



Analysis Of Plyometric Training In Volleyball: Systematic Literature Review

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ABSTRACT

The purpose of this research is to look into the use of Plyometric Training in Volleyball. Materials and methods: The table PRISMA will be used for the systematic review and meta-analysis in this review investigation. Various studies were published from January 2020 to December 2024. In the search procedure, the following keywords were used: (1) Plyometric; (2) Training; (3) Volleyball. The search in the study used Scopus research journal databases. The theme of this research as a whole obtained 117. Contains 41 articles, of which 10 are relevant. Analysis of plyometric training in volleyball includes the effect of plyometric exercises based on relevant results, including increasing vertical jumps, changing the direction of the jump, completing the training program, increasing leg muscle strength, increasing explosive jumps, and improving performance (serve, smash, and block).

ARTICLE HISTORY

Received: 2024/12/20
Accepted: 2025/01/05
Published: 2025/02/25

KEYWORDS

Plyometric;
Training;
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 : Wibowo, Sherwin Mahardika; S., Adi. (2025). Analysis Of Plyometric Training In Volleyball: Systematic Literature Review. **Competitor: Jurnal Pendidikan Kepeatihan Olahraga**. 17 (1), p.018-028

INTRODUCTION

Almost all types of sports require leg muscle strength, especially movements made by volleyball players, such as jumping, jumping, and other movements that require high leg muscle strength in a short time (Insan et al., 2024). To improve achievement in volleyball games, players must make every effort to improve their physical, technical, tactical, and mental abilities (Rosadi, 2020). Training with weights is one of the best ways to increase your strength. (Adi S, Arbanisa, et al., 2023). To improve the performance of volleyball players, a variety of high jump training is required.

Plyometric training, when compared to hurdle jumping training, significantly increases strength, explosive power, and leg muscle hypertrophy (Permana et al., 2022). The leg muscle strength of novice volleyball athletes can be improved through plyometric box jumping and hurdle jumping exercises (Sihombing & Situmeang, 2022). Mentioned



that there is an effect of plyometric box jump training on the vertical jump of volleyball athletes (Bagaskara & Suharjana, 2019). Plyometric exercises are widely used and tested to have significant effects.

Volleyball is a team sports game played by two teams, each with twelve people. The game is played on a special court separated by a net, the object of the game is to send the ball over the net into the opponent's area (Крамаренко et al., 2023). Volleyball, a sport that involves many people and has many exciting movements and skills, often leads to overuse and traumatic injuries to the extremities and back (SIEGMAN, 2020). The game of volleyball consists of five main techniques: submission, first reception, attack, defence, and second gear (Войтенко et al., 2022). It can be concluded that the game of volleyball has several basic rules and techniques that need to be mastered when someone wants to play volleyball.

A systematic review involves conducting a thorough investigation, integrating the results of the investigation, and evaluating the breadth, characteristics, and quality of evidence relating to a particular research question (Siddaway et al., 2019). The goal of a systematic review is to produce more reliable results for decision-making, to answer the research question, a systematic review searches for, assesses and synthesizes all empirical evidence that meets pre-defined eligibility criteria (Krupinski, 2019). Systematic reviews provide information on evidence-based guidelines in medicine, public policy, and environmental health by summarizing the available evidence in a thorough, objective, and transparent manner (Farhat et al., 2022). Systematic literature review includes databases that are on official websites and used by many people.

A beginner's guide to systematic literature review covers research questions, systematic search strategies, quality assessment, data extraction, data synthesis, and data demonstration, a review protocol is also created and validated (Mohamed Shaffril et al., 2021). In this article, the methodology used to conduct a replicable and scholarly literature review is discussed. This method includes bibliometric mapping (Linnenluecke et al., 2019). A systematic review focuses on reviewing the literature as a research method and consists of various research approaches and techniques (Newman & Gough, 2020). Systematic literature review helps researchers to make it easier to find themes according to the title under study.

In the study (Ahmadi et al., 2021) effects of plyometric jump training in sand, did not consider psychological factors that would affect the training results. Furthermore, in research (Dell'antonio et al., 2022) there are limitations due to the small sample size and the absence of a control group. As for research from (Kusnanik & Pramono, 2023), there is a lack of understanding of the specific effects of exercise combinations. This study was conducted to complement the limitations of previous research to be better.

METHODS

Systematic Literature Review research refers to a group of studies on data collection techniques or research subjects investigated using various library resources, such as books, encyclopedias, scientific journals, magazines, and documents (Rumini et al., 2024). Researchers used the literature research method, which means collecting data from books,

journals, articles, magazines, and the internet on the subject of the relationship between flexibility training and sports performance (Adi S, Soenyoto, et al., 2023).

Study Participants

The words "Plyometric", "Training", and "Volleyball" were searched for in published articles from the Scopus research journal database from the years 2020 through 2024. PRISMA 2020 reflects recent advances in terminology and methodology by facilitating transparent and complete reporting of systematic reviews (Page et al., 2021). Some PRISMA 2020 checklist items were overlooked in the systematic review and meta-analysis article published in the Korean Journal of Radiology (Park et al., 2022).

Study organization

The variables selected for the Scopus search were: (1) the number of databases contained in the keyword search; (2) selected years of published articles from 2020 to 2024; (3) relevant articles; (4) field (sport, training, education, or mixed); (5) type of research (discovery, experimental, descriptive, quantitative, qualitative); (6) selection of positive articles.

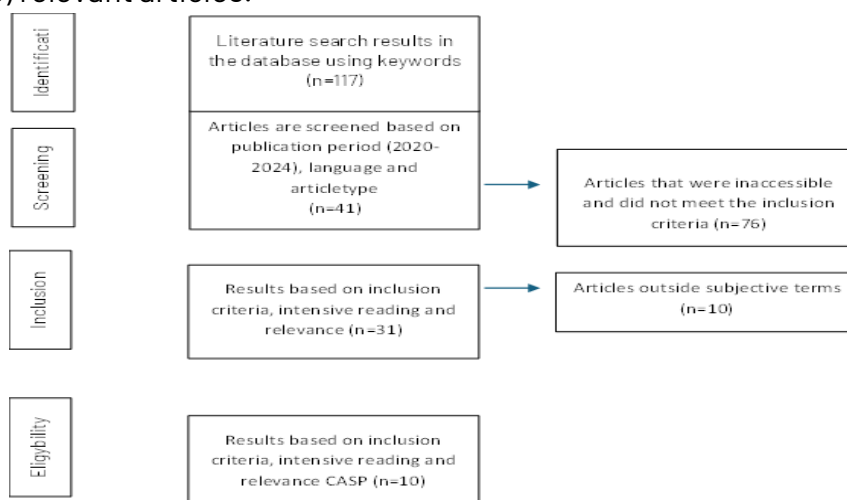
Statistical analysis

It focused on the title, abstract, and keywords of the article as these were sufficient to create a reliable and sufficient core of the article for further analysis and use. Only open-access articles were included in this review study. This was done because the authors wanted everyone to be able to see their research. The following inclusion and exclusion criteria were used to select only relevant people who could speak on a particular topic.

RESULTS AND DISCUSSION

Result

Identification of literature search results in the database using keyword ($n=117$), from the entire database will be filtered from 2020 to 2024 and selected article categories ($n=41$), Inaccessible articles that did not meet the inclusion criteria ($n=76$). Then the filtered articles will be selected to use keywords that follow the theme of plyometrics, training, and volleyball ($n=31$). Then the electability will be included in the results ($n=10$) relevant articles.



The following table shows the total number of publications published during the selected period. Year published.

Table 1.

Evolution of the number of publications of the year

Year of publications	Number of articles	Percentage
2020	6	15%
2021	6	15%
2022	8	19%
2023	11	27%
2024	10	24%
Total	41	100%

Table 1 will show the number of various periods of article publication each year, as shown in the evolution table. Explanation of the table above includes; from 2020 to 2024 there has been an increase in scientific publications (6 articles), 2021(6 articles), 2022 (8 articles), 2023 (11 articles), and 2024 (10 articles).

Article percent graph

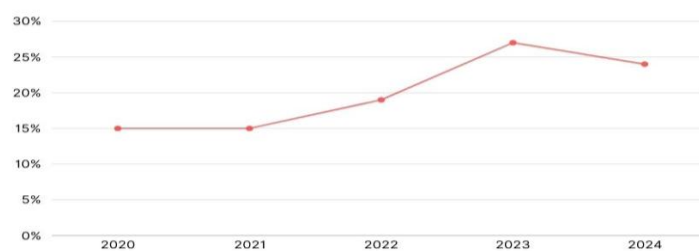


Image 1.

Evolution of the percent graph

According to the literature, the analysis that can be applied in plyometric exercises is shown in the table:

Table 2.

The analysis that can be applied in plyometric exercises is show

Topic	Sample	Result
Ladder Training Combined With Plyometric or Multidirectional Speed Drills (Bassa et al., 2024)	Volleyball players	Improve change of direction performance.
Plyometric Training on Sonographic Characteristics of Quadriceps Muscle and Patellar Tendon, Quadriceps Strength, and Jump Height (Harput et al., 2023)	Volleyball players	Can be implemented in adolescent programs especially
Effect of Low-Intensity Plyometric Training (Rojano Ortega et al., 2022)	Volleyball players	Jump quicker increasing
Plyometric training and moderating variables on stretch-shortening cycle function and physical qualities (Sylvester et al., 2024)	Volleyball players	Improve unilateral absolute leg stiffness in post-PHV
Knee Tuck Jump and Jump-To-Box Plyometric Training on Female Students' Leg Muscle Strength and Flexibility (Alim et al., 2024)	Volleyball players	Improve performance

Topic	Sample	Result
Post-activation Performance Enhancement on the Vertical Jump (Berriel et al., 2022)	Professional volleyball players	The height of the vertical jump after plyometric training
4 weeks of plyometric training in the pre-competitive period (Guimarães et al., 2023)	Professional volleyball players	An effective strategy for further CMJ performance improvement
Short-duration plyometric training on vertical jump and sprint speed (Chaturvedi et al., 2023)	Volleyball players	Effective in improving the vertical jump height
Weight vest on countermovement vertical jump and change-of-direction ability (Freitas-Junior et al., 2021)	Volleyball athletes	Improving the CMJ performance in male volleyball athletes
Land- and aquatic-based plyometrics (Dell'Antonio et al., 2023)	Volleyball athletes	Performance of spike and block

Discussion

Volleyball requires ideal height, so if someone whose height is less than he must be extra in training to increase the vertical jump, this greatly affects the basic techniques that have been mastered. Plyometric training in adolescent girls had a small impact on vertical jump performance; however, this impact was greater in younger, shorter and lighter participants and longer interventions with greater frequency and duration (Moran et al., 2019). For professional volleyball athletes, plyometric training can improve their jumping ability (P. Guimarães et al., 2023). Plyometric exercises require various variations to get maximum results for leg muscle strength. Plyometric training is a great way to increase vertical jump height. Several factors influence the effectiveness of the exercises, including duration, intensity, and variety. Combined training increased jump height, speed, and centre of mass displacement, while plyometric training increased vertical speed and centre of mass displacement (Sánchez-Sixto et al., 2021). Longer and more intense programs provide better results, and for best results, it is recommended to use a combination of different types of plyometric exercises. Volleyball players can improve their abilities in the vertical jump, strength, and horizontal jump, as well as their flexibility, agility, and speed by practising plyometrics (Silva et al., 2019). Having a high vertical jump can make it easier for volleyball players to attack and receive attacks more easily than a player who has a low vertical jump.

When a spiker makes a smash and the opponent defends, we must be able to change the direction of the jump to avoid the enemy's defence and find the direction of the opponent's weakness. In playing volleyball, the main attention should be paid to the moving ball while using peripheral vision and direct observation to observe the opponent's movements (Lazunina & Kosheleva, 2020). In female soccer players, plyometric training improved vertical jump, linear running and change-of-direction performance than strength training (Pardos-Mainer et al., 2021). Changing the direction of jumps in plyometric exercises can be done for beginner and professional players. As a coach, you can know exercises that are very suitable for changing directions such as jumping sideways and training the player's eye focus to change the direction of attack and defence from opponents. To measure individual performance in matches, elite

volleyball coaches consider a variety of contextual variables, including opponent level, set duration, score difference, previous set results, competition load variables, high level, twenty-end period, and high load category (López-Serrano et al., 2022). One example of a plyometric exercise that can be done to change direction is jumping using a box and given a distance for the desired target. This exercise can effectively make a difference for both athletes and novice players.

Practice to the maximum and a variety of variations are needed so that athletes and novice players always improve in performance. Complete training such as making a training schedule and program that is sourced from various effective and relevant research, then practice gradually. After six weeks of plyometric training, volleyball players can experience an increase in blocking agility by 6.26% and maximum vertical jump height by 3.33% (Wang et al., 2020). In research, there are many variations of plyometric exercises, such as jumping rope, jumping using a box, squad jump, barbell squat, and squat thrust. Box jump and barrier hops plyometric exercises increase leg muscle strength (Sihombing & Situmeang, 2022). Neuromuscular adaptations, which improve jumping ability, can be achieved through plyometric training (Kusnanik & Pramono, 2023). In amateur and professional volleyball players, plyometric jump training improves linear running speed, squat jumps, countermovement jumps, drop jumps, and high spike jumps (Ramirez-Campillo et al., 2021). There are various variations of plyometric exercises to complement training as a coach's guide for his athletes. Plyometric exercises can complement the athlete's training program.

Training leg muscle strength is an important part of many physical training programs, whether for rehabilitation, athletic improvement or general health. Many techniques have been studied to improve leg muscle strength and power. In (Alim et al., 2024) Jump to Box research is considered more effective in increasing leg muscle strength. An example of leg muscle strength training in plyometrics is the barbell squat because this exercise uses heavy weights supported by the body so that the muscles will work optimally. But the problem here is that if the athlete's muscles are formed too large, it will have an impact on the lack of agility because the muscles that are formed are too large.

The ability to generate maximum force in a very short period is important in many sports and physical activities. Explosive jumping is one such example. To improve muscle explosive strength, especially in the lower limbs, research has investigated various training techniques. Plyometrics requires powerful and explosive training to improve the quick response and elasticity of the major muscles of the body (Alim et al., 2024). To increase explosive strength in the lower extremities, perform squats and leg lifts in the Plyometric Jump To Box intervention (Gunarto et al., 2019). So, many different training methods can be used to improve jump explosiveness. Each method has advantages and disadvantages, so proper selection should be tailored to each person's training needs and goals. To improve muscular explosiveness, especially in the lower limbs, plyometric and complex training is very effective. Explosive performance can be improved with proper warm-up and additional training. To track progress in training, measurement of explosive power using valid and reliable tests is essential.

It is necessary to master the basic techniques of volleyball as an initial provision for volleyball players. As said by experts (Risma et al., 2020) there are six types of basic techniques in volleyball, namely lower passing, upper passing, lower service, service up, volleyball block, and smash. Research has discussed the importance of mastering the basic techniques of volleyball games. In training will be adjusted to the needs of athletes to improve game performance. If volleyball players do plyometric exercises at night, they are better at jumping and balancing (Zhu & Cui, 2024). For volleyball athletes who practice plyometrics before competition, their jumps may be better (P. Guimarães et al., 2023). Plyometric training can help an athlete improve game performance in terms of physical as well as strength and speed.

CONCLUSION

Based on the results of research on the analysis of plyometric exercises in volleyball by searching the literature, the effect of plyometric exercises based on relevant results includes increasing vertical jump, changing the direction of the jump, completing the training program, increasing leg muscle strength, increasing explosive jumps, and improving performance (serve, smash, and block). There are limitations in previous research, plyometric training will always be improved in terms of intensity, frequency, and focus on one form of training. So future research is expected to develop effective and efficient training programs.

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