COMPETITOR:
JURNAL PENDIDIKAN KEPELATIHAN OLAHRAGA
e-ISSN: 2657-0734 & p-ISSN: 2085-5389 || Volume 17, Number 3, 2025 || P.2608-2614

The Effect Of Plyometric Training Variations On The Jumping Smash Ability Of Divo Club Volleyball Athletes

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ABSTRACT

This study aims to investigate the effect of plyometric training variations on the jumping smash ability of athletes in the Divo Volleyball Club. Plyometric training is widely recognized as an effective method to improve explosive power, which plays a crucial role in performing jumping smashes in volleyball. The research employed an experimental approach with a one-group pretest-posttest design involving 16 female athletes. Data were obtained through jumping smash performance tests administered before and after the training intervention. The treatment consisted of structured plyometric training variations designed to enhance lower-body power and vertical jump capability. The results of the analysis revealed a significant improvement in jumping smash ability after the intervention, with the mean pretest score of 222.31 increasing to 256.75 in the posttest (p = 0.000). These findings confirm that plyometric training variations are highly effective in enhancing the technical performance of jumping smashes among volleyball athletes. The study highlights the importance of incorporating diverse plyometric exercises into regular training programs as a strategic approach to maximize athletes' attacking performance and overall competitive readiness in volleyball.

ARTICLE HISTORY
Received: 2025/10/09
Accepted: 2025/10/15
Published: 2025/10/20

KEYWORDS
Training;
Plyometric;
Jumping Smash;
Volleyball.

AUTHORS' CONTRIBUTION
A. Conception and design of the study;
B. Acquisition of data;
C. Analysis and interpretation of data;
D. Manuscript preparation;
E. Obtaining funding

Cites this Article : Sari, Herlina Kumala; Widowati, Atri; Diana, Fitri; Anjanika, Yonifia. (2025). The Effect Of Plyometric Training Variations On The Jumping Smash Ability Of Divo Club Volleyball Athletes. **Competitor: Jurnal Pendidikan Kepelatihan Olahraga**. 17 (3), p.2608-2614

INTRODUCTION

Volleyball is a popular sport that demands a combination of strength, speed, agility, and technical skills (Prasetya et al., 2024). In modern volleyball, offensive ability, particularly through the jumping smash, is a key determinant of team victory. Jumping smashes require not only accuracy but also optimal jump height to direct the ball powerfully and sharply into the opponent's area (Primayanti, 2016; Susila Program Studi Pendidikan Jasmani Kesehatan dan Rekreasi & Yapis Dompu, 2021). This ability is greatly influenced by the explosive power of the leg muscles, which is a key component of volleyball fitness (Febrio et al., 2023). Therefore, physical training aimed at increasing leg muscle explosiveness is a crucial focus in volleyball athlete development programs.

In the context of physical development, various training methods have been developed to support increased explosive power, one of which is plyometric training. Plyometrics is a form of exercise that emphasizes rapid, explosive muscle contractions to increase muscle power (Arif & Alexander, 2019). This exercise is believed to be effective in optimizing physical components directly related to jumping and smashing abilities. Variations of plyometric exercises such as box jumps, depth jumps, and hurdle hops are widely used in volleyball training because they have been proven to train leg muscles functionally (Syabaruddin et al., 2025). Of these variations, box jumps are considered simpler, easier to apply, and require less complex facilities, allowing them to be consistently applied both on the field and in confined training spaces.

Several previous studies have also confirmed the effectiveness of plyometrics in improving athletic performance. Padilah et al. (2024) explain that box jumps can train quick reaction times in leg muscles and gradually increase power. Meanwhile, Latif & Purnomo (2023) add that leg muscles routinely trained using this method show significant increases in explosive power capacity. Furthermore, plyometric training is considered relatively safe because it can be adjusted to the athlete's basic ability level and performed progressively according to the training program. The combination of repetition and intensity in this exercise has been shown to support the development of explosive power, which is essential for jumping smashes.

However, each training method has specific effects on certain physical components, so comparing the effectiveness of training variations is crucial to ensure optimal results (Rezeky et al., 2025). In this regard, box jumps and hurdle jumps are considered relevant forms of plyometric training for volleyball, as both can improve coordination, stability, and physical readiness to handle explosive loads. In fact, several field findings indicate that athletes who use these methods experience overall performance improvements, both in terms of jump power, posture, and stability when executing smashes (Imandaqurani & Henri, 2024; Widodo & Fadloli, 2025).

Based on field observations at the Divo Volleyball Club, many athletes are still unable to perform their jump smash to their full potential. This is due to the lack of optimal training for the explosive aspect of leg muscles in their regular training program. Therefore, the use of plyometric training variations such as box jumps and hurdle jumps is believed to be a practical solution for increasing jumping ability while improving the quality of smash technique.

Given this phenomenon, this study focused on evaluating the effect of plyometric training variations on the jumping smash abilities of Divo Club volleyball athletes. The analysis focused on the extent to which these exercises could improve leg muscle explosiveness and enhance the effectiveness of smash techniques. This research is expected to provide practical contributions to coaches and athletes in designing more effective training programs and to enrich the literature on the application of plyometric-based physical training in volleyball.

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METHODS

This study used an experimental method with a one-group pretest-posttest design. The aim was to determine the effect of plyometric training variations on the jumping smash ability of Divo Club volleyball athletes. The subjects were 16 female athletes actively training at the club and were purposively selected based on physical readiness criteria. The independent variable was the plyometric training variations, including box jumps and hurdles, while the dependent variable was jumping smash ability.

The instrument used was a jumping smash ability test administered before and after the treatment. The plyometric training program was structured within specific training periods according to the club's schedule. Pretest and posttest data were analyzed using paired sample t-tests at a 5% significance level to determine the significance of differences before and after the treatment.

RESULTS AND DISCUSSION

Result

Based on the results of descriptive analysis, the jumping smash ability of Divo Club volleyball athletes showed an increase after being given treatment in the form of plyometric training variations. In the initial measurement (pretest), the minimum score obtained by the athletes was 203, the maximum score was 239, with an average (mean) of 222.31 and a standard deviation of 10.005. After being given training, the final measurement results (posttest) showed a minimum score of 233, a maximum score of 280, with an average of 256.75 and a standard deviation of 12.710. These results show an average increase of 34.44 points between the pretest and posttest results.

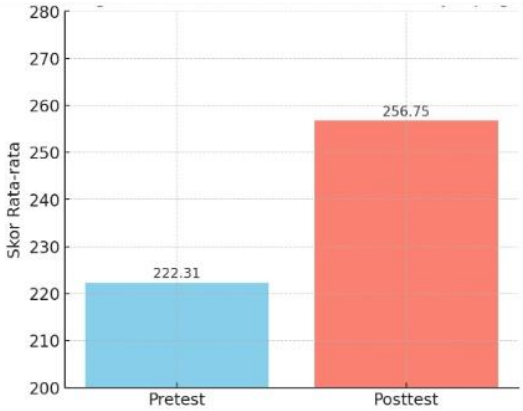

Figure 1.
Descriptive Statistics Results of Research Variables

The frequency distribution of vertical jump improvement shows that most athletes, 10 (62.5%), were in the adequate category (30–38). Six athletes (37.5%) were in the good category (39–49), while no athletes were in the very good or low category (poor or very poor). This indicates that the majority of athletes experienced adequate to good improvement in their abilities after participating in the plyometric training program.

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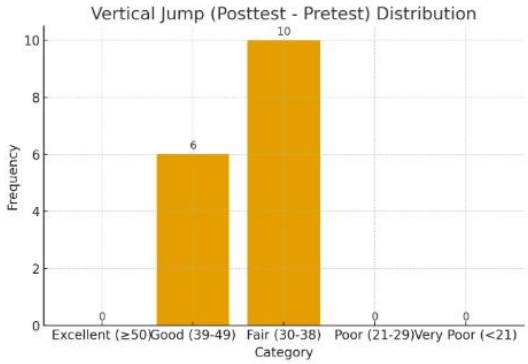

Figure 2.
Vertical Jump Frequency Distribution Results

The results of the paired sample t-test supported this finding, with a significance value of p = 0.000 (<0.05). This indicates a significant difference between the pretest and posttest results, thus concluding that the variation in plyometric training significantly improved the jumping smash abilities of Divo Club volleyball athletes. In other words, plyometric training is effective in increasing leg muscle explosive power, which directly impacts the ability to perform jumping smashes more optimally.

Overall, the results of this study indicate that the application of various plyometric training exercises has a positive effect on improving the jumping smash ability of Divo Club volleyball athletes, although there are still differences in the level of achievement among individual athletes. This improvement aligns with the research objective, which is to prove the effectiveness of plyometric training in increasing leg muscle explosive power, which directly impacts the ability to perform a more optimal jumping smash.

Discussion

The results of the hypothesis test, aimed at determining the effect of plyometric training variations on the jumping smash ability of volleyball athletes at the Divo Club, showed a p-value of 0.000 (<0.05), indicating that H0 was rejected and H1 was accepted. Therefore, it can be concluded that plyometric training variations influence the jumping smash ability of volleyball athletes at the Divo Club. This finding aligns with research by Imandaqurani & Henri (2024), which used a t-test and showed a significance value of 0.000 <0.05, proving that plyometric training has a significant positive effect on improving jumping smash ability in volleyball club athletes. Plyometric training aims to improve athletes' abilities through a combination of speed and strength training. The combination of strength and speed reflects the expression of muscular explosive power. Therefore, plyometric training is recognized as a highly effective approach to increasing muscular explosive power, which directly contributes to improving smash skills (Maulidya et al., 2024).

Leg muscles play a crucial role in volleyball for effective jumping and smashing performance. The strength and speed of the muscles supporting the jumping smash movement are crucial to the success of the technique. The leg muscles are the most

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frequently used in the jumping smash movement. Plyometric variations are a type of training aimed at increasing explosive power. Some forms of plyometric variations used include skipping, hurdles, and squat jumps. Adaptation occurs through repeated training, so jumping smash ability can improve with regular plyometric training.

Plyometric training stimulates muscles to move quickly through jumping upwards, forwards, sideways, and sprinting in all directions. This training is not only efficient but also improves muscle strength, endurance, flexibility, and agility (Haromain et al., 2023). Plyometric exercises are a type of training that utilizes effective explosive movements, such as jumping from the ground up, forwards, sideways, and sprinting as fast as possible in all directions (Utamayasa, 2020). For volleyball players, plyometric training is essential for balancing basic technique, physical strength, and talent potential from an early age, including improving their jumping ability. Therefore, jumping ability is crucial in volleyball (Anggara & Yudi, Aldha, 2019; Supriatna, 2023).

The significant difference between the pretest and posttest scores is evident in the average scores, with a pretest average of 222.31 and a posttest average of 256.75. This indicates an improvement in the jumping smash ability of volleyball athletes at the Divo Club after the training program. These results align with research by Gunawan & Jatra (2024), who analyzed the data using a t-test and showed an increase in smash ability from a pretest average of 8.77 to 12.35 in the posttest. Research by Junianto & Widodo (2023) also showed similar results, indicating that plyometric training significantly improved jumping smash ability. Therefore, the improvement in smash ability in volleyball players demonstrates the positive impact of plyometric training. Continuous plyometric training will continue to improve a player's skills.

Plyometric training utilizes one's own body weight to increase power. The primary goal is to increase explosive power. Simply put, plyometrics are defined as exercises that enable muscles to achieve maximum strength in a very short period of time.

The results of this study confirm that training is crucial for improving smashing ability in volleyball. Basic smashing technique can be improved through plyometric training, which has been proven effective in enhancing this skill. This improvement in smashing ability occurred due to the implementation of programmed and structured plyometric training. Furthermore, the plyometric training program in this study also applied the principle of overload. This principle is implemented by gradually increasing the load within a training program.

CONCLUSION

This study concluded that variations in plyometric training significantly influenced the improvement of jumping smash abilities of Divo Club volleyball athletes. The analysis results showed an average increase from 222.31 in the pretest to 256.75 in the posttest with a significance value of $p = 0.000$ (<0.05), which means that plyometric training is effective in increasing the explosive power of leg muscles. The frequency distribution

also shows that most athletes are in the sufficient (62.5%) and good (37.5%) categories, with no athletes in the low category. Thus, plyometric training can be recommended as an applicable and effective physical training method to support attack performance, especially jumping smash ability, in volleyball.

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