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The Role of Circuit Training in Badminton: A Systematic Literature Review

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Abstract. Badminton is a sport that demands constant and quick movement. Physical condition is a fundamental ability to support a player's movement. Appropriate and precise training is the key to develop a player's physical abilities. Circuit training is believed to provide innovative training methods to improve the physical condition of badminton players. This study aims to determine the role of circuit training in the physical condition of a badminton player. This study is a literature review. Data collection for the literature review is done using a database search tool as a source of literature. The search engine used to determine articles is Google Scholar, Eric, and Science Direct, covering a period of 5 years from 2019 to 2023. The collection of literature data is conducted using the PRISMA method. Based on the analysis results, circuit training serves as an innovative approach to enhancing physical fitness. Competitive and continuous training is likely to result in an effective, efficient and attractive form of training.

Keywords: Badminton; circuit training; physical conditioning

INTRODUCTION

Badminton is widely recognized as one of the most popular sports in Indonesia, as well as globally (Chen et al., 2015; Manrique et al., 2022; Phomsoupha and Laffaye, 2015; Yu and Mohamad, 2022). Its popularity stems from its accessibility, being relatively easy to play. According to Soemardiawan et al. (2019), the factors contributing to its popularity include a low risk of injury, ease of play, physical and mental health benefits, durability of equipment, and the ability to be enjoyed by individuals of all age groups. Notably, both men and women can participate in the sport (Kusnadi et al., 2019).

Badminton entails the use of rackets, nets, and shuttlecocks, incorporating a variety of hitting techniques ranging from slow to fast movements (Grice, 2008; Xu, 2015). The game is characterized by complex and dynamic movements, requiring players to exhibit sudden bursts of speed when taking or returning shots, as well as demonstrating skillful coordination in hitting, directing, and placing the shuttlecock (Chen et al., 2015; Lin et al., 2020; Robertson et al., 2018). Given the need for swift movement, players must maintain good physical conditioning.

To excel in badminton, athletes must possess excellent physical fitness as it serves as the primary foundation for achieving optimal performance (Jones et al., 2018). The sport's fast-paced nature necessitates players to possess a combination of physical, technical, tactical, and mental abilities in order to secure victory (Jacob et al., 2017). The physical condition of players plays a vital role in their training participation; without adequate physical fitness, adhering to training programs becomes challenging, and achieving desired results also becomes difficult.

Physical fitness serves as a fundamental prerequisite and integral component for attaining and enhancing badminton performance (Khan, 2019; Nazzari et al., 2016). Consequently, badminton players require physical fitness training to optimize their achievements. In training, the components of physical fitness or biomotor components should not be treated in isolation, as they form a holistic entity that is crucial for both improvement and maintenance.

Physical fitness training plays a significant role in preserving and enhancing physical performance abilities. The training methods employed in badminton's physical fitness conditioning may vary, depending on the coach's provided program. Despite their differences, these methods share a common objective, which is to enhance the physical fitness of badminton players. The training format must align with the characteristics and requirements of badminton players. Understanding the characteristics of badminton players is key to selecting appropriate training materials and methods. The circuit training method, a form of exercise aimed at

improving physical fitness, is one effective approach.

The circuit training method involves a program comprising several stations, with athletes performing various exercises at each station. It serves as an effective means of enhancing endurance (Sil, 2015). Circuit training combines multiple exercises to improve overall physical quality (Miller et al., 2014). Building upon the aforementioned studies, the present study aims to conduct a review to examine the role and effectiveness of circuit training in enhancing the physical fitness of badminton players.

METHODS

This article presents a comprehensive literature review conducted through the analysis of scientific publications, specifically literature review articles, which are derived from research articles published in reputable national or international journals. The aim of this review is to explore the role of circuit training in improving the physical condition of badminton athletes. The selected articles were sourced from prominent search engines such as Google Scholar, Eric, and Science Direct. The search spanned a period of five years, from 2019 to 2023, ensuring the inclusion of recent studies.

In order to obtain relevant literatures, the author employed specific keywords, namely circuit training, physical condition, and badminton, to guide the article selection process. The analysis method adopted in this review is the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) approach, involving four key steps: identification, screening, eligibility, and inclusion. The findings derived from the PRISMA analysis are presented in a detailed chart format.

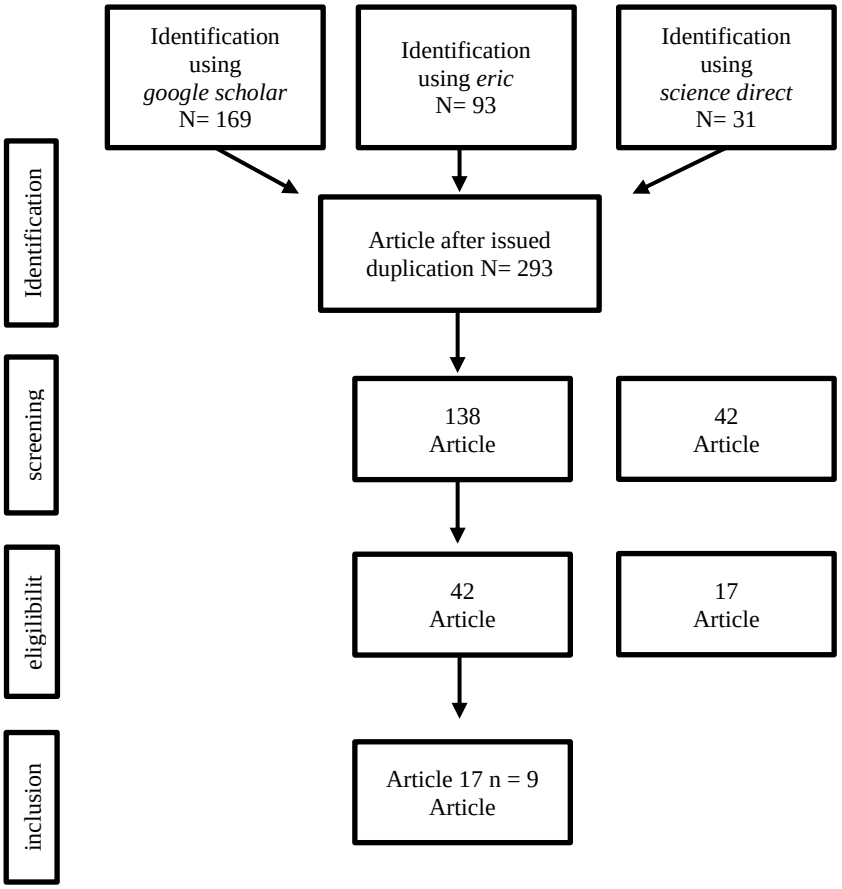

Figure 1. PRISMA flowchart

RESULTS AND DISCUSSION

The research results will be presented in the table below. The table contains the authors, types of publications, methods, sample characteristics, variables, and research results. To make it easier to see the research results will be presented in the table below:

Table 1. Article Summary

No.	Authors/ Year	Types of Publications	Methods	Sample Characteristics	Variables	Research Results
1	Bimo Alexander/2020	National Journal	Quantitative	Badminton Player	Training	The conclusion from the results of this study is that circuit and interval training methods can increase VO2Max ability in badminton athletes aged 10-14 years PWS Godean.
2	Lalu Sapta Wijaya Kusuma, Jamaludin/ 2022	Sinta 6	Qualitative	Badminton Player	Training	The badminton physical condition development program must start from the correct phases, namely by starting from the general to the special preparation phase.
3	Luh Putu Tuti Ariani, Ketut Chandra Adinata Kusuma, I Ketut/ 2022	Sinta 2	Quantitative	Badminton Player	Training	The results of this study that continuous and competitive circuit training can increase VO2 max in youth badminton player.
4	Iman Imanudin, Kuston Sultoni, Unun Umaran, Syam Hardwis/ 2020	International Proceedings	Quantitative	Student	Training	The implementation of aerobic circuit training gave a significant impact to the improvement of dynamic aerobic capacity
5	F Asbupel, Y Kiram, H Neldi/ 2020	International Proceedings	Quantitative	Badminton Player	Training	From this study it can be concluded that the two methods can increase the capacity of VO2 max badminton athletes from G-Sport Center Padang. Besides that, the playing method was more effective than the circuit method to increase the capacity of VO2 max.

No.	Authors/ Year	Types of Publications	Methods	Sample Characteristics	Variables	Research Results
6	S Hardiansyah, A Zalindro, F Maifitri/ 2020	International Proceedings	Quantitative	Student	Training	Based on statistical analysis, it was obtained that tcount was 0.68 and ttable was 1.69, so that tcount 0.68 <ttable 1.69 so it can be concluded that the increase in physical fitness given by the two training methods was not significantly different.
7	Vadivel, Maniazhagu /2022	International Journal	Quantitative	Student	Training	The results showed that the muscles strength endurance increases significantly due to circuit and circuit weight training.
8	Sigit Nugroho, Kukuh Wahyudin Pratama, Ahmad Nasrulloh, Tri Hadi Karyono, Riky Dwihandaka/2021	Scopus Q3	Quantitative	Badminton Player	Training	Based on the discussion of the research, several conclusions can be drawn showing that there is an influence of the trapping circuit training method on strength, speed and agility abilities.
9	Marina Papastergiou, Panagiotis Antoniou, Evaggelia Andreadou, Nikolaos Vernadakis/ 2021	Scopus Q3	Quantitative	Student	Training	The conclusion of this study, that tablet-based circuit training in school Physical Education can mobilize students in relation to being physically active outside of school.

This section will present the findings derived from the analysis of the articles as presented in the research results table. The focus of this discussion is on the impact of circuit training on the physical condition of badminton athletes. Physical fitness is a crucial factor in effectively following a training program. For badminton athletes, achieving optimal performance requires a high level of physical fitness, as it serves as the fundamental groundwork (Jones et al., 2018). Circuit training, a comprehensive fitness training approach, contributes to the overall development of an athlete's physique.

Circuit training programs have been found to be beneficial for athletes in the early age category of 10-12 years, particularly in increasing their VO2max (Alexander, 2020; Ariani et al.,

2022; Asbupel et al., 2020; Taufik et al., 2021). This is an important phase for coaching programs, as it sets the foundation for future achievements in various sports, including badminton. Coaching in badminton typically starts at the age of 10-12 with practice, followed by specialization at ages 14-16, and reaching the peak of achievement between ages 20-25 (Bompa and Gregory, 2009). Each training program should be tailored to the athlete's age and game-specific characteristics. Given the fast-paced nature of badminton, players must possess good physical, technical, tactical, and mental qualities to succeed (Jacob et al., 2017).

Circuit training also contributes to enhancing endurance, muscle strength, speed, agility, and power (Vega et al., 2013; Nugroho et al., 2021; Roberson et al., 2017; Vadivel and Maniazhagu, 2022). Endurance is a crucial component in improving overall physical condition. Badminton, like any other sport, relies on fundamental biomotor components, including strength, endurance, speed, flexibility, and coordination (Nugroho et al., 2021; Wahyudi et al., 2018).

In badminton, the biomotor components play a crucial role in determining player performance. The sport's high-intensity nature, interspersed with short rest periods, demands excellent fitness, skill, and game tactics (Chia et al., 2019; Ariani et al., 2022). Thus, badminton players need to develop both their aerobic and anaerobic energy systems, with a dominance towards the aerobic system (Huang et al., 2019; Phomsoupha and Laffaye, 2015; Ramos Álvarez et al., 2016). Circuit training serves as an innovative method to enhance aerobic and anaerobic endurance (Apriantono et al., 2021; Imanudin et al., 2020; Martha et al., 2022). From the aforementioned research discussions, it is empirically evident that circuit training is effective in improving the physical condition of badminton players, provided that the training is carried out competitively and continuously to achieve optimal results.

CONCLUSION

It is learnt that circuit training demonstrates a positive influence on the physical condition of badminton players. The design of an appropriate training program is a crucial factor in a coach's success in achieving performance targets. Circuit training serves as an innovative approach to enhancing physical fitness. Competitive and continuous training is likely to result in an effective, efficient and attractive form of training.

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