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The Effect Of Pliometric Depth Jump Training On The Jump Height Of Volleyball Extracurricular Participants At SMAN 5 Malang In The 2024/2025 School Year

Danang Dwi Prasetyo[1]
[1]Department of Sports Science, Faculty of Sports Science, State University of Malang, Malang, Indonesia
Corresponding Author : danangp639@gmail.com

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ABSTRACT

Jumping ability is one of the main components in a volleyball game, especially during smash, block, and serve. Optimal jump height provides a competitive advantage, both in attack and defense. This study aims to determine the effect of pliometric depth jump training on the jump height of volleyball extracurricular participants at SMAN 5 Malang in the 2024/2025 school year. Pliometric depth jump training was chosen because it was proven to have an effect in increasing leg muscle strength, and explosive power. This study used an experimental method with a one group pre-test-post-test design. The population in this study were 10th grade students who were members of volleyball extracurricular activities at SMAN 5 Malang, with a total sample of 25 students. The training program was carried out for six weeks with a frequency of three times per week on Monday, Wednesday, Friday. The vertical jump test was used to measure jump height before and after the training program. The data obtained were analyzed using paired sample t-test with the help of SPSS software. The results showed an increase in jump height after the subject received treatment in the form of pliometric depth jump training. The average increase in jump height was 3-5 cm. The statistical test resulted in a significance value of <0.001, which indicates the effect of pliometric depth jump training on the vertical jump ability of volleyball extracurricular participants of SMAN 5 Malang. In addition, the results of this study indicate that pliometric depth jump training can also improve athletes' body coordination, balance, and reaction time, which are important elements in volleyball. Based on the results of the study, it can be concluded that the depth jump pliometric training program is effective for increasing the jump height of volleyball extracurricular participants of SMAN 5 Malang.

Keywords: Pliometric Depth Jump, Jump Height, Volleyball

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Introduction

The game of volleyball is one of the most popular sports abroad as well as in Indonesia, known for the technical and physical skills required. Volleyball games are played in teams of 6 people both offensively and defensively (Arif & Alexander, 2019). Volleyball can be said to be a sport that hones skills and relies on jumps when playing, jump height is one of the key factors that can affect the performance of players in various aspects of the game, such as spike, block, and serve. Volleyball games can also improve physical health, and achievement in its players (Susilawati & Primayanti, 2019). In a volleyball game, optimal jumping ability is needed. Optimal jumping ability allows volleyball players to perform stronger smashes and more effective blocks, which in turn improves overall team performance (Asota et al., 2022). Good jumping height not only helps in performing powerful attacks but is also important in defense, specifically when blocking opponent's attacks. Therefore, training that aims to increase jump height is

very important in the development of volleyball players' skills.

One training that can be used to increase jump height is pliometric training. Pliometric training is a training method that focuses on increasing explosive power and muscle strength through rapid eccentric and concentric movements (Susanti et al., 2021). Eccentric movement is a type of muscle contraction in which the muscle lengthens when producing force or movement while concentric movement is a type of muscle contraction shortens when producing force or movement (Perikles et al., 2016). This method is known to be effective in improving the performance of players in sports that require high jumping strength. Pliometric training significantly increases muscle strength through increased muscle reactivity and mechanical efficiency, which is important in sports with explosive strength requirements such as volleyball (Yanti et al., 2021). These exercises include various techniques, such as jumps and other fast movements, which can increase anaerobic capacity and explosive power. In volleyball, pliometric exercises play an important role in improving players' jumping which is one of the keys in volleyball games.

One of the pliometric techniques that can increase jump height is the depth jump. This technique involves jumping from a certain height and thereafter performing a vertical jump after landing. Depth jump increases muscle strength and mechanical efficiency by stimulating reflex responses that increase explosive power, so it is very useful for athletes who need high jumps such as volleyball players (Netti Afrina, 2019). By analyzing the jump height with depth jump training, it is hoped that it will be able to help players to know, understand, and increase knowledge related to the effect of depth jump pliometric training on jump height. Because jump height greatly affects when playing, especially in terms of serve, block, and spike. Pliometric exercises are needed in volleyball to increase the jump height of volleyball participants. Volleyball is one of the extracurricular programs at SMAN 5 Malang. Volleyball extracurricular program is one of the efforts of SMAN 5 Malang to develop students' talents. Therefore, the researcher wants to know the effect of pliometric depth jump training on jump height performed by volleyball extracurricular at SMAN 5 Malang.

Based on the problems that have been described above regarding pliometric depth jump training on jump height, the researchers conducted a study with the title "The Effect of Pliometric Depth Jump Training on Jump Height of Volleyball Extracurricular Participants of SMAN 5 Malang Academic Year 2024/2025" and the researchers tried to find out the effect of pliometric depth jump training on the jump height of volleyball extracurricular players at SMAN 5 Malang. So that later the volleyball extracurricular participants can find out the effect of pliometric depth jump training on jump height. As well as to develop and update from previous research data.

Methodology

Research Location

This research was conducted at SMAN 5 Malang which is located at Jl. Tanimbar No. 24, Kasin, Kec. Klojen, Malang City, East Java 655117, Indonesia.

Research Design

The research method that researchers use in this study is experimental research method. The research design in this study is quantitative research using the pre-experimental design method of the one group pretest-posttest type (single group pretest-final test). This one group pretest-posttest design consists of one group that has been determined. In this design, two tests are carried out, namely before being given treatment called pre-test and after treatment called post-test. The research pattern for the one group pretest-posttest design method according to (Jafar, 2021).

Population and Sample

This study used a population of 10th grade male volleyball extracurricular participants at SMAN 5 Malang with a total of 25 participants. The sample used in this study is the entire population is a sample because the population is less than 100 population, so the sample amounted to 25 volleyball extracurricular participants in grade 10 of SMAN 5 Malang in the 2024/2025 school year.

Data Collection Technique

Data collection techniques are an important stage in the conduct of research. This process is very important because the main purpose of research is to obtain the necessary information. In this study, data was collected by measuring jump height before the subject was given treatment (pre-test). After that, the subject will be given a depth jump training program to increase jump height. The treatment is given for 6 weeks, with three meetings a week. After that, the subject will be given a test to find out how much influence the depth jump training program has on the jump height of volleyball extracurricular SMAN 5 Malang, so that the research is carried out which is divided into several stages, namely one time taking initial data (pre-test), 16 times treatment (treatment) in one week three times a meeting, and one time taking final data (post-test), in 6 weeks carried out on Monday, Wednesday, and Friday in each week, during the 6-week meeting. Other days besides Monday, Wednesday, and Friday can be used to recover the body in order to adjust to the exercises to be given (Arikunto, 2010).

Result

Data Normality Test

Table 1. Normality Test

Normality Test	Statistic	Df	*Sig*
Vertical Jump result	0.970	25	0.641

From the results of the normality test using the Shapiro-Wilk method, the following data were obtained, on the vertical jump results, the Shapiro-Wilk statistical value was 0.970 with a df of 25, and a significance value (Sig.) of 0.641. Because the significance value of 0.641 is greater than the significance level of 0.05, it can be concluded that the vertical jump data is normally distributed.

Homogenity Test

Table 2. Homogenity Test

Homogenity Test	F	F Table	Sig.
Vertical Jump result	-26.116	4.04	0.695

From the results of the analysis, the Homogeneity Test in this study obtained F count (-26.116) < F table (4.04) with these results, the variance in this study is homogeneous.

Hypothesis Test with T-Test

Table 3. Hypothesis Test with T-Test

Homogenity Test	Df	Sig.
Vertical Jump result	24	0.001

From the T test analysis data, the results of the significance value of <0.001 are obtained because the value of Thitung (-24.137) > Ttable (1.710) is found, then H0 is rejected and the significance (<0.001) < (0.05) then H1 is accepted so that it can be said that there is an effect of pliometric depth jump on jump height on volleyball extracurricular participants in class 10 of SMAN 5 Malang Academic Year 2024/2025.

Dicussion

Volleyball is one of the most popular sports abroad as well as in Indonesia, known for the technical and physical skills required. The game of volleyball is played in teams of 6 people both offensively and defensively. Volleyball can be said to be a sport that hones skills and relies on jumping while playing, jumping height is one of the key factors that can affect the performance of players in various aspects of the game, such as spike, block, and serve.

Optimal jumping ability allows volleyball players to perform stronger smashes and more effective blocks, which in turn improves overall team performance (Asota et al., 2022). According to (Islamabad et al., 2024) the efficiency of a technique after 6 weeks of training serves as a physical and mental regeneration of the core nervous system before the next training. As explained (Husaini, n.d.) the effectiveness of the minimum frequency of exercise is 3 times a week which is most often done and most effective consistently done more often also has a good impact on certain sports. In the sport of volleyball, participants must have a good jump height to support the game because volleyball is a game that relies on jumping while playing, so it needs proper training to increase jump height in volleyball extracurricular participants of SMAN 5 Malang.

Plyometric training is mostly defined by names such as elastic strength training,

reactive training and eccentric training. It is also divided into several subscales such as jump depth and stroke method. Plyometric training is aimed at maximizing muscle strength with a short duration (Çimenli et al., 2016). Plyometric training can increase nerve-force reaction activity. Furthermore, plyometric training is stated to develop vertical jumping skills (Çimenli et al., 2016).

Depth Jump is an intense training movement and its main focus is to train the strength and coordination of the muscles of the lower body. When performing a depth jump, a person will descend from a higher place to a lower surface, then immediately jump as hard as possible upwards once they touch the ground (Louder et al., 2023). Depth jump training is beneficial in increasing strength in muscle groups by allowing maximum power generation. This is achieved through stimulation of the mechanoreceptors, which helps increase muscle recruitment in a short period of time. Increased motor neuron excitability, increased motor unit recruitment, or increased synergistic activation all result in increased strength through training such as that resulting from the depth jump leading to an increase in overall muscle strength, which demonstrates the effectiveness of the depth jump in increasing muscle strength which contributes to improved overall athletic performance and reduced injuries.

In volleyball games, strong and trained muscles are needed, because this sport requires speed, agility, coordination, quick reactions, and balance (Pardiman et al., 2021). The muscles involved in pliometric depth jump training are the muscles of the lower body, especially the leg muscles. Leg muscles that play a role in pliometric depth jump training such as the quadriceps muscle (quadriceps), hamstring muscle (hamstring), calf muscle (calf), hip muscle (hip), and gluteus muscle (glute). (Sari et al., 2020) stated that plyometric depth jump training can increase vertical jump. This happens because this exercise can increase muscle strength including hamstrings muscles (semimembranosus, semitendinosus, biceps femoris), quadriceps (vastus medialis, vastus intermedius, vastus lateralis, rectus femoris), gluteus medius, and gluteus maximus along with other muscles namely calf muscles (gastrocnemius, soleus), adductor muscles effectively to improve performance and muscle skills when carrying out vertical jumps.

A number of results from several previous studies state that pliometric depth jump training can have an effect on increasing leg muscle explosive power for 6 weeks (Fitrianto et al., 2021). Increased myoglobin in muscles that function to bind oxygen can occur through physical activity that is carried out regularly. This activity can increase the amount of myoglobin by about 13%-14%, so that the ability of muscles to bind oxygen also increases. This results in an increase in the number and size of mitochondria, which act as energy producers (ATP). This results in increased muscle explosive power, which in turn can increase jump height.

Plimoterik depth jump training has a neurophysiological basis related to proprioceptors in the body, such as muscle spindles, golgi tendon organs, and mechanoreceptors found in joint capsules and ligaments. These receptors play a role in facilitating and modulating agonist and antagonist muscle activity. When the muscle spindle is stretched, afferent nerve excitability increases. The strength of the signal sent to the spinal cord by the muscle spindle is influenced by the speed of stretching that occurs. The faster the stretch, the stronger the neurological signal generated by the muscle spindle, which ultimately increases muscle contraction and results in a higher jump. In addition, plyometric depth jump training also stimulates adaptation of the neuromuscular system, which contributes to improved intermuscular coordination. Maximum intermuscular systematics will cause muscle fibers to respond simultaneously and provide strong and fast movements (Sari et al., 2020).

A number of studies have shown the effect of pliometric depth jump training on jump height. Research conducted by Saputra in 2024, showed that there was a significant effect of pliometric depth jump training on jump height. In addition, research conducted by Wea & Samri in 2022 also revealed that pliometric depth jump training can increase jump height in volleyball players. These findings indicate that pliometric depth jump can be one of the optimal training methods to improve vertical

jumping ability, especially in the context of sports and physical activity.

Conclusions

The provision of pliometric depth jump training consistently has an influence on the jump height of volleyball extracurricular players of SMAN 5 Malang in the 2024/2025 school year. With this research, it is hoped that it can provide practical guidance for coaches in designing structured training programs and enriching insights into the benefits of pliometric depth jump training in developing the abilities of volleyball athletes.

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