

Effectiveness of skipping exercises and bench step-up against explosive power leg muscles

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Abstract

The purpose of this study is to determine whether there are differences in the skipping exercises and the bench step-up on the leg muscle explosive power of members of Participants of extracurricular futsal Bina Darma. The research method used an experimental method with a two-group pretest-posttest design, a population of 24 people, and a sample of 12 people in the skipping exercise group and 12 in the bench step-up exercise group using the MSOP technique. The pre-test and post-test test instruments used a standing broad jump. Data analysis used t-test difference (paired t-test). The results showed a significant difference in skipping exercises and the bench step-up in generating leg muscle explosive power in Bina Darma university futsal club participants ($F\text{-count } 4,620 > F\text{-table } 3,98$). The percentage of skipping training on the explosive power of the leg muscles was 26%, and bench step-up training was 63%, so the difference between the two was 37%. Still, it was inseparable from the limitations that existed during the study, namely: 1) The sample was not in a dormitory, so there might be some who practiced alone outside treatment 2) In this study, the subjects studied were still very few, limited to the men's futsal extracurricular members of Bina Darma University Student Activity Unit. 3) The researcher cannot control other factors that may affect the test results, such as body condition, psychological factors, and so on. Suggestions for the trainer or teacher; they should provide more varied exercises as an effort to increase the explosive power of the leg muscles and further research is needed by adding other variables.

Keywords: skipping, bench step-up, explosive power, leg muscles.

INTRODUCTION

Sport tells about so much meaning in people's hearts. Through a series of sport types, it is not only social behavior obtained from a series of sports activities. But on the other hand, sports can also provide benefits in the form of developmental abilities for children, especially at school. This is confirmed in the National Sports System Law (SKN) 2005 Chapter VI Article 17 explains that sports are within sports, achievement, recreation, and education. Based on the type of sports activities they are divided into several branches, including futsal ([UU No 3 Tahun 2005, 2005](#)). Futsal in Indonesia is quite well known by the public, from the middle to lower class

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up to the upper-middle class. For example, workers, farmers, and even conglomerates play futsal. The current futsal game is not only a recreational sport but has become an achievement sport. Some evidence has shown that futsal has become a realm of achievement in the formation of national and international futsal bodies and leagues, for example, student futsal leagues, Indonesian futsal leagues, and so on.

Good physical quality really supports the various techniques in futsal. The arrival of foreign players is a competition and a challenge for local players to train better in order to remain competitive (Almy & Sukadiyanto, 2014). Completeness as a factor for athletes is one thing that must be possessed if they want to achieve optimal performance, namely: (1) Physical development, (2) Technical development, (3) Mental development, (4) Maturity of champions (Sudarsono, 2012). Thus, to achieve an optimal achievement in the world of sports, the four supporting aspects must be carried out properly, in accordance with the sport they are engaged in. Of the four aspects above, one of them is the physical condition. In essence, futsal players must, of course, be supported by excellent physical conditions. There are many physical components needed by futsal players, for example, speed, strength, endurance, coordination, and power (Naser et al., 2017).

Bompa & Haff, stated that training must contain readiness, individual, adaptation, overload, progressive, specific, variation, warm-up and cool-down, long-term training, the principle of the opposite, not excessive and systematic (Bompa & Haff, 2009). Many training methods are used to improve physical condition, either using tools or using training methods. All physical components support each other in some technical ability. For example, power, or what is known as the explosive power of the leg muscles, has a very important role in playing futsal. Almost every technical skill in futsal requires power. Dribbling, passing, shooting, heading, and other types of skills are various techniques that must be supported by power, especially leg muscle power. Power training can be done in various ways, one of the correct media to be used as an exercise

method is to provide skipping and bench rides. According to [Naser et al., \(2017\)](#), a futsal player needs to have a great capacity of intermittent endurance, repeated sprint ability, and leg power, while technical aspects include the ability of high-level shooting and passing skills, agility, and coordination.

This type of exercise is an exercise devoted to bringing out the explosiveness of the muscles of the limbs. From this movements skipping exercises and bench step-up is in the category of plyometric exercises. Plyometric is defined as a short and explosive movement that activates a retractable stretching cycle in the muscles aimed at developing eccentric strength, elasticity, and muscle explosiveness ([King & Cipriani, 2010](#)). Plyometric exercises are exercises with the natural movement of most sports movements due to the form of jumping, jumping, and jumping (i.e., such as high jump, throwing, or kicking) ([Anderst, 2012](#)). plyometrics Exercise is broken down into 4 phases of movement (1) phase of momentum, in this phase, the body moves from kinetic energy taken from previous actions; (2). The instant phase is constant, in this phase the momentum stops due to contact with the surface; (3). the amortization phase, in which stored kinetic energy produces a stretch reflex and then eccentric contractions followed by explosive action; and (4) the rebound phase, in which elastic energy is released from connective tissue and accidental concentric contractions occur due to stretch reflexes ([Grosprêtre et al., 2014](#)).

The activity is in the form of jumping and jumping, it is assumed that this can increase the strength and speed of the limb muscles. If the player's limb muscles have the power of course the player can easily exercise his technical ability in playing futsal. Based on observations that the researcher conducted on the extracurricular participant futsal club in Bina Darma University, futsal when looking at some of their meetings in training, the researcher found some awkward techniques that were not supported by the explosiveness of good limb muscles. For example, when students dribble, it is very clear that the limbs moved very slowly as well as

other abilities such as shooting when shooting does not appear to be a jolt or a cut raised by the muscles of the limbs. Looking at the problems that arise, it is clear that the researcher's assumption of this problem occurs because students do not yet have maximum limb muscle explosiveness. So, it is necessary to be trained with skipping exercises and exercises bench step-up in order to bring out the power faster so that the engineering skills can run properly.

Skipping exercises is a simple move. The skipping referred to in this study is the movement of jumping in place with both feet together and both hands holding the ends of the rope to rotate past the top of the head and soles of the feet (Tse et al., 2017). Skipping is a fairly simple physical activity, so it can appeal to everyone with various ages, but it is quite difficult and complicated, so it is a challenge for sportsmen who have good coordination, high fitness, and talent. Skipping fosters the ability to coordinate movements that come together from the feet and hands. Skipping exercises improve coordination, balance, agility, rhythm, speed, and especially static and dynamic muscle strength, which is useful for repetitive performance that can contribute to the development of motoric skills (Meylan & Malatesta, 2009).

Exercise bench step-up is one of the plyometric exercises, where that plyometric is a method of exercise that focuses on high-speed movements (Sáez De Villarreal et al., 2015). In this exercise, the main muscles that work are hamstrings (hamstring muscles), then other muscles that work are adductors (muscles located on the inner side of the thigh and play a role in pulling the legs towards the inner side), calves (calf muscles), gluteus, quadriceps (quadriceps muscles) (Chatzinikolaou et al., 2010).

Plyometric is a specific exercise to improve jumping ability that is complemented by stretching exercises and shortening the union of muscle contractions, this elastic force is then reused to shorten muscle activity that becomes stronger (Davies et al., 2015).

According to [Stojanović, Ristić, McMaster, & Milanović, \(2017\)](#) "The general principles of plyometric training, individual training plans were devised. In order to evaluate the effects of training." The statement explains that the general principle of plyometric training, individual training plans are designed to evaluate the impact of training that has been implemented. In this study, the exercises applied can prove that skipping exercises and bench step-up can have an effect on the muscle explosiveness on students' limbs.

Previous exercise research using rope jumping was conducted by [Kardiawan \(2013\)](#), entitled Comparative Study of the Effectiveness of Skipping Rope and Weight Training with Leg Press Technique on Increasing the Power of the Leg Muscles of Students in Basketball Achievement Development Faculty of Sports and Health Undiksha from the results of his research using rope jumping training. There is an increase in explosive power on leg muscles significantly. Furthermore, research on chair ups and downs was also conducted by [Roziandy & Budiwanto \(2018\)](#) with the title on the effect of bench step-up training on leg muscle power in female volleyball athletes, and the results of this study showed that there was a significant effect of bench step-up training on increasing leg muscle power. in volleyball players.

From the two previous studies, skipping exercise was used to increase the explosive power of the leg muscles in basketball athletes, while bench step-up training was used to increase the explosive power of the leg muscles in volleyball athletes. In this study, the researcher compared the results of the two methods, namely skipping training with bench step-up training in training the leg muscles of futsal athletes.

METHODS

Type of Research

This research can get good results, and in accordance with expectations, so the research method used in this research is an experimental method. The basis for using the experimental method is experimental activities with pre-test (before being given treatment) and

post-test (after being given treatment). The experimental method is the most appropriate method for investigating causal relationships. That experimental research is a way to find a causal relationship between two factors that are deliberately caused by researchers by reducing or setting aside other disturbing factors (Suharsimi, 2013).

Research Design

The correct research paradigm for this type of research is (pretest-posttest control group design) which can be described as follows:

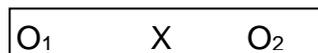


Figure 1. Pretest-Posttest Control Group Design (Suharsimi, 2013)

Research Population

According to Suharsimi (2013), the population is the entire research subject. If someone wants to research all the elements that exist in the research area, then the research is a population study. The population in this study were 24 extracurricular futsal students at extracurricular futsal Bina Darma University.

Research Samples

The population in this study were 24 futsal extracurricular students of Bina Darma's futsal extracurricular activities. Given the number of population samples below 100 people, the researcher used the total sampling technique. Thus, the sample to be examined in this study amounted to 24 students. Furthermore, the sample group was divided into two experimental groups, namely, the sample group to be given the skipping exercise treatment and the sample group to be given the upper and lower treatment. The division of the group was done through ordinal fitting technique. The following describes the two sample groups after drawing by lot in the table 1.

Table 1. Research Sample

NO	Class	Group		Amount
		Skipping Exercise	Bench Step-up Exercise	
1	Participant Futsal Club Bina Darma University	1	2	24
2		4	3	
3		5	6	
4		8	7	
5		9	10	
6		11	12	
7		14	13	
8		15	16	
9		18	17	
10		19	20	
11		22	21	
12		23	24	
Amount		12	12	

(Source: Researcher, 2018)

Data Collection Techniques

Data collection was done using tests and measurements.

- The initial test by taking the test scores for the explosive power of the leg muscles of the students.
- Skipping exercises and going up and down stairs for 12 meetings.
- The final test scores of the students' leg muscle explosive power test.
- Research instruments are tools or facilities used by researchers in collecting data so that their work is easier to process (Suharsimi, 2013).

In accordance with the research method that will be used in this study, namely the test and measurement techniques, the test instrument used in this study is the explosive power of the leg muscles using the standing broad jump test (Widiastuti, 2011).

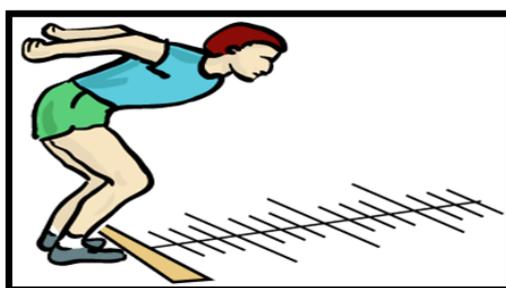


Figure 2. Test Procedure (Widiastuti, 2011)

Data Analysis Technique

The steps for data analysis and hypothesis testing in this study were using the SPSS program. The work steps are:

- a. Disseminate data through statistical descriptions.
- b. Calculating the normality and homogeneity tests.
- c. Compute the paired t-test of the sample.
- d. Calculating anava test.

RESULTS

The descriptions of the pre-test and post-test data obtained by researchers in this study can be seen in table 2.

1. Normality test

Before the data is analyzed to determine the effect of several related variables, the data must first be normally distributed. For more details, the prices that can be described regarding the normality test using Kormolgrov Smirnov are in table 3.

2. Homogeneity Test

Once the data is distributed normally, then the data can then be tested with a homogeneity test. The homogeneity test results can be seen in table 4. Based on table 4 it can be concluded that the entire data of both the pre-test and post-test skipping exercise groups and bench step-up is distributed homogeneously because the sig values are greater than 0.05 i.e. (0.650, 0.993, 0.964, and 0.552 > 0.05).

Table 2. Data Description

		Skipping		Bench Step-up Exercise	
		Pre-test	Post-test	Pre-test	Post-test
N	Valid	12	12	12	12
	Missing	0	0	0	0
Mean		2.0592	2.0808	2.0592	2.0825
Median		2.0500	2.0600	2.0300	2.0300
Mode		1.98 ^a	2.01 ^a	2.03	2.00 ^a
Std. Deviation		.08929	.09885	.06815	.10411
Minimum		1.93	1.95	1.98	1.95
Maximum		2.20	2.25	2.20	2.27
Sum		24.71	24.97	24.71	24.99

Table 3. Experimental Group Normality Test

		Pretest	Posttest	Pretest	Posttest
N		12	12	12	12
Normal Parameters ^a	Mean	2.0592	2.0808	2.0592	2.0825
	Std. Deviation	.08929	.09885	.06815	.10411
Most Extreme Differences	Absolute	.146	.231	.249	.242
	Positive	.146	.231	.249	.242
	Negative	-.096	-.136	-.123	-.131
Kolmogorov-Smirnov Z		.505	.800	.863	.838
Asymp. Sig. (2-tailed)		.961	.545	.446	.484

a. Test distribution is Normal.

3. Hypothesis Test

a. Effect of skipping exercise on limb muscle explosive

Based on table 5 obtained that the value of t-count 2,940 is greater when compared to t-table, which is 1.80 at a significant rate of 0.05%. Thus, it can be concluded that there is a significant influence of skipping exercise on the results of limb muscle explosive in the extracurricular futsal students of Futsal Club Bina Darma University.

Table 4. Statistics Homogeneity

	Pretest Skipping	Posttest Skipping	Pretest Bench step-up Exercise	Posttest Bench step-up Exercise
Chi-Square	.833 ^a	1.500 ^b	3.000 ^c	.833 ^a
Df	10	8	9	10
Asymp. Sig.	.650	.993	.964	.552

Table 5. Paired Samples Test

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	
				Lower	Upper
Pair 1 Pretest - Posttest	.02167	.02552	.00737	.03788	.00545
				2.940	11
					.013

b. The effect of exercise bench step-up on the explosiveness of the muscles of the limb

Based on the results of hypothetical test data to find out the effect of exercise bench step-up on the explosiveness of the arm muscles can be seen in the table 6.

Table 6. Paired Samples Test

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	
				Lower	Upper
Pair 1 Pretest - Posttest	.02333	.11130	.03213	.09405	.04738
				2.726	11
					.483

Based on table 6, it is found that the value of t count 2.726 is greater than t table, namely 1.80, at the significant level of 0.05%. Thus, it can be concluded that there is a significant effect of bench step-up training on the yield of leg muscle explosive power in the extracurricular members of the Futsal Club Bina Darma University.

c. Differences in skipping exercises and bench ups and downs against the results of limb muscle explosiveness

Based on table 7, the calculated f value of 4.620 is greater than the F table, namely 3.98, with a significant level of 0.05%. Thus, it can be concluded that there is a significant difference between bowling and fecal training on the results of leg muscle detonation in extracurricular members of the Bina Darma University Futsal Club.

The percentage deviation between the skipping exercise group and the bench step-up can be seen in table 8.

Table 7. ANOVA Test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.045	5	.009	4.620	.286
Within Groups	.033	6	.006		
Total	.078	11			

Table 8. Deviation of the Exercise Group Percentage

No	Exercise Group	Deviation	Percentage
1	<i>Skipping</i>	0,26	26%
2	Bench step-up	0,63	63%
	Percentage Deviation		37%

DISCUSSION

There is a significant influence of skipping exercises on limb muscle explosive results in the participant Futsal Club Bina Darma University. (t -count 2,940 > t -table 1.80). Based on the findings during the study, especially in the skipping exercise group, the researcher found no events that could complicate the research process. Students were happy to participate in a directed training program. So, the results can also be known to be very maximal.

Skipping exercises are a type of exercise that uses rope as a media to jump over. Repeated jumps will make a group of limb muscles accustomed to optimal performance. In addition, coordination is required so that the rhythm of the jump can be stable caused by the relatively constant rotation of the rope, therefore coordination is an important factor in the jump, thus in general physical fitness will improve such as balance, agility, and limb strength (Trecroci et al., 2015).

There is a significant influence of exercise bench step-up on limb muscle explosive results in the participant of Futsal Club Bina Darma University (t -count 2,726 > t -table 1.80). Based on findings during the study, especially in the exercise group bench step-up, the researcher found no events that could complicate the research process. Students were happy to participate in a directed training program. So, the results can also be known to be very maximal.

The bench step-up exercise has basically the same function as the skipping exercise, it's just that the difference is in the tools. The movement is a jumping movement making a group of leg muscles contracts continuously, which can cause maximum strength and speed. Therefore, a person who continuously practices going bench step-up will be able to gain leg power easily. In their research, Van Lieshout, Anderson,

Shelburne, & Davidson (2014) stated that box jump training could improve jumping ability.

The percentage of the effect of skipping exercise on the explosiveness of the limbs is 26%, and the exercise bench step-up is 63%. The results answer all the theories that have been put forward in the previous chapter that skipping exercises and bench step-up have a significant difference in their influence on the muscle explosiveness of futsal players' limbs. The difference between the two exercises is 37%, which is very reasonable, considering that these two types of exercises are the same type of exercise that emphasizes the increased muscle strength of a person's limbs.

This research was carried out as well as possible, but it was inseparable from the limitations that existed during the study, namely: 1) The sample was not in a dormitory, so there might be some who practiced alone outside treatment 2) In this study the subjects studied were still very few, limited to the men's futsal extracurricular members of Bina Darma University Student Activity Unit. 3) The researcher cannot control other factors that may affect the test results, such as body condition, psychological factors, and so on. Suggestions for the trainer or teacher to provide more varied exercises as an effort to increase the explosive power of the leg muscles and further research is needed by adding other variables.

CONCLUSION

Based on the results of the research and hypothetical tests that have been obtained, this study provides the following conclusions. There is a significant influence of skipping exercises on limb muscle explosive results in the participants of Futsal Club Bina Darma University. There is a significant influence of bench step-up exercises on limb muscle explosive results in the participants of Futsal Club Bina Darma University. There is a significant difference in skipping exercises and bench step-up against the results of limb muscle explosive in the participant Futsal Club Bina Darma University. The percentage of the effect of skipping exercise on the

explosiveness of the limbs is 26%, and the exercise bench step-up is 63%, so the difference between the two is 37%.

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