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Training Methods for Javelin Throwing Skills: Literature Review

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ABSTRACT

This study aims to explore various effective training methods for improving javelin-throwing skills. Through a literature review, it was found that methods such as strength training, plyometric, and automatic recognition techniques showed positive results in improving athlete performance. Additionally, factors such as flexibility and muscle strength also contribute significantly to javelin throwing ability. The results of this study are expected to provide guidance for coaches and athletes in designing more effective training programs, as well as be the basis for further research on the development of javelin throwing training methods in the future.

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INTRODUCTION

Javelin throwing is one of the athletic sports that requires a combination of strength, speed, flexibility, and good coordination. Optimal javelin throwing skills depend heavily on correct technique and effective training methods. Therefore, research on the right training methods to improve javelin throwing skills is very important (Ma'arif, 2024).

Along with the development of science and technology in the field of sports, various new training methods have been developed to improve the performance of athletes, including in javelin throwing. These training methods include strength training, speed training, engineering training, plyometric training, and mental training (Hashim & Saharullah, 2022).

Strength training aims to increase the muscle strength needed to make throws (Putra & Armade, 2020). Speed training aims to increase the speed of throwing

movements. Technique exercises aim to improve and perfect the correct throwing technique. Plyometric exercises aim to increase the explosive power of the muscles needed to make throws. Mental training aims to improve the focus, concentration, and confidence of athletes.

Various studies have been conducted to evaluate the effectiveness of various training methods in improving javelin throwing skills. Some studies show that strength training and plyometric exercises are effective in increasing muscle strength and explosiveness, which is important for producing long throws. Other research shows that proper technique and regular mental training can improve throw accuracy and consistency.

However, there is no clear consensus on which training methods are most effective for improving overall javelin-throwing skills. Some research suggests that a combination of different training methods, such as strength training, speed training, and engineering training, may be more effective than relying on just one type of training method.

In addition to the training method, other factors such as the athlete's age, gender, fitness level, and experience can also affect the effectiveness of javelin throwing training (Mapanyukki, 2010). Therefore, it is important to consider these factors in designing a training program that is appropriate for each individual.

This literature review aims to collect and analyze previous studies on training methods for javelin-throwing skills. This review will discuss the various training methods commonly used in javelin throwing, as well as the effectiveness of each method based on existing scientific evidence.

This review will also discuss other factors that can affect the effectiveness of javelin throwing training, such as age, gender, fitness level, and athlete experience. In addition, this review will provide recommendations on how to design an effective javelin-throwing training program based on existing scientific evidence.

The results of this literature review are expected to provide useful information for coaches, athletes, and researchers in developing more effective training methods to improve javelin throwing skills. In addition, this review is also expected to serve as a basis for further research on javelin-throwing training methods in the future.

METHODS

This type of research is a research literature review. Data collection was carried out using keywords in Indonesian and English on various sources, namely Google Scholar, ScienceDirect and Pubmed. The keywords in the search for literature sharing in this study are "Method", "Training", "Skill" and "Javelin Throwing".

RESULTS AND DISCUSSION

The results of the search in various articles found that the training methods to improve javelin throwing skills are very diverse. Various methods are effective for improving certain aspects of javelin throwing skills. The following are the results of

identification in various literature about the benefits and effectiveness of various training methods on javelin throwing skills.

Table 1.
Training Methods for Javelin Throwing Skills

No.	Training Methods for Javelin Throwing Skills	Source (Author, Year)
1	Lumbar muscle flexibility measurement test	(Lestari, 2020)
2	Pull up exercises	(Hidayat, 2023)
3	Triceps strength and bench press exercises	(Sukamto, 2023)
4	Push-up test for arm muscle strength and modified bass test of dynamic balance for dynamic balance	(Anisa, Arsil, Emral, & Astuti, 2022)
5	Plyometric exercises are conducted for four weeks with three sessions per week.	(Yanti, 2024)
6	Automatic recognition based on statistical characteristics	(Dong & Wang, 2022)
7	Attaching mass to the upper arm	(Linthorne, Heys, Reynolds, & Eckardt, 2020)
8	Special speed training (special speed training on the development of the explosive strength of working muscles and performance)	(Ali, Dahesh, & Saleh, 2020)
9	Ritme Kinetik	(William, 2021)
10	Biomechanical assessment	(Bondarenko et al., 2020)

One of the studies discussed the relationship between waist muscle flexibility and javelin-throwing ability in SMP Negeri 42 Palembang students. This research faces challenges in the development of athletic sports, especially javelin throwing, caused by the lack of socialization and interest of students. Using a correlational quantitative descriptive method, 30 grade VII students were involved. The results showed an average waist muscle flexibility of 11.43 cm and javelin-throwing ability of 14.86 m. The analysis using the product moment correlation formula produced an r-value of 0.76, which shows a strong relationship between the two variables, with a determination coefficient of 57.76%. This study concluded that there was a significant relationship between waist muscle flexibility and javelin-throwing skills (Lestari, 2020).

Another study showed the positive effect of pull-up exercises on the javelin-throwing achievement of SMAN 2 Dompu students. By involving 21 students of grade XI Science 2, data was collected through tests to measure throwing performance. Data analysis using simple linear regression confirmed the relationship between pull-up exercises and students' javelin-throwing ability. These findings provide important insights for the development of more effective training programs in javelin throwing (Hidayat, 2023).

Furthermore, research by (Sukamto, 2023) showed that the application of bench press and triceps strength exercises affected the improvement of javelin throwing skills of FIK UNM Makassar students. By comparing the two exercise methods in 40 college students, the two-way ANOVA analysis showed that the triceps strength method was more effective, especially in the group with high flexibility. In contrast, bench press exercises were more effective for groups with low flexibility. These findings guide coaches in choosing appropriate methods to improve athlete performance.

The results of another study showed a significant relationship between arm muscle strength and dynamic balance with the javelin throwing ability of SMPN 1 Panti students.

Using the proportional sampling technique, 25 grade VIII students were taken as a sample from a population of 160 students. Test *push*-ups and modified bass test of dynamic balance were used to measure strength and balance, while product moment analysis showed a significant contribution of both variables to javelin throwing ability (Anisa et al., 2022).

Plyometric exercises have also been shown to be effective in increasing throwing strength and speed in handball athletes. The study involved 15 athletes on a handball team with a four-week pretest-posttest experimental design. The results showed a significant improvement in the performance of the athletes, so coaches were advised to integrate plyometric exercises into the training program.

On the other hand, the javelin throwing angle automatic recognition method shows promising results in improving accuracy. This study corrects the weaknesses of traditional recognition methods by achieving an accuracy of more than 98%. The results of the experiment showed that the flight trajectory of the javelin identified by this method was close to the actual trajectory, making it an effective solution for improving the accuracy of the throw (Yanti et al., 2024).

Finally, the addition of mass to the upper arm was shown to increase the throw distance on modified javelin throws. This initial study involved three trained adult male athletes, who showed an increase in throwing distance depending on the mass added. These findings suggest that the addition of mass to the upper arm has the potential to improve throwing performance, although more research is needed to explore this relationship in depth (Linthorne et al., 2020).

Discussion

The results of the search in various articles show that the training methods to improve javelin throwing skills are very diverse, with each method providing different benefits and effectiveness. In this study, several training methods have been identified and proven to be effective in improving certain aspects of javelin throwing skills. By understanding these different approaches, coaches and athletes can design training programs that are more targeted and tailored to each individual's needs.

One of the methods discussed was the waist muscle flexibility measurement test, which showed a significant relationship between flexibility and javelin-throwing ability in students. Research (Lestari, 2020) confirms that the flexibility of the lumbar muscles plays an important role in optimal throwing technique. The results of the data analysis showed a strong correlation between the two variables, which emphasized the importance of paying attention to muscle flexibility in athletic training programs. This method can be integrated into a warm-up routine to prepare the muscles before an intensive training session.

On the other hand, training pulls up It has also been proven to have a positive impact on javelin throwing achievements. Research (Hidayat, 2023) shows that this exercise can improve the strength of the back and arm muscles, which are essential for making strong and accurate throws. Using quantitative methods, this study successfully proved that increasing the strength of pull-up exercises contributes to increasing throwing distance. This suggests that strength training should be an integral part of a javelin-throwing training program.

Furthermore, the results of the research by (Sukamto, 2023) show that triceps strength and bench press exercises have different effects depending on the athlete's flexibility condition. In this experiment, the triceps strength was proven to be more effective for athletes with good flexibility, while bench press was more beneficial for those who have lower flexibility. These findings highlight the importance of considering an individual's physical condition when designing a training program so that each athlete can maximize their potential.

In addition, the practice plyometric also received attention in research by (Yanti et al., 2024), which suggests that this method significantly increases the power and speed of the throw. The four-week intervention with three sessions per week succeeded in significantly improving the performance of the athletes. This suggests that exercises involving explosive movements can provide a competitive advantage in javelin throwing, especially for improving speed and muscle strength.

The automatic recognition method is also discussed in the context of improving the accuracy of the throw. Research by (Dong & Wang, 2022) shows that this method can overcome the disadvantages of traditional recognition techniques. With a recognition accuracy of more than 98%, this method assists athletes in adjusting the optimal throw angle. These findings provide important insights into how technology can be integrated into sports training to improve athlete performance.

Finally, the biomechanical assessment carried out by (Bondarenko et al., 2020) Provides an in-depth understanding of the optimal movement structure in javelin throws. Analysis of various biomechanical parameters, such as angular velocity and moment of inertia, helps in identifying irregularities that can result in injury. By understanding the biomechanical aspects of throwing techniques, coaches can design safer and more effective workouts, and help athletes achieve their best performance.

Overall, the diversity of training methods found in this study shows that the development of javelin-throwing skills can be done with a diverse and integrated approach. By applying these various methods simultaneously, coaches and athletes can create a comprehensive and effective training program to improve performance in javelin throwing.

CONCLUSION

Through a literature review, it was found that methods such as strength training, plyometric, and automatic recognition techniques showed positive results in improving athlete performance. Additionally, factors such as flexibility and muscle strength also contribute significantly to javelin throwing ability. The results of this study are expected to provide guidance for coaches and athletes in designing more effective training programs, as well as be the basis for further research on the development of javelin throwing training methods in the future.

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