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Increasing long jump performance through plyometric exercises

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Abstract

Low athlete's long jump performance is attributed to the unsystematic training approach. Therefore, this study aimed to determine the effect of plyometric training on athlete performance. It was a quasi-experiment comprising of 32 athletes who were selected through purposive sampling. The instrument used in the long jump test is under the standard of the Indonesian Athletics Association (PASI), and the data analysis used a t-test. The results of the data analysis showed significant differences in athlete performance before and after plyometric training. This study recommends adjusting athletes' long jump performance using Plyometric Exercises.

Keyword: Plymometrik Exercise, and Long Jump

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Introduction

Long jump is one of athletic sports widely carried out in the community. According to (Iswandi & Purnomo, 2013; Church et al., 2017), long jump is a type of jump number alongside infectious, high, and pole jumps. In this study, jump away involves moving the whole body from certain points by running then rejecting, floating in the air, and landing (Thompson, 2019; Fraser et al., 2019). Generally, it is a movement that requires jump lifting of legs upfront while in the air by making repulsion on one leg to reach the far distance (Later, 2017a; Organism et al., 2019). It is an athletic number that combines speed, strength, and agility to land as far as possible from the point of repulsion (Iswandi & Purnomo, 2013; Qi et al., 2019).

Long jump is divided into four phases, including prefix, repulsion, drift, and landing (Yadav & Paris, 2014; Michailidis, Tabouris, & Metaxas, 2019). Prefix is the initial movement in the form of running to gain the speed for repulsion or jumping. According to (Yadav & Uparosiya, 2014), the purpose of the prefix is to accelerate to a maximum controlled speed when taking off. The higher speed at taking off helps to move to a long distance. The speed attained from the prefix is called horizontal speed and it provides strength for upward repulsion upfront (Stojanović, Ristić, McMaster, & Milanović, 2017; Wyss et al., 2019).

In this study, the squat style long jump number is discussed. According to (Ballesteros, 1993; Church et al., 2017) Squat long jump result from horizontal velocities during prefix with vertical power from the strength of the repulsive leg. In this athletic sport, the implementation of the activity begins with a quick run prefix and then jumping with a body lift movement from one point to another. The techniques in this athletic branch are grouped into several stages (Kariyala, Hobara, & Zushi, 2018; El-Asher, Hassan, Taiar, & Tipp, 2019).

The repulsion or pedestal is a rapid movement between running, starting and floating (Dissent, 1992; Asadi, Ramirez-Campillo, Arazi, & SeAZ de Villarreal, 2018). According to (Hafiz, Arwin, & Shorten, a. a.), footstool or repulsion of the foot needs to be strong to achieve sufficient jump height without losing the forward speed. The purpose of repulsion is to create a vertical impulse through the center of gravity while maintaining balance and control, and involves placing the foot with the knee bent for repulsion with the leg straight. This process is enhanced by lifting the arms and legs (Yadav & Paris, 2014). The repulsion distance is the horizontal length between the prefix line and the jump repulsion board when flying. The jumper distance starts at the center of the moving mass from take off to Jump landing (Wakai & Linthorpe, 2005; Kim et al., 2018).

The jumper needs to reach the furthest distance by not losing body balance when landing (Dissent, 1992; Stojanovic et al., 2017; Wilke et al., 2019). The main goal is to avoid falling back into the pit. Essentially, the pit measures leap from the location where the body contacts the sand closest to the take off point (Yadav & Paris, 2014; Karcher & Buchheit, 2017). When jumping at a low take off angle, there is a high horizontal speed at landing. For this reason, the feet can be far in front of the body without the risk of falling backward. (Lutheran, N. P., Guzman, M. S., & Bridgett, 2005) (Marchant, Griffith, Partridge, Beesley, & Porter, 2018; Tufano et al., 2018). One might appear to be falling backward and to prevent this, the point of weight needs to be brought to the front by bending for the body and knees to dock. Several factors influence the ability of a jumper, including speed, explosive strength of leg muscles, flexibility and coordination of motion (Yani, 2015; Seattle, phylogeny, Koski, Ojanen, & Carolinian, 2019; Cohen & Negra, 2017).

Plyometric training is often used in connecting repetitive jump and movements or stretch strain reflexes from the muscles to produce explosive reactions (Radcliffe, J., & Farentino, 2015; Beato, Bianchi, Cortella, Merlini, & Durst, 2018). This is based on the plyometric training on individual prerequisites (Froelich, M., Felder, H., & Reuter, 2014). It is important to ensure that the level of stimulation and scope of training does not cause very tight artificial structures. The long jump performance increase during the simulation competition when the oligomeric conditioning exercise is carried out 3 minutes before each experiment. This improvement is attributed to the progressive increase in the vertical speed of takeoff, while there is no effect on horizontal speed (Bodanis, G. C., Tsokkos, A., & valgus, a. a.; Whitehead, Schett, Michigan, & Martin, 2018; McKinlay et al., 2018).

Depth jump exercise refers to the training which starts with standing on a high gymnastic box (65-75 cm), falling to the mat on the floor with two legs, and jumping upfront before returning to the top of the box to for the next jump. This activity is often carried out in the determined stimulus (Radcliffe, J., & Farentino, 2015; Silva, Neiva, Marques, Izquierdo, & Marinho, 2018). Depth jump training requires one to jump down as fast as possible. It is similar to a long jump where after starting the prefix the student makes a repulsion on the board and jumps as far as possible. It is supposed to be conducted to improve jumping ability (Earp, Newton, Cormie, & Blazevich, 2017; Settle et al., 2019).

Method

This was a quasi-experiment focusing on the difference in the long jump performance of athletes in SMP Negeri 3 Batang Kapas after being subjected to plyometric exercises. The population involved 58 students, though 32 were selected through purposive sampling technique. The preliminary data was obtained by measuring the ability of athletes of State Junior High School 3 Batang Kapas with a long jump test under the standards union of every Indonesian athletic (PASI). Each exercise was conducted in 16 meetings with a frequency of three times a week and a duration of 60 minutes per meeting. After a plyometric exercise, the final test out with the long jump test was conducted. This was meant to determine the difference in the increase in students' abilities after taking part in the training (Negra et al., 2017). T-test was used to analyze the data as a prerequisite for the analysis of the normality test with the piliform and the variance homogeneity tests with the F test at the confidence levels a = 0.05.

Results and Discussions

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Based on the experimental research design, there are two groups of data described separately.

Table 1. Long Jump Performance Data Pretest- Posttest after plyometric

No	Group	N	Highest score	Lowest score	Average	Standard Deviation
1	Pretest	32	400	320	350,31	22,91
2	Posttest	32	410	320	374,66	22,53

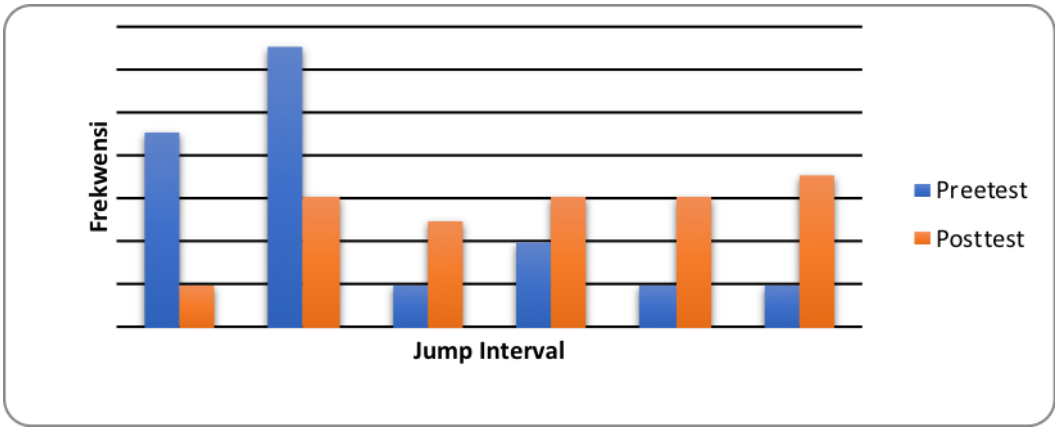
Table 1 shows an increase in scores before and after since the high score increased by 10 points. The average score also increased. The distribution of long jump performance data is described in the frequency distribution table below:

Table 2. Distribution of long jump performance data

Interval Class	Pretest	Percentage	Posttest	Percentage
(320 - 335)	9	28.13%	2	6.25%
(336 - 351)	13	40.63%	6	18.75%
(352 - 367)	2	6.25%	5	15.63%
(368 - 383)	4	12.50%	6	18.75%
(384 - 399)	2	6.25%	6	18.75%
(400 - 415)	2	6.25%	7	21.88%
Total	32		32	

Table 2 shows the long jump performance improved between before and after the training. The difference is in the pretest and posttest columns, where the interval class increases significantly in the posttest, proving that Plyometric training improves long jump performance.

The frequency distribution of achievement motivation scores can also be seen in the diagram below:



Picture 1. Long jump performance chart

As an analysis prerequisite test, normality and homogeneity were conducted. The normality test in the two groups of pretest and posttest data is normally distributed while the homogeneity test results of all analysis groups show they were homogeneous. Research hypothesis testing used a t-test with a = 0.05. The

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results of the analysis of the hypothesis show 1) there are significant differences in the long jump performance before and after a plyometric exercise; 2) the athlete's long jump performance after a plyometric training is better than before the training.

A good and appropriate form of training is an important thing a trainer needs to choose and design since it affects the athlete's long jump ability. Plyometric exercises increase the explosive power. This study used depth jump training, which is the most popular form of limb Plyometric exercise meant to develop the ability of explosive limb muscles. In case it is good and correct, it produces maximum leg muscle strength. During the long jump, explosive power is a very supportive physical condition and increases the long jump ability if it is good.

Conclusions

From this study, the following conclusions are drawn 1) There are significant differences in long jump performance before and after plyometric exercises; 2) The athlete's performed better after plyometric training than before the training. To improve performance, a plyometric needs to be used.

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