



The Effect of Plyometric Training Program on Increasing Vertical Jump Ability in Volleyball Players

Ahmad Muchlisin Natas Pasaribu ^{*a,b,c,d,e}

Sports Coaching Education, Bhayangkara Jakarta Raya University, Jl. Raya Perjuangan No. 81 Marga Mulya
Bekasi Utara Jawa Barat, 17143

e-mail: ahmad.muchlisin@dsn.ubharajaya.ac.id

Abstract

Purpose – This study aims to examine in depth the effect of plyometric training programs on improving vertical jumping ability in volleyball players. **Design/methodology/approach** – The research approach used in this study is a quantitative approach. This type of research is a quasi-experimental. This research method involves a pre-test and post-test design with a control group. The population in this study is all high school level volleyball athletes in Bekasi city. Sample of 30 students. The data collection techniques used include vertical jump ability. The data analysis techniques used are descriptive and inferential statistical analysis. **Findings** – This study proves that a plyometric training program significantly improves vertical jumping ability in high school level volleyball athletes in Bekasi city. The experimental group who underwent plyometric training showed a significantly greater increase in vertical jump height compared to the control group who underwent conventional training. These findings support the theories of muscle adaptation and the stretch-approach cycle, and are consistent with previous research showing the effectiveness of plyometric training in improving athletic performance. **Limitasi/Novelty**– Although this study has limitations, such as the small sample size and short duration of the intervention, the results provide strong empirical evidence that plyometric exercises can be an important component in volleyball training programs to optimize vertical jump performance.

Keywords: Plyometric Training; Vertical Jump; Ability; Volleyball Players

Corresponding Author

email: ahmad.muchlisin@dsn.ubharajaya.ac.id

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A. Introduction

Volleyball is one of the most popular sports around the world, which demands high physical, technical and mental abilities from its players (Yahya et al., 2020). One of the most crucial physical abilities in volleyball is the vertical jump (Syamsi et al., 2021). A good vertical jump is essential for performing various basic techniques in volleyball such as blocking, spiking, and serving (Carvalho et al., 2021). Therefore, improving vertical jumping ability is the main focus in the training program for volleyball athletes.

Plyometric training is one training method that has been proven effective in improving vertical jumping ability (Sinulingga et al., 2023). Plyometric training involves a series of explosive movements that aim to increase muscle strength, speed, and explosive power (Suchomel et al., 2016). It utilizes the stretch-shortening cycle of the muscle, which allows the muscle to produce more force in a short period of time (Juntara, 2019).

Various studies have shown that plyometric training programs can significantly improve muscle strength and athletic performance (Sinulingga et al., 2023). However, although the benefits of plyometric training have been documented

in a variety of sporting contexts, specific research exploring its effects on volleyball players' vertical jump ability remains relatively limited. Most of the existing research has focused on athletes from other sports such as basketball or athletics, which also require high jumping ability.

The problems faced by volleyball athletes in Bekasi city are very diverse, including aspects of facilities, training, support, and physical condition. One of the main problems is the lack of adequate training facilities. Many volleyball courts do not meet international standards, both in terms of court surface quality, net height, and lighting. This negatively impacts the quality of training and potentially increases the risk of injury. In addition, not all volleyball clubs or teams in Bekasi have access to experienced professional coaches. Many teams are still handled by coaches with limited knowledge and skills, so the training programs provided may not be optimal and less effective in improving athlete performance.

Minimal financial support is often a big obstacle to the development of volleyball athletes in Bekasi. Many clubs and athletes have difficulties in terms of funding to buy quality training equipment, participate in tournaments, or even just to cover the team's daily operational costs. In addition,

some volleyball teams in Bekasi do not have a structured and well-planned training program. Training is often done without clear objectives and without adequate evaluation, so the results obtained are not maximized. This also includes the lack of specific programs such as plyometric exercises that can improve vertical jumping ability.

Health and recovery aspects are often neglected. Many athletes experience overtraining due to busy training schedules without adequate rest time and effective recovery programs. This can lead to injury and reduce the athlete's performance in the long run. In addition, motivation and mental support are also important issues. Pressure to perform, lack of support from family or community, and the lack of mental coaching programs can affect athletes' morale and performance. Overall, these various problems need serious attention to improve the achievements of volleyball athletes in Bekasi city.

The importance of this research is also reinforced by the fact that vertical jumping ability in volleyball not only affects individual player performance, but also overall team performance. Teams with players who have good vertical jumps tend to have a significant competitive advantage, especially in critical game situations such as blocking and spiking.

On the other hand, the implementation of a plyometric training program must be done carefully, given the potential risk of injury that can occur due to explosive movements and high training intensity. Therefore, a specifically designed and measured training program is needed to optimize results and minimize the risk of injury to players.

This study aims to examine in depth the effect of plyometric training programs on improving vertical jumping ability in volleyball players. Through this research, it is hoped that empirical data can be obtained that supports the effectiveness of plyometric training and provides practical guidance for coaches and athletes in designing effective and safe training programs.

B. Methods

The research approach used in this study is a quantitative approach, which aims to measure the effect of a plyometric training program on improving vertical jumping ability in volleyball players. This type of research is a quasi-experimental, in which researchers will observe the effects of a special treatment, namely a plyometric training program, on the dependent variable, namely the vertical jumping ability of volleyball players.

This research method involves a pre-test and post-test design with a control group. The population in this study is all high school level volleyball athletes in Bekasi city. From this population, the sample will be selected by purposive sampling, which means that the researcher will select subjects according to certain criteria, such as age, gender, and skill level of playing volleyball. The sample will be divided into two groups: an experimental group that will receive a plyometric training program and a control group that will undergo a regular training program without plyometric.

The data collection techniques used include vertical jump ability tests conducted before and after the training program intervention. The measuring instrument used is a standardized vertical jump measuring device to ensure data accuracy and consistency. In addition, data will also be collected through direct observation during training sessions to ensure compliance with the established training program.

The data analysis techniques used are descriptive and inferential statistical analysis. Descriptive analysis will be used to describe the sample characteristics and

vertical jump test results, while inferential analysis, such as the t-test for paired samples, will be used to test the research hypotheses and determine the significance of differences between the experimental and control groups before and after the intervention. The results of this analysis are expected to provide a clear picture of the effectiveness of the plyometric training program in improving vertical jumping ability in volleyball players in Bekasi city.

C. Result and Discussion

Result

The results of this study are presented based on data collection and analysis from the experimental group and control group. The data obtained through the vertical jump ability test before and after the intervention of the plyometric training program were analyzed to determine the effectiveness of the program.

The sample consisted of 30 high school volleyball athletes in Bekasi city, which were divided into two groups: 15 athletes in the experimental group and 15 athletes in the control group. The following table shows the results of the vertical jump test (in cm) before and after the intervention:

Table 1. The results of the vertical jump test (in cm) before and after the intervention

Group	Pre-test (Mean \pm SD)	Post-test (Mean \pm SD)
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Eksperimen	45.3 ± 5.1	52.7 ± 5.4
Control	46.1 ± 4.8	47.5 ± 4.7

Statistical Analysis

1. Descriptive Analysis:

The experimental group showed an average increase in vertical jump of 7.4 cm after following the plyometric training program.

The control group showed an average increase in vertical jump of 1.4 cm after following a regular training program.

2. Inferential Analysis:

A t-test for paired samples was conducted to see the significant difference between the pre-test and post-test in the experimental and control groups.

The t-test results for the experimental group:

$$- t(14) = 9.23, p < 0.001.$$

The t-test result for the control group:

$$- t(14) = 2.17, p = 0.05$$

Results of t test for comparison between experimental group and control group after intervention:

$$- t(28) = 4.87, p < 0.001$$

Based on the results of the analysis, it can be concluded that the plyometric training program has a significant effect on improving vertical jumping ability in volleyball players in Bekasi city. The experimental group showed a much greater improvement compared to the control

group, which indicates that plyometric training is effective in improving vertical jump performance. This indicates that the implementation of a structured and measurable plyometric training program can provide significant benefits for the physical development of volleyball athletes.

Discussion

The results of this study showed that the plyometric training program significantly improved vertical jumping ability in volleyball players in Bekasi city. The average increase in vertical jump of 7.4 cm in the experimental group compared to only 1.4 cm in the control group demonstrates the effectiveness of plyometric training in developing explosive power and leg muscle strength. This finding is consistent with previous studies which have also found that plyometric training can improve vertical jump performance in athletes of various sports, including volleyball.

One of the relevant studies that support these results is a study conducted by (Ramírez-de la Cruz et al., 2022), which states that plyometric exercises increase muscle strength through the mechanism of the stretch-shortening cycle. Plyometric

training increases the ability of muscles to store and release elastic energy effectively, which then translates into an increase in vertical jump height. The study showed similar performance improvements in athletes undergoing a plyometric training program compared to those undergoing conventional training.

Furthermore, the muscle adaptation theory expressed by (Kons et al., 2023) explains that plyometric training stimulates specific neuromuscular adaptations, including increased motor unit recruitment and improved muscle contraction efficiency. These adaptations support the increased ability of muscles to generate explosive force, which is critical in the vertical jumping movements used in volleyball for spiking and blocking.

The study also found that the control group showed minimal improvement in vertical jump ability, even though they underwent a regular exercise program. This confirms the importance of specifically designed exercises to develop certain aspects of athlete performance. Plyometric training, which is focused on explosive movements, directly targets the improvement of vertical jump, in contrast to conventional training which may not be as effective in developing leg muscle explosiveness.

In addition, the results of this study are in line with a study conducted by (Ramirez-

Campillo et al., 2020), who found that eight weeks of plyometric training increased vertical jump height and muscle strength in junior volleyball players. Their research shows that structured and sustainable plyometric training can provide significant benefits in improving athlete performance.

Thus, the results of this study not only provide empirical evidence regarding the effectiveness of plyometric training in the context of volleyball athletes in Bekasi city, but also strengthen the theories and findings of previous research. The importance of a specific and measurable training program is clear in improving athlete performance, which in turn can improve the overall quality of the volleyball game. Therefore, the implementation of a systematic and appropriate plyometric training program is highly recommended for volleyball coaches to optimize the performance of their athletes.

This study offers a novel contribution by demonstrating the significant effects of a plyometric training program applied specifically to volleyball athletes in Bekasi city, a context that has not been extensively researched before. The novelty lies in the local and specific focus on high school athletes, providing practical insights for coaches at the regional level. However, this study has several limitations, including a relatively small sample size and limitations in the short intervention timeframe. In

addition, external factors such as variations in individual physical condition and adherence to the exercise program may have influenced the results, so further research with a larger sample and longer duration is needed to confirm these findings.

D. Conclusion

This study proves that a plyometric training program significantly improves vertical jumping ability in high school level volleyball athletes in Bekasi city. The experimental group who underwent plyometric training showed a significantly greater increase in vertical jump height compared to the control group who underwent conventional training. These findings support the theories of muscle adaptation and the stretch-approach cycle, and are consistent with previous research showing the effectiveness of plyometric training in improving athletic performance. Although this study has limitations, such as the small sample size and short duration of the intervention, the results provide strong empirical evidence that plyometric exercises can be an important component in volleyball training programs to optimize vertical jump performance. Thus, it is recommended that volleyball coaches integrate plyometric exercises into their

training routines to improve athletes' explosive power and overall performance.

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F. Conflict of Interest

No Conflict of interest.

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