

Effect of Limb Muscle Power Training with Leaps on Athlete's Speed during the COVID-19 Pandemic

Yogi Mandala Putra¹, Sugeng Purwanto², Erick Burhaein^{3,*}

¹Master Program of Sports Science, Postgraduates Program, Universitas Negeri Yogyakarta, Yogyakarta 55281, Daerah Istimewa Yogyakarta, Indonesia

²Faculty of Sports Science, Universitas Negeri Yogyakarta, Yogyakarta 55281, Daerah Istimewa Yogyakarta, Indonesia

³Doctoral Program of Sports Education, School Postgraduates Studies, Universitas Pendidikan Indonesia, Bandung, 40154, Jawa Barat, Indonesia

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Abstract This study aims to determine the effect of leg muscle power training with leaps on athlete's speed during the COVID-19 pandemic. The method in this study was a true experiment with pretest-posttest control group design. The total participants were 38 male athletes with an age range of 15-18 years (M = 17.3; SD: 1.26). Data analysis in this study is descriptive analysis and hypothesis testing. The results of the study are: 1) For the control group, the statement H₀ "There is no effect of leg muscle power training with leaps on athlete's speed during the COVID-19 pandemic", is accepted. Then, there was a decrease in the mean of 0.23 or 1.78%; 2) For the experimental group, H₁ statement "There is effect of leg muscle power training with leaps on athlete's speed during the COVID-19 pandemic", is accepted. Then supported by an increase in the mean of 0.44 or 3.42%. The conclusion is that there is an effect of leg muscle power training with leaps on athlete's speed during the COVID-19 pandemic. These findings may have implications, namely being a reference for trainers in developing training programs to increase leg muscle power with leaps that seem to be of significant effectiveness. For further researchers, it is hoped that they can modify other types of training and conduct research with a wider sample and population as well as add different variables so that the treatment given is to influence speed through treatment of leg muscle power.

Keywords Limb Muscle Power, Leap Training, Speed,

Athlete, COVID-19

1. Introduction

Speed is one of the biomotor components that an athlete must have in a sport that involves this element [1], [2]. Speed is defined as the amount of displacement made by an object in one unit of time [1], [3]. The running speed of an athlete is influenced by the leg muscle power. This is because power and speed are interrelated biomotor components. Athletes who have strong leg muscle power are able to run more optimally. The importance of training the leg muscle power of athletes in their respective clubs [2], [4].

The current COVID-19 pandemic is a global issue that has affected all aspects of the world, especially sports clubs [5]–[7]. There have been various kinds of training conditions since the pandemic in sports clubs, including: 1) Club and group training has been terminated in accordance with the government policy to prohibit crowd activities, and; 2) Club and group training cannot be continued despite strict health protocols, this is because the competition has not yet started and the sponsoring sponsors have withdrawn [8]–[11]. This condition certainly has to be addressed by athletes by practicing

independently to maintain their physical abilities, especially the biomotor component of speed.

The importance of training leg power muscles to train speed during a pandemic is a real challenge that must be faced by athletes [12]–[14]. One of the trainings that can be done is the leaps training. Leaps training is a form of plyometric training to increase leg muscle power [15]. The implementation of the leaps training is a body position that is upright on one leg while the other leg is bent back, the posture of the hand bent at the side of the body. The legs are supporting jumping forward (on tiptoe) followed by the arms bent at the sides, the posture straight, the hands straight at the sides [1], [15].

Leaps training has an advantage especially during a pandemic like this time. The advantages of leap training include: 1) The ability to gain maximum power because the body weight is lifted with fast and continuous footsteps; 2) Can increase leg muscle power in running speed, and; 3) This training program is deemed suitable to be implemented independently during a pandemic [1], [2], [16].

Based on the existing problems, researchers are interested in conducting further studies on "The Effect of Limb Muscle Power Training with Leaps on Athlete's Speed during the COVID-19 Pandemic".

2. Materials and Methods

2.1. Research Method

This study used a quantitative research approach, then the design used was a true experimental research design with pretest-posttest control group design [17], [18]. The research design is as shown in Table 1 as follows.

Table 1. True experiment pretest-posttest control group design

Treatment Group	M ₁	O ₁	X	O ₂
Control Group	M ₂	O ₁	C	O ₂

Information:

M₁: The subjects of the treatment group with randomized

M₂: The subjects of the control group with randomized

O₁: Pretest

X: Providing treatment

C: Without treatment

O₂: Posttest

2.2. Participant

Participants in this study used 38 male athletes with an age range of 15-18 years (M = 17.3; SD: 1.26). Participants were divided into two groups without being randomized, namely 19 athletes as the treatment group and 19 athletes as the control group. Participants will undergo a pretest, treatment, and posttest in the

participants' home environment. The provisions for the venue can be at home (if it has a large enough hall) and an indoor field. All participants underwent treatment and testing with the guidance of researchers and followed health protocols during the pandemic.

2.3. Instruments

The research instrument used in this study was a 100 meters sprint speed test [19]. The subject ran a sprint from the start point to finish as far as 100 meters. Measurements using a stopwatch with standardized units of time. The test is carried out independently by the athlete assisted by a testor (preferably the closest fellow athlete from where he lives).

2.4. Data Collection Technique

The data collection techniques in this study were carried out by tests and measurements [18]. The data collection process begins with giving an explanation of the test implementation and warming up. Data were collected 2 times, namely at the beginning of the study (pretest) and the end of the study (posttest). Measurements (pretest & posttest) using a stopwatch with standardized units of time for the speed athletes. The control group was left to do the exercises independently without any special treatment (treatment). For the treatment group, after doing the pretest they followed the process of training activities.

Athletes in the treatment group followed a leaps training program with theoretical standards in training including:

1. Explosive training load and speed [1], [20] ie 50-75% intensity, sets of 4-6, intervals of 2-5 minutes, explosive/fast rhythm.
2. How to calculate the Maximum Repetition (RM) is that the athlete does 30 seconds of sprinting.
3. The frequency of training is carried out for 6 weeks with a frequency of training 3 times a week [1].
4. The increase in training load is calculated every 2 weeks by means of the RM test again.
5. The increase in load is individual

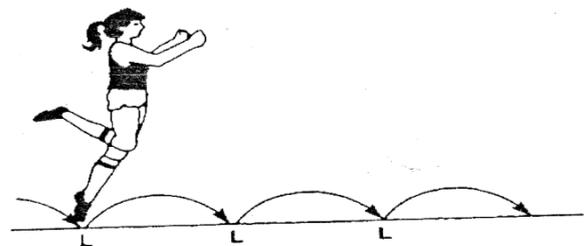


Figure 1. Technique steps in Leaps [15]

2.5. Data Analysis

Data analysis in this study is descriptive analysis and hypothesis testing [18]. Descriptive analysis reveals descriptive data about the control and experimental groups. Then test the research hypothesis using the t-test. The research hypothesis is as follows:

Hypothesis 0 (H0): "There is no effect of leg muscle power training with leaps on athlete's speed during the COVID-19 pandemic".

Hypothesis 1 (H1): "There is an effect of leg muscle power training with leaps on athletes' speed during the COVID-19 pandemic".

3. Results

3.1. Results of Descriptive Data of the Control Group Pretest and Posttest

The results of the descriptive statistics for the pretest and posttest athlete's speed in the control group (n = 19) can be seen in table 2.

Table 2. Statistics Descriptive speed of athlete of the control group athletes

Statistik Deskriptif	Pretest	Posttest
Mean	12.93	13.16
Median	13.16	13.21
Mode	11.29	11.67
Std. Deviation	1.09	1.12
Minimum	11.28	11.67
Maximum	14.42	14.60
Difference in Mean (time)	(+) 0.23	
Percentage of Decrease (speed)	1.78%	

The results of the description show that the pretest to posttest mean (time) from 12.93 increases to 13.16. This means that there is an increase in time 0.23 which means that the speed decreases 1.78%. This means that when viewed from the comparison of the mean, the athlete's speed in the control group experienced a decrease (speed). Further hypothesis testing is needed to strengthen these findings.

3.2. Results of the Experimental Group Pretest and Posttest Descriptive Data

The results of the descriptive statistics for the pretest and posttest athlete's speed in the experimental group (n = 19) can be seen in table 3.

Table 3. Descriptive statistics of the experimental group athlete's speed

Statistik Deskriptif	Pretest	Posttest
Mean	12.86	12.42
Median	12.48	12.34
Mode	11.28	11.07
Std. Deviation	0.99	0.98
Minimum	11.28	11.07
Maximum	11.42	14.28
Difference in Mean (time)	(-) 0.44	
Percentage of Increase (speed)	3.42%	

The results of the description show that the mean pretest to posttest (time) from 12.86 decreased to 12.42. This means that there was a decrease in time 0.44 which means that the speed increased by 3.42%. This means that when viewed from the comparison of the mean, the athlete's speed in the experimental group experienced an increase (speed). Further hypothesis testing is needed to strengthen these findings.

3.3. Hypothesis Testing

The results of the t-test pretest and posttest of the control group as well as the experimental speed of the athletes are presented in table 4. After the t-test results are known, it is followed by hypothesis testing of the control and experimental groups.

Table 4. Hypothesis testing of the control and experiment group athlete's speed

Pretest – Posttest	t	df	Sig. (2-tailed)
Control Group	1,877	18	0.010
Experiment Group	3.753	18	0.000

Based on the calculation of pretest and posttest data in the control group on the the athlete's speed, the value of p = 0.010 was obtained, meaning that $p > 0.005$ so that H0 was accepted and H1 was rejected. So for the control group, the statement H0 "There is no effect of leg muscle power training with leaps on athlete's speed during the COVID-19 pandemic", is accepted.

Based on the calculation of pretest and posttest data in the experimental group on the athlete's speed, the value of p = 0.000 is obtained, meaning that $p < 0.005$, so H0 is rejected and H1 is accepted. So for the experimental group, H0 "There is no effect of leg muscle power training with leaps on athlete's speed during the COVID-19 pandemic", is Rejected. So, H1 statement "There is an effect of leg muscle power training with leaps on athlete's speed during the COVID-19 pandemic", is accepted.

4. Discussion

Leaps training is a practice of jumping bounces on one leg performed repeatedly. With a strong and fast bouncing jump motion, the power elements of the lower muscles are maximally developed, so that adequate leg muscle power is formed [15].

Judging from its implementation, leaps training requires stronger and faster work of the leg muscles in order to be able to jump as high and as far as possible in a sustainable manner [21], [22]. Jumping on one leg is quite a strenuous movement, because the muscles in the leg are required to work to lift the body with one leg and land on one leg as well, so that when landing this leg holds the weight. Jumping with heavy loads and carried out quickly, the leg muscles develop.

With the development of strength and speed of the leg muscles, it will produce adequate leg muscle power [2], [23]. Both force and speed of movement are very important in the principles of plyometric training, especially leaps training. In many cases, the emphasis is on the speed at which a particular action can be performed. Judging from the leaps training movement, this movement resembles a jumping technique (take off), where in the leaps training it is done by jumping using one leg which is done strongly and quickly. Leaps training focuses on bouncing jumping movements that are carried out strongly and quickly, then the elements of the lower muscle power are maximally developed, so that adequate leg muscle power is formed which affects the increase in athlete's speed [1], [15].

The results of the study in the control group showed that the average pretest to posttest (time) from 12.93 increased to 13.16. This means that there was an increase in time of 0.23, which means that the speed decreased by 1.78%. This is in line with the acceptance of the hypothesis H0 that "There is no effect of leg muscle power training with leaps on athlete's speed during the COVID-19 pandemic". The results of the study in the treatment group showed that the average pretest to posttest (time) from 12.86 decreased to 12.42. This means that there was an decrease in time 0.44, which means that the speed increased by 3.42%. This is in line with the acceptance of the hypothesis H1 that "There is an effect of leg muscle power training with leaps on athlete's speed during the COVID-19 pandemic".

A person who has high leg muscle power will easily develop his running speed, both in his reaction speed (at start), acceleration of motion (in the first few meters), basic velocity (as maximum speed) and on his stamina of speed (endurance of speed) when compared to someone who has low leg muscle power [1], [24]. For someone who has high leg muscle power, it will result in a higher stride frequency and a longer stride length when running when compared to someone who has a low stride frequency. This is very useful for producing the maximum

running speed when running because running speed is the result of the frequency of steps and the length of the athlete's stride.

5. Conclusions

Based on the above conclusions, it can be seen that there is an effect of leg muscle power training with leaps on athlete's speed during the COVID-19 pandemic. These findings may have implications, namely being a reference for trainers in developing training programs to increase leg muscle power. The findings of this study can be used as a reference for increasing leg muscle power training with leaps that seem to be of significant effectiveness.

This research is not without limitations in its implementation. Limitations of the study include: 1) The researcher cannot control the athlete's activity outside of training which can affect the test results, such as body condition, psychological factors, and so on; and 2) The fluctuating government policies during the pandemic have a direct and indirect impact on athletes during treatment.

For further researchers, it is hoped that they can modify other types of training and conduct research with a wider sample and population as well as add different variables so that the treatment given is to influence speed through treatment of leg muscle power.

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Conflict of Interest

All authors state that there is no conflict of interest in this study.

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