



## Improving Leg Muscle Power Using A Combination Of Bunny Hop And Squat Jump Exercises

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### ABSTRACT

The purpose of this study was to determine the effect of a combination of bunny hop (ladder drill) and squat jump (plyometric) exercises in increasing leg muscle power. The type of research used was a quasi-experimental design with one group pretest-posttest design. The population of this study were badminton extracurricular students at SMP Negeri 1 Jogoroto, and a purposive sampling technique was used to determine the research subjects and 12 students were obtained. The research subjects were given a combination treatment of bunny hop and squat jump exercises which were carried out three days a week for six weeks. The test instrument used is jump MD, then the result of the jump height is used to calculate the power formula. The instrument is used during the pretest and posttest. The data analysis technique used was descriptive statistics, the Shapiro-Wilk normality test, and the paired sample t-test with the help of Microsoft Excel and SPSS applications. The results showed that the average value of leg muscle power during the pretest was 341.7 watts, while the posttest was 447.05 watts. The results of the Shapiro-Wilk normality test showed that the data were normally distributed ( $p > 0.05$ ) and the paired sample t-test showed a significance value of 0.00 ( $p < 0.05$ ) so the results of the study showed that the treatment given in this study could significantly increase muscle power limbs. The conclusion is that the combination of bunny hop and squat jump exercises can increase leg muscle power.



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### INTRODUCTION

Currently, sports achievements no longer belong to individuals or individuals, but involve the dignity of a nation (Ip & Syahputra, 2019). Sports achievements can be used as a measure of the strength, honor, welfare, and progress of a nation's civilization (Junaidi et al., 2021). High sporting achievements are supported by coaching that is carried out as early as possible starting from finding and monitoring one's talent, nursery, training and more effective science and technology-based sports education (Rasyono, 2016). Bompa and Buzzichelli (2019) stated that there are four pillars that must be met in fostering sports achievements, namely physical, technical, tactical, to psychological or mental.

Physical condition plays an important role in achievement sports, because optimal physical conditions can support technical abilities (Fauzi & Majid, 2022) and success in applying the concept of game tactics in competition (Syafuddin, 2011). Physical condition also acts as the basis or foundation for athletes in carrying out various activities in training (Piyana et al., 2020). In improving the components of the physical condition of an athlete, the needs and characteristics of each sport must be adjusted (Ridwan, 2020).

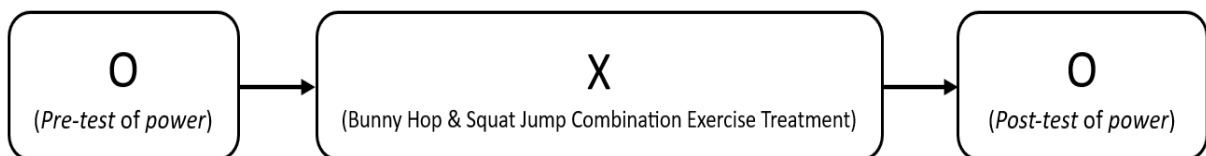
One of the popular achievement sports in Indonesia and even the world is badminton (Williyanto et al., 2018). Badminton is a racquet sport that is used to hit the shuttlecock and is played by two people in a singles game, or two pairs in a doubles game (Muharram et al., 2022) who face each other on a field divided by and limited by a net or net (Aksan, 2013). The game of badminton requires explosive movements, including sprints, lunges, smash jumps, and quick changes in direction (Hader et al., 2015; Walklate et al., 2009), most of these explosive movements are driven by the feet or leg muscles (Huang et al., 2019). Therefore, leg muscle power is a component of the physical condition needed for badminton players. Power is also known as explosive power which is defined as a person's ability to carry out an activity or movement strongly and quickly to achieve certain goals (Gusnelia et al., 2022) because the power component is a combination of speed and strength (Oktaviani & Donie, 2020). By knowing the components of leg muscle power that play an important role in supporting badminton players, a training method is needed to improve these components.

There are various types of training methods, but the currently popular training methods are ladder drill and plyometrics. The ladder drill is a training model that uses essential tools such as ladders and has a function to train movement skills and generally has a length of 10 yards with a size of 18 inches each box (Pelamonia & Harmono, 2018). Not only being able to increase speed and agility, ladder drills also have the potential to increase power (Ravi & Kalimuthu, 2019). On the other hand, plyometrics is a training method to maximize muscle strength by stretching the muscles quickly before contracting (Mahindra & Masrun, 2019). So that various types of variations of plyometric exercises can increase the ability of leg muscle power (Mahindra & Masrun, 2019). Ladder drill and plyometric have many types and variations of training models, but in this study we will use bunny hop (ladder drill) and squat jump (plyometric) variations.

Until now, references regarding the combination of plyometric and ladder drill exercises are still minimal, especially in the bunny hop (ladder drill) and squat jump (plyometric) models. So far, previous studies have identified separate effects of the ladder drill and plyometric training methods in increasing leg muscle power. Therefore, researchers conducted a study entitled *Improving Leg Muscle Power Using A Combination Of Bunny Hop And Squat Jump Exercises*. From the results of this study it is hoped that it will provide concrete evidence regarding whether or not there is an effect of the combination of these exercises in increasing leg muscle power in badminton players.

**METHOD**

This type of research is quantitative research and the research method used is quasi-experimental, where quasi-experiments are known as developments from pure experiments (Sugiyono, 2022). Quasi-experiments are also known as experimental designs that are carried out without going through randomization or randomization, but involve placing research subjects into groups (Creswell, 2015). The research design used is one group pretest-posttest design which can be interpreted as a research design that has a pretest (test before being given treatment) and posttest (test after treatment is done) in one group (Sugiyono, 2015). The research design is presented in the figure below.



**Figure 1.** Research Design

The participants or research subjects used were badminton extracurricular students at SMP Negeri 1 Jogoroto, Jombang Regency. There were 12 students who became research subjects, where the subjects were obtained through a purposive sampling technique with the following criteria: 12-15 years old, male, physically and mentally healthy, and willing to participate in the research to completion. The 12 students who were the subject of the study carried out bunny hop and squat jump exercises with a frequency of 3 days in 7 days which were carried out for 6 weeks.

**Table 1.** The bunny hop and squat jump combination exercise program

Week	Exercise name	Intensity	Freq	Set	Recovery
1 – 2	Bunny hop Squat Jump	50% Maximum repetition	3 days/ 1 week	3	2 min
3 – 4	Bunny hop Squat Jump	60% Maximum repetition	3 days/ 1 week	3	2 min

5 – 6	Bunny hop Squat Jump	70% Maximum repetition	3 days/ 1 week	3	2 min
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The research instrument used is a tool known as Jump MD. Leg muscle power data collection was carried out twice, namely during the initial test/pretest (before the treatment was carried out) and the final test/posttest (after the treatment was carried out). The use of the Jump MD tool is by jumping as high as the research subject can do on the base or surface of the Jump MD (Pembayun et al., 2018). Subjects who have made a jump, the tool will show the results of the jump in the form of a jump height in centimeters which will be converted to the power formula (Wismanadi et al., 2020), namely:

$$P = \frac{m \times g \times h}{t}$$

Information: P = power (watts), m = mass (kg), g = gravity (9.8 m/s<sup>2</sup>), h = jump height (m), and t = time (s) (Haryono & Pribadi, 2013).

Data analysis techniques used in this study were descriptive statistics, the Shapiro-Wilk normality test, and the paired sample t-test. SPSS and Microsoft Excel applications were used to perform data analysis.

## RESULT AND DISCUSSIONS

### Research Result

The results of the descriptive statistics in this study included data on age, height and weight, the results of the pretest leg muscle power, and the results of the posttest leg muscle power. The descriptive statistical data presented in table 1 below uses data on the minimum value, maximum value, mean, and standard deviation (SD).

**Table 2.** Research subject characteristic data

Variable	Descriptive statistic			
	Min	Max	Mean	SD
Age (year)	12	15	13.58	1.08
Height (m)	1.32	1.67	1.59	0.09
Weight (Kg)	25	67	43.3	10.2
Pretest of power (watt)	168.78	520.32	341.7	102.3
Posttest of power (watt)	238.55	734.77	447.05	136.48

Table 3 below presents data from the results of the Shapiro-Wilk normality test which is used as a prerequisite test before conducting an inferential test (paired sample t-test).

**Table 3.** Shapiro-wilk normality test results

Variable	Sig. (p-value)
Pretest of power	0.493
Posttest of power	0.621

The value of p > 0.05 indicates the distribution of data in this study is normal.

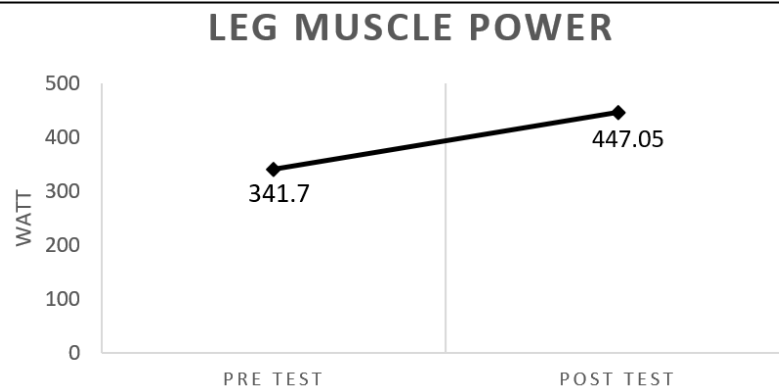
To find out whether or not there is an effect of the combination of bunny hop and squat jump exercises on increasing leg muscle power, a paired sample t-test is performed which is presented in the table below.

**Table 4.** Paired sample t-test results

Variable	Sig. (p-value)
Power	0.000*

\*p-value < 0.05 it can be concluded that there is a significant effect

To make it easier to see the changes that occur between the pretest and posttest leg muscle power, Figure 2 is presented below.



**Figure 2.** Increase in leg muscle power

### Discussions

This study aims to determine the effect resulting from a combination of bunny hop (ladder drill) and squat jump (plyometric) exercises in improving leg muscle power in badminton players. The results of the paired sample t-test showed that there was a significant increase in leg muscle power in the combination of bunny hop (ladder drill) and squat jump (plyometric) exercises with a significance value of 0.000 ( $p < 0.05$ ). Changes in leg muscle power components that occur between posttest and pretest have an average value (mean) of 105.35 watts.

Badminton is a sport that has characteristics in the form of fast game movements (Rifai et al., 2020), so this sport is a game sport that requires various physical conditions and complex movement skills (Kusuma, 2013). Various movements such as running fast, jumping, reaching, stepping wide, turning the body, and trying to respond quickly and precisely to punches and attacks from opponents are movements that are demanded by badminton players (Kusuma, 2013). Therefore, badminton requires strength and explosive power in the leg muscles that are used to actively move (Panuntun et al., 2022), even power is one of the main factors in the success of athletes (Cinthuja et al., 2015).

The results of this study are supported by several previous studies. The ladder drill training model does not only increase leg speed, but the tools used in ladder drills can be extremely multipurpose so that they can increase leg muscle power (Pelamonia & Harmono, 2018). Apart from that, there is other research which has shown that ladder drills can be a training method used to increase leg muscle power (Ravi & Kalimuthu, 2019). Various variations of plyometric exercises can increase leg muscle power, including variations of squat jumps which are proven to increase leg muscle power (Loturco et al., 2015; Ropianti et al., 2021). The squat jump exercise is also known to be able to increase leg muscle power in badminton players (Pratama & Erawan, 2019). Not only that, squat jumps have been proven to improve the smash abilities of badminton players (Nur et al., 2020).

From the results of this study, concrete evidence has been obtained that a combination of bunny hop (ladder drill) and squat jump (plyometric) exercises can increase leg muscle power in badminton players. However, the research subjects in this study were badminton extracurricular students who were still studying at the junior high school level and their ability level had not yet reached the level of elite players. Thus, recommendations for further research are expected to be able to compare badminton players who have different levels of ability and age regarding the effects of combination bunny hop (ladder drill) and squat jump (plyometric) exercises.

### CONCLUSION

The results of the research and discussion that have been described above, the conclusion obtained in this study is that the combination of bunny hop and squat jump exercises can significantly increase leg muscle power.

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