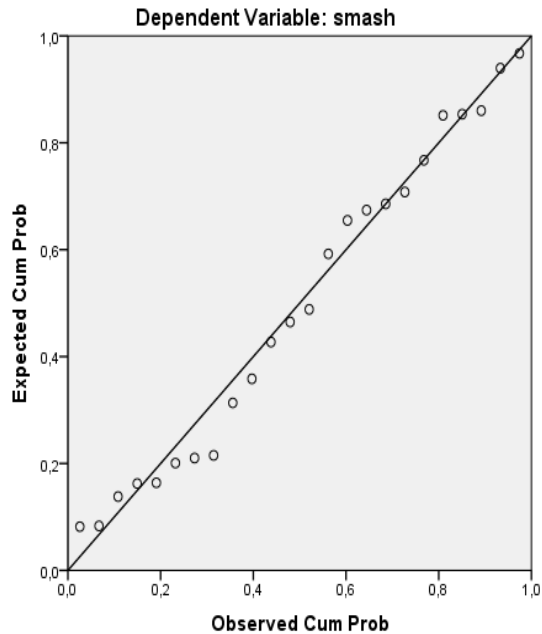


Figure 7. Normal P-P Plot of Regression Standardized Residual

Homogeneity test is done to find out whether the data in variables X and Y are homogeneous or not. Then the homogeneous data variant is obtained $\alpha = 0.968 > 0.05$, can be said to be homogeneous if the significant value is more than $\alpha = 0.05$, it is noted that variants of two or more groups of data are the same or homogeneous.

The testing of the assessment hypothesis was carried out by the two-way ANOVA technique to find out the individual effects of independent variables and dependent variables. The results of the two-way ANOVA calculations are presented in table 2.

Table 2. The results of the Two-way ANOVA

Group compared	df	f	R squared	Information
A1B ₁	23	1.531	0.316	Significant
A ₂ B ₁	23	0.776	0.258	Significant
A ₁ B ₂	23	1.557	0.225	Significant
A ₂ B ₂	23	2.944	0.118	Significant

This means that there is an influence between the method of high swing dumbbell training and the method of push-up training with the category of long arms and short arms against the results of the accuracy of the forehand smash in table tennis at Silaberanti club, Palembang has

a significant value category with a level of $\alpha = 0.05$. Where there is an influence between the high swing dumbbell training method and push-ups on the results of the accuracy of the forehand smash in the table tennis game with a significant value $\alpha = 0.002 < 0.05$, H_1 is accepted and H_0 is rejected. There is no difference between the long arm and short arm categories towards the results of the accuracy of the forehand smash in the table tennis game with a value $\alpha = 0.041 > 0.05$, H_1 is accepted and H_0 is rejected, then there is an interaction between the training method, and the arm length towards the accuracy of the forehand smash in the table tennis game at the Silaberanti club, Palembang with a value of $\alpha = 0.810 > 0.05$, H_1 is accepted and H_0 is rejected with a significant level $\alpha = 0.05$.

CONCLUSION

The discussion of the results of this study provides further interpretation of the results of data analysis that has been done previously. Where the training method in this study uses high swing dumbbell and push-ups to increase arm muscle power. Where in the training process, the athlete is required to use the method of training with strength times the speed to increase the results of the arm muscle power. Homogeneity test is done to find out whether the data in variables X and Y are homogeneous or not. Then the homogeneous data variants obtained data $\alpha = 0.968 > 0.05$, can be said to be homogeneous if a significant value of more than $\alpha = 0.05$, it is said that a variant of two or more groups of data is the same or homogeneous.

The hypothesis testing of this study was carried out by the two-way ANOVA technique aimed at knowing the individual effects of independent variables and attribute variables with the dependent variable. The results of two-way ANOVA can be obtained: There is the influence of high swing dumbbell training method, and push-ups on the results of the accuracy of the forehand smash in table tennis at Silaberanti club, Palembang. There is no difference in influence between athletes who have the category of short sleeves and long arms

towards the results of the accuracy of the smash forehand in playing table tennis at Silaberanti club, Palembang. There is an influence of the interaction between the method of high swing dumbbell training, and push-ups with arm length on the results of the accuracy of the forehand smash in table tennis at Silaberanti Club, Palembang.

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