

THE EFFECT OF PLYOMETRIC TRAINING ON FOREHAND ABILITY IN PICKLEBALL

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Abstract

This study aimed to determine the effect of Plyometric Exercise on improving forehand in pickleball, focusing on the age of 15-18 years. The research conducted was quantitative method with quasi-experiment with pre-test and post-test non-equivalent to control the group design. The respondents of this study were 40 pickleball athletes aged 15–18 years. They were divided into two groups, of which 20 respondents were in the experimental group. While the control subjects numbered 20 people. The research instrument used a forehand test on pickleball. The data was analyzed with the SPSS 26 application. The results of this study showed that the value of $t = 41.68$, $df = 20$ and its significance (2 tailed) or $p\text{-value} = 0.000 < 0.05$. Thus the descriptive statistical results with 20 experimental subjects showed an average of 18.95, and after they were given treatment, the post-test results showed a mean of 35.05. This shows that descriptively obtained differences before and after treatment. Thus, the descriptive statistical results for the 20 control subjects were an average of 18.20, and after treatment the average post-test result was 22.21. This shows that descriptively obtained differences before and after being given treatment. Therefore, it can be ascertained that this plyometric exercise is effective in increasing the topspin groundstroke ability of junior tennis athletes aged 15-18 years.

Keywords: Forehand, Pickleball Athletes, Aged 15-18 years

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INTRODUCTION

Sports have an important role in human life. This is because exercise can maintain and improve physical and spiritual health, and promote a better healthy life (Is and Hariansyah, 2020). In today's modern life, humans cannot be separated from sports activities, both to increase achievements and the need to maintain a healthy body condition. By exercising can form humans who are physically and spiritually healthy and have a disciplined nature and in conclusion want to create quality humans. In an effort to create a young generation who can become the backbone

of the nation's struggle, coaching through sports has long been stared at like a very effective and successful facility. Because human development essentially leads to a whole Indonesian person who is physically and spiritually healthy. The condition of Indonesian people who are physically and spiritually healthy can only be achieved if humans are aware and want to carry out healthy living movements through physical learning and exercise. Therefore, the movement to socialize sports and exercise citizens needs to be more intensively carried out in all corners of the Indonesian homeland.

Pickleball, a lifelong trending sport, is different from other sports because it is competitive, requires physical activity, provides social benefits, and is easy to learn. (Alexander et al., 2021). Pickleball was first introduced among the community. The popularity of pickleball among older adults is due to the fact that this sport can be learned easily; It is also a cost-effective and space-saving sport. Pickleball has gained popularity at various levels of competition, and as a result, there are many casual enthusiasts, serious amateurs, and mature professionals in the country. Pickleball has also gained popularity on a global level, and the positive effects of playing pickleball have also been well documented. Pickleball has not been studied empirically. The study only notes that participation in pickleball tournaments is an indication of commitment, for athletes who want to excel.(Heo, Ryu, Yang, & Kim, 2018). Pickleball is a combination of several sports such as batminton, table tennis and tennis. (Heo, Ryu, Yang, Kim, et al., 2018). Pickleball has become a recreational activity and achievement sport in Indonesia that focuses on community fitness from children to adults, especially to find athletes in achievement sports to be prepared in an event or multi-event match and has been proven to have a positive relationship adding significant value to the lives of the wider community. (Zagrodnik, 2019). Pickleball is also an interesting and viable option for older adults who used to play racquet sports because it is played on courts that are usually smaller than tennis courts. In addition, pickleball relies on a punch oriented towards the lower hand (this reduces pressure on the elbows and shoulders), and the ball usually moves at a

moderate pace. According to the Sports and Fitness Industry Association, there are 930,000 core pickleball participants (over the age of eight) across the United States, and some professional tennis players even see pickleball as a sport similar to tennis. (Ryu et al., 2019).

Forehand Pickleball

According to Brown in (pious: 2020), a groundstroke is a hit after the ball bounces onto the field. Groundstroke is a punch that can be done by means of forehand and backhand. Broadly speaking, two types of spin punches are known, namely: top spin and slice Spin punches can be used in forehand drives and backhand drives. The topspin hit is the ball spinning forward from bottom to top at hover time so that the air pressure is greater at the top of the ball which causes the ball's trajectory to curve downward (Mardian 2020).

The blow to the right is called the forehand. In tennis, the forehand groundstroke is a stroke often used in the game, and the forehand stroke is easier to learn than the backhand stroke. The forehand groundstroke is done after the ball bounces off the ground and is then hit from the right side for the right player and from the left for the left-handed player. Forehand groundstrokes are also one of the most common types of strokes in the game. During the game, this shot is a fundamental pillar for the players, but in the opponent's game, most of the ball is surrendered to our weakness.

From the results of the description above, it can be concluded that the forehand groundstroke is a blow after the ball bounces off the field and is hit from the forehand. The forehand groundstroke has several stages, namely the movement of swinging the racket backwards, the swing of the punch forward (when hit) and the continued movement after the impact between the racket and the ball. A forehand groundstroke that is done consistently will be able to provide numbers in a court tennis game, because this punch is more often used to kill the opponent. (piou: 2020).

Here's how to hit a groundstroke forehand in a pickleball game When you hit a bouncing ball using a forehand stroke, use a forehand grip and keep the paddle

surface flat (parallel to the net). This helps keep the ball low as it passes over the net. You can apply a little force to the forehand hit because the low trajectory of the ball helps keep it within limits. From the ready position, turn it to the side where the ball will land so that you face that side line. Start swinging backwards as you move to your original position and transfer the weight to the back legs. Some players pivot on the ball of their feet or step onto their back foot to achieve this. Pull your paddle back and up, keep your elbows slightly bent, and extend your other hand toward the net for balance. (Leach, 2005)

Pickleball through plyometric exercises

Plyometric refers to exercises designed to increase muscle, primarily through the use of jumping exercises. Plyometric exercises are a natural part of most sports movements because they involve jumps, jumps, and jumps. Identifying features A distinctive feature of plyometric exercises is the lengthening (eccentric contraction) of muscle-tendon units followed directly by concentric shortening or contraction, otherwise called the strain-shortening cycle (SSC).¹³ SSCs are an integral part of plyometric training because they can increase the ability of muscle-tendon units to produce maximum power in a short period of time. (Asadi et al., 2016).

The eccentric pre-stretching phase is also described as the readiness, pre-loading, pre-setting, preparation, facilitation, readiness, potentiation, counter strength, or counter movement phases. The eccentric pre-stretching phase of plyometric activity stretches the muscle spindle of the muscle-tendon unit and non-contractile tissue within the muscle (series elastic component [SEC] and parallel elastic component [PEC]). The stimulation of these muscle components is often referred to as the neurophysiological-biomechanical response. Some researchers have shown this eccentric pre-stretching will increase the resulting concentric muscle contractions. The pre-stretching phase is based on three stretch variables: stretch magnitude, stretching speed, and stretching duration. Manipulating any of these variables will have a significant effect on the amount of energy stored during eccentric pre-stretching movements. (Davies, 2015)

Plyometrics refers to exercises designed to improve neuromuscular performance. For the lower body, this exercise involves applying jumping, jumping, and tying exercises. Plyometric exercises are a natural part of most sports movements because they involve jumps, jumps and jumps (i.e., such as high jump, throwing or kicking).¹⁴⁻¹⁶ Plyometric exercises are implemented in various forms depending on the purpose of the training program. Common plyometric exercises are countermovement jump (CMJ), squat jump (DJ), and squat jump (SJ). These exercises can be combined in an exercise program or can be done separately. In addition, plyometrics can be formed at various levels of intensity, ranging from low-intensity two-foot jumps to high-intensity unilateral exercises. For the lower body, plyometrics includes performance from various types of weighted jumping exercises, such as DJ, CMJ, alternate-leg bounding, hopping, and other stretch shortening cycle (SSC) exercises.¹⁷⁻²⁰ These exercises are characterized by the action of the SSC, which begins with rapid stretching of muscles (eccentric phase) and is followed by rapid shortening of muscles (concentric phase). (Villarreal et al., 2009). Previous studies have concluded that the effectiveness of plyometric training depends on the volume and frequency of exercise, and a number of subjects' characteristics, such as level of strength training, gender, age, and exercise. Neural recruitment and development of movement patterns in both men and women continue to change through the stages of maturation and into adulthood. Compared to women, men experience greater increases in power, strength, and coordination as they age which correlates with the stages of maturation. It has been observed that VJ height (VJH) performance increases during maturation in males, but not in females. VJH is the primary measure and the most widely reported variable for assessing VJ capability. Leapfrog performance capability is regulated by an individual's ability to harness the elastic and nerve benefits of the stretch-shortening cycle (SSC), along with the strength and speed of muscle excretion activated during traction. Higher forces are associated with shorter amor- tization (transition) times from eccentric phase to

concentric phase and with greater energy stored in the elastic components of the series.(Ristic, 2017)

Plyometric training can produce varying training effects, depending on the nature of the exercise program. This is usually determined by the desired increase in sports performance. For example, a tennis player wants increased agility. Greater agility improvements are seen by using Plyometric Training with horizontal components. Sprinters may want greater speed from leg strikes which would normally also require some form of horizontal displacement in programming. A basketball or volleyball player, however, may need not only better agility but also greater vertical jumps, which will require practice with both horizontal and vertical components.(Booth & Orr, 2016).

METHOD

This study used a quantitative approach with quasi-experimental methods to collect data from the participants. Quasi-experiments were conducted face-to-face with field tests to respondents from the ages of 15-18 years. The target population is pickleball club athletes in Bekasi City. The sample size was set at 40 respondents who were selected by purposive sampling from the target population. This amount is determined with reference to the determination of the sample size (Krejcie & Morgan, 1970) in order to obtain an adequate level of precision. After the instrument grid is carried out, then validation is carried out by experts in the field of pickleball to see the compatibility of the concept with what will be measured. Furthermore, to gain confidence that the test instruments that have been validated by experts are in accordance with what is measured, the next step is the process of reliability of the instrument. After the instrument grid is carried out, then validation is carried out by experts in the field of pickleball to see the compatibility of the concept with what will be measured. Furthermore, to gain confidence that the test instruments that have been validated by experts are in accordance with what is measured, the next step is the process of reliability of the instrument.

RESULTS

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pre tes Experimen	16	24			2.305
Post tes Experimen	20	35	45	38.05	2.438
Pre Tes Kontrol	20	15	21	18.20	1.881
Post Tes Kontrol	20	18	24	21.25	1.517
Valid N (listwise)	20				

From the data above, it can be seen for the experimental sample group that the average PreTest Score is 18.95 and Posttest is 38.05. while for the Control sample group, the Pretest Average Score was 18.20 and Posttest was 21.25.

Table 2. Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		Descriptive Statistics
	Kelas	Statistic	df	Sig.	Statistic	
Forehand	N	Minimum	Maximum	Mean*	Std. Deviation	Pre test
	24	18.95	2.305	Post test	20	35
	2.438	Pre Control	20	15	21	18.20
	20	18	24	21.25	1.517	Valid N (listwise)
						20

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Based on the output above, it is known that the significance value (sig.) for all data both on the Kolmogorov-smirnov test and the shapiro-wilk test > 0.05, it can be concluded that the data is normally distributed.

Table 3. Test of Homogeneity of Variance

	Levene Statistic	df1	df2	Sig.
Hasil Forehand Based on Mean	1.266	7	152	.271
Based on Median	1.258	7	152	.275
Based on Median and with adjusted df	1.258	7	122.049	.277
Based on trimmed mean	1.287	7	152	.260

Interpretation of homogeneity test

Based on the above output known significance (sig.) Based on mean is 0.979 > 0.05, so it can be concluded that the variance of experimental class posttest data and control class posttest data is equal or homogeneous.

Table 4. Paired Samples Test

Paired Differences					
	Std. Error	95% Confidence			
Mean	Deviation	Mean	Interval of the	Difference	Sig. (2-tailed)
					t

					<i>Lower</i>	<i>Upper</i>	
Pair Pre-Test Eksperimen	-	2.049	.458	-20.059	-18.141	-41.68019	.000
1 Forehand - Post-Test	19.100						
Eksperimen Forehand							
Pair Pre-Test Eksperimen	-	.523	.117	-20.445	-19.955	-19	.000
2 Backhand - Post-Test	20.200					172.680	
Eksperimen Backhand							
Pair Pre-Test Kontrol	-3.050	.887	.198	-3.465	-2.635	-15.37719	.000
3 Forehand - Post-Test							
Kontrol Forehand							
Pair Pre-Test Kontrol	-5.250	1.164	.260	-5.795	-4.705	-20.16819	.000
4 Backhand - Post-Test							
Kontrol Backhand							

Paired Sample T Test Interception

Based on the results of data processing obtained Sig. (2-tailed) values of $0.000 < 0.05$, it can be concluded that there is a difference in the average forehand ability of athletes for the experimental class pre-test with the post-test experiment class. Based on the results of data processing obtained Sig. (2-tailed) values of $0.000 < 0.05$, it can be concluded that there is a difference in the average forehand ability of athletes with the pre-test control class with the post-test control class

Based on the discussion of paired output 1, it can be concluded that there is an influence on the ability of the forehand pickle ball. From the data above, it can be seen that the experimental group using Plyometric Exercise had an average score of 38.05, and the control group of 21.45. So it was stated that the experimental sample group with Plyometric Exercises was more effective in improving the ability of the forehand Pickle Ball.

DISCUSSION

Based on the results of research that has been conducted on the effect of Plyometric training for Pickleball athletes aged 15-18 years, it was found that the exercise model given to the experimental group had a significant influence on improving the ability of Forehand pickleball compared to the control group. This is shown by the difference in the average posttest scores in the two groups after being given different treatment.

The ability of Forehand pickleball is very important to master by pickleball athletes because Forehand is the most widely used stroke when playing Pickleball. Plus a good forehand will provide more advantages to maximize the stroke for

Pickleball players. Therefore, the correct Forehand training model needs to be taught early so that Pickleball athletes have a solid foundation for further skill development.

The exercise model given in this study refers to the theory of motor learning. (Schmidt & Wrisberg, 2008) states that to learn a movement skill well, stages of practice or structured practice are needed. This is also true in learning the skills of the Forehand Technique in the sport of Pickleball. The training model given starts from the cognitive stage, namely providing information and examples of Forehand movements, then continued with the associative stage in the form of exercises in forming Forehand movement patterns by paying attention to body position when hitting, Paddle position and contact ball impact. This exercise is done repeatedly in order to form automatic motion patterns at the autonomous stage.

Based on the interpretation of the research data, it can be said that the provision of exercise models Forehand and backhand pickleball by applying principles Motor Learning demonstrate significant progress on improving capabilities Forehand Pickleball athletes ages 15-18 years. The exercise model in this study is also in accordance with the theory (Landlinger, Lindinger, Stöggel, Wagner, & Müller, 2010) To achieve forehand and high-speed backhand with adequate accuracy is one of the fundamental requirements for the development of the modern tennis or pickleball athlete. In the implementation of forehand and backhand punches, the theory is applied to training Forehand and backhand pickleball given to the experimental group for 16 meetings. So that the high increase in ability Forehand Pickleball athletes aged 15-18 years experimental group compared to the control group is thought to be the result of the influence of training models forehand which has been adapted to the relevant theory.

Regarding the interpretation of the average score of research data before and after treatment, it is known that the average pretest and posttest scores of the experimental group are higher than the average pretest and posttest scores of the control group. While the increase in the control group was relative. In other

words, the Forehand training model given has a good effect in improving the Forehand ability of pickleball athletes aged 15-18 years.

The difference in the increase in the average posttest score in these two groups is thought to be due to the treatment factors given. The control group received a form of Forehand and Backhand exercises without a special model, which was dominant only doing conventional exercises given by the trainer. While the experimental group received a dose of Forehand and Backhand pickleball exercises structured with the application of motor learning principles. So that more special training stimuli obtained by Pickleball athletes aged 15-18 years in the experimental group. This is thought to cause differences in the effect of treatment on improving the forehand ability of Pickleball athletes in each group.

Based on the confirmation between the Forehand Pickleball exercise model used in this study with motor learning theories and Forehand components according to experts, it can be concluded that the exercise program given to the experimental group is quite effective in improving Forehand ability Pickleball athletes ages 15-18 years. With a structured, measurable and planned training model, it is hoped that junior Pickleball athletes will be able to master the basics of good Forehand Pickleball techniques as a foundation for the development of advanced Pickleball playing skills in the future.

Overall, the results of research on the Forehand Pickleball exercise model provide a real picture that the application of motor learning science and skill training principles is beneficial for improving Pickleball sports performance. By designing training programs based on theory and athlete needs, coaches are expected to produce the best Pickleball athletes in the future.

CONCLUSION

Based on the results of our research on the effect of plyometric exercises on forehand ability, the provision of plyometric exercises can improve the forehand hitting skills of tennis pickleball athletes aged 15-18 years. Thus obtained descriptive statistical results with 20 experimental subjects showing an average of 18.95, and after being given treatment, post-test results showed an average of

38.05. This shows that descriptively obtained differences before and after treatment. So, the result of the descriptive statistics for the 14 control subjects was an average of 18.20, and after treatment, the average post-test result was 21.45. This shows that descriptively obtained differences before and after treatment. Therefore, plyometric exercises can be applied and effective to improve forehand ability for pickleball athletes aged 15-18 years. Our results show that the level of effectiveness is significant, but this study is still limited to a few clubs. Further development is useful for the rejuvenation of science.

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