

The Effect of Combination of Plyometric Exercises on Normal Smash Skills in the Review of Leg Muscle Strength



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ABSTRACT: The aim of this study to find out the effect of the combination of plyometric exercises on normal smash skills in terms of leg muscle strength. The method in this study using the experimental method uses a 2 x 2 factorial design. This method is validation, namely testing the effect of one or more variables on other variables. The number of samples in this study were 60 people divided into 2 groups by ordinal pairing and each got 20 athletes with high limbs, 20 athletes with low muscles and 20 athletes without treatment. And the jump height was measured in each group before and after being given the plyometric depth jump exercise treatment. Based on the results of the study, it shows the effect of a combination of plyometric exercises on normal smash skills in terms of leg muscle strength. The average jump height in the group (Plyometric jump and high jump Depth) increased from 52.20 to 61.60 in the A1B1 group, in the A2B1 group from 155.85 to 170.25. While the average jump height in (Plyometric jump and low depth jump groups) also increased from 32.50 to 45.00 in the A1B2 group, in the A2B2 group it also increased from 113.05 to 131.64. The results of the effect test in the treatment group and the control group showed a significant value ($P < 0.005$). The results of the different effect test showed that there was a different effect between the treatment group and the control group in increasing jumps. There is a significant effect between Plyometric exercises (box jumps and depth jumps) and leg muscle strength (high and low) on the increase in leg muscles in athletes. The results showed that the box jump training method was a more effective method used for athletes who had low leg muscle strength and depth jump training was used for athletes who had high leg muscle strength.

KEYWORDS: Plyometrics, Volleyball, Leg Muscle Strength

I. INTRODUCTION

Volleyball is a sport played by two opposing teams, each with six players. According to Mulyadi, & Pratiwi (2020: 1) Volleyball is a sport that is known by all levels of society, both men and women, young, adults and old, as well as between villages and the world, because in volleyball there are many competitions. It turns out that this volleyball game is a combination of several big ball games which are combined into one, namely basketball, baseball and handball.

As a result of the Covid-19 pandemic, the quality of service for all supporting training venues such as public facilities, stations, sports fields, running tracks and swimming pools cannot be used for training. (Yildi z, K., Polat, E. and Güzel, p. 2018). Especially in this era of increasingly fierce competition, everyone is increasingly aware of the importance of loyalty in continuing current operations. When training is carried out, there is a strong and positive relationship between the quality of service facilities and athlete loyalty, the quality of service facilities at training venues affects athlete satisfaction. (Napitupulu, D., Rahim, R., Abdullah, D., Setiawan, M. I., Abdi Ilah, L. A., Ahmar, A. S & Pranolo, A. 2018).

Complex learning is a popular learning method that is widely used in practical situations and has been tested in several studies. Although most sports scientists and coaches agree that resistance training and plyometric training should be included in an athlete's training to increase muscle strength, data on the effectiveness of complex exercises as appropriate training methods are conflicting. Prior literature on compound training has shown increased athletic performance, although the opposite has been reported. A possible explanation for these conflicting results could be the role of variables such as the size and shape of the exercise with the initial weight, the rest interval between resistances, and the plyometric component of compound exercises. In addition, a participant's gender, fitness, age, and fitness level can also affect the benefits of holistic practice. (Annadurai, R., & Kalarani, A., 2021).

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To achieve high muscle strength and explosive power, plyometric training must be done quickly. Plyometrics trains the muscles to pre-stretch before jumping. This stretching causes the muscle to store potential energy, which helps it jump higher. For example, if an opponent's movement causes you to jump early, elastic energy is stored in the soleus and medial gastrocnemius muscles. This exercise trains fast-twitch muscle fibers and activates nerves and reflexes, making it one of the most important tools for increasing strength and speed. In the plyometric method, each exercise or activity is designed to increase the player's explosive response through vigorous muscle contraction, an increase in response occurring as a result of a rapidly eccentric contraction. (Harmandeep, S., Satinder, K., Amita, R., & Anupriya, S., 2015).

The leg strength needed to perform the smash technique plays an important role in the success of the kick. According to Hamonangan, M., & Wellis, W. (2020) The long jump exercise significantly increases the explosive power of the leg and hip muscles, especially the glutes, gastrocnemius, biceps femoris, glutes, brevis soleus, extensors, and abdomen at high speed and full of energy.

The strength of a person's limbs is influenced by the strength of the leg muscles. Strength is the ability of a muscle or muscle group to perform a single maximal contraction under pressure or load. It is this muscle strength that strengthens athletes to perform movements in any sport (Suchomel, T. J., Nimphius, S., Bellon, C. R., & Stone, M. H., 2018).

II. METHODOLOGY

The type of research used is an experiment using a 2 x 2 factorial design. This method is validation, namely testing the effect of one or more variables on other variables. Payadnya, I. P. A. A., & Jayantika, I. G. A. N. T. (2018). The experimental method is aimed at examining causal relationships by manipulating one or more variables in one (or more) experimental group and comparing the results with the control group which did not experience manipulation. . In this research design, there were 2 groups that received different treatment, namely the administration of Plyometric box jumps and depth jumps. This research will be conducted at UPT SMK Negeri 1 Selayar, Selayar Islands Regency, South Sulawesi Province and will be carried out for 6 weeks with 3 exercises a week from February to March. The population in this study were volleyball athletes at UPT SMK Negeri 1 Selayar who joined and practiced actively, totaling around 60 athletes. The sampling technique in this study used a random sampling technique where the samples were taken randomly. The sample size in this study was 57 people divided into 2 groups by way of ordinal pairing and each got 20 athletes with high limbs, 20 athletes with low muscles and 20 athletes without treatment. The manipulative independent variables in this study were Plyometric Box Jump and Depth Jump while some of the attributive independent variables were leg muscles. Then the dependent variable is leg strength.

III. RESULTS AND DISCUSSION

1. Description of Research Data

Table 1 shows the results of the Descriptive Statistics of the Pretest and Posttest of the Leg Muscles. In the first stage, the Pretest was carried out to obtain initial data for assessing leg muscle strength in February 2023. The second stage of this research was to carry out the treatment, this study lasted 1 month and 2 weeks.

Table 1. Description of Research Data

Group	N	Minimun	Maxsimum	Mean	Standar Deviasi
Pretest A1B1	20	35	68	52.20	9.908
Posttest A1B1	20	48	79	61.60	9.870
Pretest A2B1	20	130	198	155.85	18.689
Posttest A2B1	20	142	210	170.25	17.956
Pretest A1B2	20	23	45	32.50	7.156
Posttest A1B2	20	30	62	45.00	9.984
Pretest A2B2	20	95	129	113.05	10.180
Posttest A2B2	20	108	160	131.65	15.551

Based on the table above, it shows that the leg muscle strength of the A1B1 group had an average pretest of 52.20 and experienced an increase in the posttest of 61.60, the A2B1 group had an average pretest of 155.85 and experienced an increase in the posttest of 170.25. The A1B2 group had an average pretest of 32.50 and experienced an increase in the posttest of 45.00, the A2B2 group had an average of 113.05 and experienced an increase in the posttest of 131.64.

2. Normality Test

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The data normality test in this study used the Shapiro - Wilk method. The results of the data normality test carried out in each analysis group were carried out with the SPSS version 22.0 for windows software program with a significant level of 5%.

Table 2. Normality Test

Kelompok	P	Signifikan	Keterangan
Pretest A1B1	0.197	0.05	Normal
Posttest A1B1	0.149		Normal
Pretest A2B1	0.186		Normal
Posttest A2B1	0.565		Normal
Pretest A1B2	0.128		Normal
Posttest A1B2	0.318		Normal
Pretest A2B2	0.206		Normal
Posttest A2B2	0.240		Normal

Based on the statistical analysis of the normality test that was carried out with the Shapiro - Wilk test, on all pretest and posttest data on leg muscles, the results for Group P were significant. Posttest A1B2 0.318 Normal Pretest A2B2 0.206 Normal Posttest A2B2 0.240 Normal 0.05 Table 8. Summary of Normality Test Results 94 normality test data significance value $p > 0.05$, which means the data is normally distributed.

3. Homogeneity Test

The homogeneity test was carried out to test the similarities of several samples, namely homogeneous or not. The homogeneity test is intended to test the similarity of the variants between the Pretest and Posttest. Based on the statistical analysis of the homogeneity test which was carried out using the Levene Tests. The calculation results obtained a significance value of $0.492 \geq 0.05$. This means that the data group has homogeneous variants. Thus the population has the same variance or homogeneity.

Table 3. Homogeneity Test

F	df1	df2	Sig.
0.736	3	156	0.392

From the results of the study, three groups of conclusions were analyzed, namely (1) the difference in the effect of Plyometric box jumps and depth jumps on increasing leg muscles; Based on the hypothesis testing, it is known that there is a significant difference in the effect of Plyometric box jump and depth jump exercises on increasing leg muscle strength in athletes. The box jump training group was lower compared to the depth jump group on increasing leg strength, (2) The difference in the effect between athletes who had high and low leg muscle strength on increasing leg muscle strength in athletes; The results of the analysis show that there is a significant difference in the effect of athletes who have high and low leg muscle strength on the increase in athlete's leg muscle strength. Athletes who have high leg muscle strength are higher (good) compared to athletes who have low leg muscle strength in terms of increasing leg muscle strength. (3) The effect of Plyometric exercises (box jumps and depth jumps) and leg muscle strength (high and low) on increasing leg muscle strength in athletes; Based on the results that have been put forward in the results of this study that there is a significant effect between Plyometric exercises (box jumps and depth jumps) and leg muscle strength (high and low) on increasing leg muscle strength in athletes. The results showed that the box jump training method is a more effective method for athletes who have low leg muscle strength and depth jump training is more effective for athletes who have high leg muscle strength. From the results of the influence form it appears that the main factors of the study in the form of two factors show a significant influence. In the results of this study influence which means that each cell or group has a different effect on each group that is paired.

Athletes who have high leg muscle strength are better than low leg muscle strength on leg muscle strength. Muscle strength can be influenced by two components, namely strength and speed, both the speed of nerve stimulation and the speed of muscle contraction. The explosive muscle power generated by the leg muscle strength has an effect on the transfer of horizontal to vertical momentum. This will affect the thrust generated from the change in momentum, because the characteristic of the jump is that the repulsive movement must be carried out by directing the explosive power of the muscles. Explosive power is the product of the two components of the physical condition, namely strength and speed which are formulated; $\text{power} = \text{force (strength)} \times \text{Velocity (speed)}$. From this formula it can be concluded that explosive power cannot be separated from explosive power, namely strength and speed, so the main factors for explosive power are strength and speed, where all the factors that affect the two components of the physical condition mentioned above. Explosion power. (Widiastuti, 2015:60).

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IV. CONCLUSIONS

Based on the research results and the results of data analysis that has been done, the following conclusions are obtained

1. There is a significant difference in the effect of Plyometric box jump and depth jump exercises on increasing leg muscle strength in athletes. The box jump exercise group was lower compared to the depth jump exercise group in terms of increasing leg muscle strength.
2. There is a significant difference in the effect of athletes who have high and low leg muscle strength on increasing leg muscle strength in athletes. Athletes who have higher leg muscle strength (good) compared to athletes who have low leg muscle strength increase in leg muscle strength.
3. There is a significant effect between Plyometric exercises (box jumps and depth jumps) and leg muscle strength (high and low) on the increase in leg muscles in athletes. The results of the study show that the box jump training method is a more effective method used for athletes who have low leg muscle strength and depth jump exercises are used for athletes who have high leg muscle strength

RECOMMENDATION

Based on the results of the research, the trainers and other researchers were given the following suggestions:

1. Trainer Based on the results of the research that has been done, it proves that the box jump training method is more effective than the depth jump. it is suggested to the coach, to use the box jump method to increase leg muscle strength.
2. For further researchers
 - a. Based on the results of this study, it is proven that the box jump training method is a more effective method for athletes who have low leg muscle strength and depth jump training is more effective for athletes who have high leg muscle strength. This is an empirical study that can be used by researchers in innovating to improve leg muscles.
 - b. For researchers who intend to continue or replicate this research, it is recommended to exercise tighter controls in the entire series of experiments. These controls are carried out to avoid threats from validity and internal

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