

The Contribution of Hand-Eye Coordination and Arm Muscle Strength on Punch Ability of Forehand Drive of Table Tennis Athletes

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Abstract—This study aims to determine the relationship and contribution of hand-eye coordination and muscle strength of the arms of the ability of a forehand drive. This study is correlational research that involved 15 players. The instruments used were the tests to catch a throwing tennis ball for hand-eye coordination, dynamometer tests for arm muscle strength, and ability tests conducted with the backboard forehand drive test. Data analysis technique using product-moment correlation analysis techniques (simple correlation and multiple correlations) with significance level $\alpha = 0.05$. The results of that study, 1) There significant relationship between eye-hand coordination on the ability of the athlete's forehand drive Sports Activity Table Tennis Unit Padang State University. 2) There is a significant correlation between the strength of the arm muscles to the ability of the athlete's forehand drive Sports Activity Table Tennis Unit Padang State University. 3) There is a significant association between eye-hand coordination and muscle strength in the arms of the ability of athletes' forehand drive.

Keywords— *Hand-eye coordination, arm muscle strength, forehand drive*

I. INTRODUCTION

Sport is an activity that is done deliberately someone who took the time to train the body, not only physically such as muscles and body but also spiritual focus to maintain a balance of mind offender. Sport also means seriousness in paying more attention to the training process so that what is done in accordance intended target and does not give the feeling of wasting time on an ongoing basis. But more than that, a lot of things actually can be obtained by exercising. Not only manifested on the physical health and mental freshness, but this activity also gives pride on what is undertaken with diligence. For example, as an athlete who gained achievements in sports activities, sports has a goal like Indonesian human form physically and mentally healthy,

Coaching and performance in sports is very important to do both for the national and local levels, due to the progress and give pride of its own. With the government must pay attention to the progress in the field of sports and Achievement sport National in particular in table tennis, it is necessary for PTMSI to carry out sports activities accomplished in each area, "the promotion and

development of sports achievers implemented and directed to achieve sporting achievements at the local level, the National and International" [1].

Judging from the quote above, then the government will be very attentive to the progress in this sport. Where one of the government's efforts, we can see that the establishment of a good sports training center student level and the level of students in every province in Indonesia. In the province of West Sumatra has been heavily shaped table tennis club. There is also the goal of the sports training center (club) is to establish, develop and nurture the talent of the athletes that excel in fields ranging from entry level up to level athletes who profesional. Tennis table is one of the sports activities organized well so that generation highly motivated youth can develop their talents and potential in him to excel in the field of sports are table tennis.

Table tennis is a sport that is played in the building (indoor games) by two or four players. How to play it by using rubber-coated bat to hit the ball over the net that hung above the table, which is linked to the two poles of the net. Game of table tennis, better known by the term "ping pong" is a unique sport and recreational nature.

In table tennis techniques need to be controlled essentially in order to make the game properly. Basic techniques such as caramemegang game of table tennis racket / bat, service, hit the ball, stroke technique and some other special techniques. Stroke technique in table tennis game is divided into two forehand drive engineering backhand drive.

"Forehand is a blow made with the hands from the outside swung into while backhand is a blow made with the hands of the swung out" [2]. To become a table tennis player who excel, one table tennis player must have the skills forehand drive which is good as a known technique forehand drive is considered important for three reasons: first someone the players need this shot to attack the position of the forehand, the two punches can be be a major blow to the attack, the third this punch is a punch is most often used to smash someone's players. Furthermore "forehand drive is the most powerful blow since the body does not obstruct when making a stroke" [3].

"To forehand drive support is also needed eye-hand coordination" [4]. Hand-eye coordination is the ability to perform the movements with varying degrees of difficulty with fast efficient and full ketepatan. Tingkatan whether or not a person's motor coordination is reflected in its ability to carry out a smooth movement, precise, fast, and good efesien. coordination can change and move quickly from one movement pattern to another motion so that movement to be effective. "coordination is the ability to perform the movements with varying degrees of difficulty with fast and efficient and full accuracy" [5]. In order to successfully unify some movement into a movement that effectively, one must have good coordination. With it, one can display the skill to put it mildly, and movement patterns will look beautiful. Coordination is the ability to re-combine several movements without tension, in the correct order, and perform complex movements smoothly without spending excessive energy. Thus the result is a movement that is efficient, smooth, smooth and well coordinated.

"On the other hand coordination is the ability to simultaneously perform a variety of tasks in a seamless and accurate motion right" [6]. The level of motor coordination someone will be seen from the ability to perform the movements smooth, precise, and efficient. Someone who has a good coordination will be able to make a move or skill perfectly and can cover existing limitations to it, like a wrestler that little can beat a wrestler larger, an athlete lower can jump the bar higher than those that have a high higher body.

Strength is the force of muscle "contraction is achieved in a maximum uaha. Maximum effort is carried out by a muscle or group of muscles to overcome a detainee" [7]. "Strength is a very important component of overall physical condition, because it is the driving force of any physical activity" [8].

Based on observations in athletes tennis table Activity Unit Sports State University Padangdapat found there are still players who have not mastered the forehand drive which is good in the game of table tennis, still a part of table tennis athletes Activity Unit Sports Padang State University hit its not on target in a game of tennis table, low ability of table tennis forehand drive is caused by several factors such as eye-hand coordination, arm muscle strength, grip bet, perkenaan ball with the bat used, and the timing of the ball when hit.

II. RESEARCH METHODS

The population in this study are all numbering as many as 15 people. Sampling is done by using a sampling technique which amounts totaling 15 people. The instrument of this research through eye-hand coordination tests to test the ability testee catching a tennis ball throwing, Expanding Dynamometer tests for arm muscle strength and ability tests done backboard forehand drive. Data analysis technique using product moment correlation analysis techniques (simple correlation and multiple correlation) with significance level $\alpha = 0.05$.

III. RESEARCH RESULT

Based on the results of eye-hand coordination test, obtained the maximum score is 65 and a minimum score

of 30. Besides, the obtained mean (average) = 49.40 and Standard Deviation = 9.83. To be more details description of the data eye-hand coordination can be seen in Table 1.

Table 1. Frequency Distribution Hand Eye Coordination (X1)

No.	class interval	Fa	Relative (%)	Category
1	> 64.24	1	6.67	Very well
2	54.31-64.23	4	26.67	Well
3	44.49-54.30	4	26.67	Enough
4	34.66-44.48	5	33.33	Less
5	<34.65	1	6.67	KurangSekali
amount	15	100		

Of the 15 samples, 1 (6.67%) had eye-hand coordination range between > 64,24dengan excellent category, 4 (26.67%) had eye-hand coordination range between 54.31 - 64,23dengan both categories, 4 (26.67%) had eye-hand coordination range between 44,49- 54.30 with enough categories, 5orang (33.33%) had eye-hand coordination range between 36.66 - 44,48dengan category less, and 1 (6.67%) had eye-hand coordination range between <34,65dengan less category yet.

Based on the test results the arm muscle strength gained a maximum score of 31 and a minimum score of 15. In addition, obtained a mean value (average) of 22.87 and a standard deviation of 4.64. To be more details datakeuatan description lengandapat muscle seen in Table 2.

Table 2. Frequency Distribution arm Muscle Strength (X2)

No.	class interval	Fa	Relative (%)	Category
1	> 29.88	1	6.67	Very well
2	25.19-29.87	4	26.67	Well
3	20.55-25.18	5	33.33	Enough
4	15.90-20.54	4	26.67	Less
5	<15.89	1	6.67	KurangSekali
amount	15	100		

Of the 15 samples, 1 (6.67%) had muscle strength lenganberkisar between > 29,88dengan excellent category, 4 (26.67%) had forearm muscle strength ranging between 25,19-29,87dengan good category, 5 (33.33%) had forearm muscle strength ranging between 20,55-25,18dengan category enough, 4orang (26.67%) had forearm muscle strength 15,9-20,54dengan categories ranging from less, and 1 person (6.67%) had muscle strength lenganberkisar between <15,89dengan less category yet.

Based on the test results kemampuanpukulan forehand drive, obtained the maximum score of 38dan minimum score of 18. In addition, the mean values obtained (on average) at 28.07, and a standard deviation of 6.63. To be more details forehand drive kemampuanpukulan results are shown in Table 3.

Table 3. Frequency Distribution arm Muscle Strength (X2)

No.	class interval	Fa	Relative (%)	Category
1	> 38.07	-	-	Very well
2	31.38-38.06	5	33.33	Well
3	24.75-31.37	5	33.33	Enough
4	18.13-24.74	4	26.67	Less
5	<18.12	1	6.67	KurangSekali
amount	15	100		

Of the 15 samples, there was no person has the ability to hit a forehand drive ranges > 38.07 dengan excellent category, 5 (33.33%) had a forehand drive kemampuan kemampuan pukulan ranged 31,38-38.06 dengan good category 5 people (33, 33%) had a forehand drive kemampuan pukulan categories ranging 24.75-31,37 dengan enough, 4 orang (26.67%) have the ability to hit a forehand drive 18,13-24,74 dengan categories ranging from less, and 1 (6.67%) has the ability to hit a forehand drive ranged between <18,12 dengan less category yet.

IV. DISCUSSION

1. Eye-Hand Coordination Relationship Against Stroke Forehand Drive Capability

The research proves that hand-eye coordination (X1) has a significant relationship to the ability of a forehand drive. These results were marked by the acquisition of r calculated at 0.752 and r tables in $\alpha = 0.05$ by 0.514 thus $r_{count} > r_{table}$, it means eye coordination-owned tanganyang athletes have a significant relationship to the ability of a forehand drive. Dan contributions between eye coordination forehand-hand the ability of the unit table tennis drive atlet State University sports activities Padang adalah of 56.55%. Therefore, the element muscle strength lengan memiliki role contributes to the ability of a forehand drive.

2. Relations Arm Muscle Strength to blow Forehand Drive Capability

The research proves that there is a significant relationship between the strength of the arm muscles against a forehand drive ability, the results of statistical analysis is done the correlation coefficient values obtained by 0.602, The figure is larger than the correlation coefficient table is 0.514. That is, variabel kekuatan arm muscles have a significant relationship to the ability of a forehand drive in the sport of table tennis. And the contribution of muscle strength lengan terhadap ability forehand drive unit table tennis athletes Padang State University sports activities amounted to 36.19%. Therefore because the element of the arm muscle strength must be given to the table tennis athletes.

3. Eye-hand coordination relationship (X1) and arm muscle strength (X2) Together Against Stroke Forehand Drive Capability

The research proves that hand-eye coordination (X1) and arm muscle strength (X2) together have a significant

relationship to the ability of a forehand drive. From the results of statistical analysis is done for values obtained 0,816 dan correlation coefficient 0.514 correlation coefficient table. That is, the variable-eye coordination hands and forearm muscle strength together have a significant relationship with a forehand drive capability in the sport of table tennis. And the contribution of eye-hand coordination and muscle strength of the arms together against the ability of table tennis forehand drive atlet unit Padang adalah State University sports activities amounted 66.56%. Therefore, elements of the condition of eye-hand coordination and muscle strength of the arms should be given to the table tennis athletes.

V. CONCLUSION

1. There is a significant relationship between eye-hand coordination terhadap kemampuan forehand drive in athletes unit table tennis sporting activities Padang State University with the value of the correlation coefficient of 0.752, the coefficient of determination of 56.55% and a distribution coefficient $t_{hitung} 4,11 > t_{tabel} 1,77$.
2. There is a significant correlation between muscle strength terhadap kemampuan arm athlete's forehand drive on the sport of table tennis activity units Padang dengan State University correlation coefficient of 0.602, the coefficient of determination of 36.19% and a distribution coefficient $t_{hitung} 2,72 > t_{tabel} 1,77$.
3. There is a significant correlation between muscle strength and arm-eye coordination tangan secara together there is the ability of the athlete forehand drive unit table tennis sporting activities Padang State University with the value of the correlation coefficient of 0.816, the coefficient of determination of 66.56% and a distribution coefficient $F_{hitung} 11,94 > F_{tabel} 3,88$.

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