

Increasing Leg Muscle Power and Leg Muscle Strength with Plyometric Exercise Variations

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ABSTRACT

This study aims to determine the effect of the form of plyometric training, namely the Tuck jump, Squad jump, and Basic box jump Exercises to increase leg muscle strength and leg muscle power. The subject of this research is 32 students of SMAN 12 Surabaya. The results of this study, the leg muscle power of group 1 with an average of 609 joules, while the post-test results were 668 joules. Conclusion for group 1 Leg muscle power increased by 10% and strength increased by 3%. The results of group 2 for leg muscle power had an average pretest of 503 joules and an average post-test result of 543 joules. Conclusion of group 2 Leg muscle power increased by 8% and strength increased by 3%. The results of group 3 for leg muscle power had an average pre-test of 602 joules and an average post-test result of 645 joules. Conclusions for group 3 leg muscle power increased by 7% and strength increased by 3%. In conclusion, the results of this study Group 1, group 2, and Group 3 exercises affect leg muscle strength and leg muscle power, for leg muscle strength the increases are all the same and for leg muscle power which has a big influence, namely group 1 with the tuck jump exercise for strength and leg muscle power.

Keywords: *Effect of Exercise; Tuck jump; Strength; Leg muscle power.*

INTRODUCTION

Sports at this time can also be a basic need for humans. Australian Bureau of Statistics (McKinlay et al., 2018) explained "Sports is not just a demonstration of physical prowess but also an event for employment, enjoyment or improving one's health and fitness" which means that sport does not only show physical abilities but as work, enjoying or improving one's health and fitness (Sahabuddin, Hakim, et al., 2022). Biomotor ability fitness is an aspect that must be considered. Good biomotor abilities will also make the body's performance easier. In addition to educating Indonesian children, education has the function to improve students' biomotor abilities and fitness (Subarjah, 2018).

Sports and health physical education is an educational process that uses physical and physical activities that cover psychomotor, cognitive and affective aspects (Promrit & Waijanya, 2019). The development and progress of the times require educators and trainers to have good knowledge and skills. This needs to be realized by students and teachers at SMAN 12 Surabaya to overcome problems that arise and the diversity of types of needs and increase community aspirations, especially with sports achievements, a student and teacher must also be able to improve knowledge and skills to face tough challenges.

Therefore, the efforts made by the Ministry of Youth and Sports through the deputy for achievement improvement and human resources, to improve the abilities of coaches, coaches and sports teachers at the national level are by organizing training courses for coaches and teachers, youth and women (training of training) (Pritchard et al., 2019). In various regions throughout Indonesia also carried out several studies that created new views and also something new that could be developed in an educational unit or an association, especially in the field of sports (Kim, 2017).

The National Sports System according to law number three (UU OR Indonesia, 2005), sport is an activity to improve and maintain health and fitness, human achievement and quality, sportsmanship, discipline, strengthening and fostering friendship, noble character and national unity. According to (Lamusu & Lamusu, 2020) Training is a process of consciously improving the quality of athletes and aims to achieve maximum performance which is carried out regularly, directed, and repeatedly given physical and mental loads (Prawira et al., 2022).

The purpose of physical education is to improve student fitness (Shakty, 2019). Based on (Roesdiyanto & Budiwanto, 2008) students if they have good fitness, will not experience fatigue (Wang & Liu, 2011). With good student fitness abilities, it is hoped that students can receive learning material well so that they become high-achieving students (Hinda Zhannisa & Sugiyanto, 2015; Hana Puspita Santoso, 2017; Hasibuan & Simamora, 2018).

Sport is a form of physical activity that is planned and structured and involves all body movements that are repeated to improve physical fitness (Sahabuddin, Syahrudin, et al., 2022). Sport is part of the basic needs in everyday life because it can increase the fitness needed by the body to carry out its duties (Sari Helen Purnama, 2017; Rahmad et al., 2020), exercise can also be a physical activity that involves the limbs so that it can be done from a young age to old age and can be done at any time (Asfiyani & Sulistyarto, 2016; Hidayat et al., 2019).

The physical condition is a unified whole of components that cannot be simply separated, both for improvement and maintenance. According to (More & Salahudin, 2020) This means that to improve physical conditions, all of these components must be developed, even if it is carried out with a priority system according to the condition or status of each component and what form the condition or status requires (Pritchard et al., 2019).

There are several physical components namely; Power, Strength, Speed, Endurance, Reaction, Flexibility, and Agility (Anggreni et al., 2022). Physical components that are carried out systematically will affect the physical development of athletes to achieve maximum training performance (Sahabuddin, 2017). In achievement sports, certain sports have their characteristics, such as Power, which is a combination of strength and speed training. Power is the ability of the muscles to exert maximum strength in a very short time. Thus, to train this component, athletes must develop their strength and speed, such as the plyometric training program method (Ishak et al., 2022).

Popular training methods in the modern era are often used in various fitness centres or by sports players who want to improve their fitness by using these training methods. Examples of popular training methods in this modern era are plyometric training, SAQ, and so on. Variation in exercise and choice of form Exercise keeps students motivated and fresh in adapting (Ahmad et al., 2019) The more varied training methods besides having a positive effect on improving one's physical performance, turns out that it also has an unfavourable effect on athletes who do this without the correct procedures and stages. Especially for ordinary people who only follow the trend of developing training methods without understanding the goals and stages of the training, it is certain that they will experience negative impacts (Putra et al., 2019).

Based on (Hardiansyah, 2018) an understanding of the science of biomechanics and exercise physiology shows that many new products about these training methods that initially claim to improve physical performance may be detrimental to them. With the background of the problem above, the researcher has the idea to solve the problem (Rosmi, 2017), the researcher uses the plyometric training method to compare the training of several plyometric training methods, which is a method that is easy to do and can be published with several training methods that will be compared scientifically (Krismon et al., 2022).

This is what causes sports actors to increase their number of studies with new methods with the same goal, namely to improve performance. For example, Tuck jumps,

Squat Jumps and Basic box jumps are the same forms of exercise, namely leg performance, but all have different methods so that the exercises are not boring and students can always be motivated in training.

METHOD

This study uses a type of quantitative approach to experimental research with experimental methods. The experimental method is the method used because it is necessary to supervise and check the process of conducting research (Ali Maksum, 2012) which is a special characteristic in experimental research, namely giving tests at the beginning and end of the study as a means to find out the difference after giving treatment to research subjects. This method was chosen because the research design used was to provide treatment to all subjects. So that the results of the treatment can be seen based on the results of the pretest and posttest. In his book (Maksum, 2014). Research design is a research design that will be carried out to obtain answers to research questions that have been formulated. There are two kinds of research validity, namely internal validity and external validity. Internal validity relates to the extent to which there are differences in the variables in the treatment. While external validity is a conclusion or generalization that will be applied to the subject, size, and other settings.

According to (Ali maksum, 2012) This study used experimental research while the design was Pre-Experimental Design in the form of four pretest and posttest groups, namely 4 groups that were given treatment in 4 different types of treatment. The first group was used as the control group (variable control), and the other 3 groups were given different exercises, including Tuck jumps, Squad jumps, and basic box jumps, but before the treatment was given, an initial test (pre-test) was carried out. , grouping with ordinal pairing and then at the end of the treatment another final test (post-test) was carried out.

Research instruments are tools or facilities used by research in collecting data so that work is easier and the results are better (Arikunto, 2006: 136). For data collection, the instrument was divided into 2, the first, namely abdominal muscle strength with sit-up for 30 seconds, the test was carried out 2 times, namely the 1st pre-test session, and the 3rd post-test session after the athlete participated in the treatment for 18 meetings, while the second was the second is the stork stand test, namely the balance test is carried out as long as possible, the test is carried out 2 times, namely the 1st pre-test session, and the 3rd posttest session after the athlete has participated in the treatment for 18 meetings.

RESULTS AND DISCUSSION

The data obtained in this study are the results of Plyometric training variations. The results of the study are described as follows:

Table 1.
Normality Test

Variable dan Test		Sig.	Information	Status
Leg Muscle Strength	Pretest	0,362	P > 0,05	Normal
	Posttest	0,262	P > 0,05	Normal
Leg Muscle Power	Pretest	0,547	P > 0,05	Normal
	Posttest	0,589	P > 0,08	Normal

Based on the table, shows that the data obtained for the two dependent variables, namely leg muscle strength and leg muscle power, have all normal variants. This is based on a significant value or (P) > 0.05. So it can be concluded that the variance in each group is normal.

Table 2.
Homogeneity Test

	Levene Statistic	df1	df2	Sig.
delt_Power	2,012	3	28	,135
delt_Strength	1,825	3	28	,165

Based on the table of acquisition of the dependent variable, namely leg muscle strength and leg muscle power, it means that the data contribute normally. This is based on the significant value of each data showing a significant level or (p) > 0.05. So that the data can be concluded that the data taken from the population is normally distributed.

Based on the data obtained, then perform the data processing of paired T-Test on leg muscle power and the results are presented in the table below.

Table 3.
Uji Paired T Sample T Test

Leg Muscle Power	Mean	Sig. (2-tailed)	Information
Group 1 (Tuck jump)	59,37	0,000	Significant
Group 2 (Squad Jump)	28,40	0,005	Significant
Group 3 (BBJ)	42,72	0,000	Significant
Group 4 (Konvensional)	19,37	0,007	Significant

The results obtained from the calculation of the T-Test Paired T-Test in the Tuck Jump Training by looking at the sig. (2-tailed) 0.000, it can be concluded that Ho is rejected and Ha is accepted because of the sig. 0.000 < value α = 0.05. this shows that there is an effect of the Tuck Jump Exercise on Badminton extracurricular students at SMAN 12

Surabaya. The results obtained from the calculation of the T-Test Paired T-test on the Squad Jump Training by looking at the sig. (2-tailed) 0.005, it can be concluded that Ho is rejected and Ha is accepted because of the sig. $0.005 < \text{value } \alpha = 0.05$. this shows that there is an effect of Squad Jump Training on Badminton extracurricular students at SMAN 12 Surabaya. The results were obtained by calculating the Test-Paired T-Test on the Basic Box Jump Training by looking at the sig value. (2-tailed) 0.000, it can be concluded that Ho is rejected and Ha is accepted because of the sig. $0.000 < \text{value } \alpha = 0.05$. this shows that there is an effect of Basic Box Jump Training on Badminton extracurricular students at SMAN 12 Surabaya. The results were obtained from the arithmetic data of the T-Test Paired T-Test in the Basic Box Jump Training by looking at the sig value. (2-tailed) 0.007, it can be concluded that Ho was rejected and Ha was accepted because of the sig. $0.007 < \text{value } \alpha = 0.05$. this shows that there is an effect of Convectional Training on Badminton extracurricular students at SMAN 12 Surabaya.

Table 4.
Box's Test of Equality of Covariance Matrices

Box' M	16,401
F	1,585
df1	9
df2	8984,489
Sig.	0,113

Table 5.
Levene's Test of Equality of Error Variances

	F	df1	df2	Sig.
delta_Strength	1,285	3	28	.165
delta_Power	2,012	3	28	.135

The post hoc test was carried out after the Manova test using LSD on the variable strength and power. The results of the post hoc test can be seen in the table

Tabel 6.
Uji Post Hoc

Variabel	Group	Sig
Strength	group 1	group 2
		0,629
		0,108
	group 2	group 4
		0,021
		0,629
	group 3	group 1
		0,040
		0,007
	group 4	group 1
		0,108
		0,040

Variabel	Group	Sig
Power	group 4	group 1
		group 2
		group 3
	group 1	group 2
		group 3
		group 4
	group 2	group 1
		group 3
		group 4
	group 3	group 1
		group 2
		group 4
	group 4	group 1
		group 2
		group 3

Discussion

This discussion will discuss all the things that can be discussed and give an explanation after data collection is carried out. The first is why there is an effect of the plyometric variation of training, namely the tuck jump on increasing power and leg muscle strength. Second, why is there an influence of the plyometric variation training, namely the name Squad jump on increasing muscle power and leg muscle strength? The third is why there is an effect of the plyometric variation training, namely the Basic box jump on increasing leg muscle power and strength. Fourth, is there a difference between all variations of Plyometric exercises between the Tuck jump, Squad jump and Basic box jump in terms of increasing power and leg muscle strength?

Thus, when doing the Tuck jump exercise it is lighter, therefore the Power of the Tuck jump exercise is greater than the Squad jump Exercise and basic box jump. Therefore, the increase in leg muscle power in comparison to the Tuck jump and Squad jump training and the basic box jump is different. The leg muscle power in the Tuck jump group experienced an increase of up to 10% while for the Squad jump it was only 8% and for the basic box jump it was 7% with a close comparison difference in leg muscle power.

Meanwhile, there is no difference in the variable leg muscle strength because all exercises, namely Tuck jump, Squad jump, and Basic box jump, have the same percentage, namely with a percentage of 3% there is an increase in leg muscle strength. Strengthened by research conducted by Zarra Pratiwi et al. in 2018 entitled "The Effect of Plyometric Front Cone Hops and Counter Movement Jump Exercises on Leg Muscle Power and

Strength". Has been published in SPORTIF Journal: Journal of Research and Learning. The results of the study showed that plyometric front cone hops and plyometric countermovement jumps were effective in improving the two components of the physical condition of leg muscle strength and power.

CONCLUSIONS AND SUGGESTIONS

This research requires further research regarding Plyometric exercises, especially the Tuck jump, Squad jump, and basic box jump exercises with different sample conditions and populations. As with other extracurriculars that require strength and leg muscle power, it can be used in certain sports athletes in club associations or sports organizations to increase leg muscle strength and power.

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