



Review Article

The Influence of Circuit Training in Improving Technical Skills and Physical Performance of Young Football Players: A Systematic Review

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Abstract

Objectives. This study aimed to examine the effect of circuit training (CT) on improving technical skills and physical performance for adolescent soccer players, and to provide an understanding of the effective application of CT.

Materials and methods. In this study, the selection process was carried out using the PRISMA filter. Four databases were used to search for research sources that cover circuit training in improving technique performance and physical performance or fitness. The databases used include ScienceDirect, Scopus, Google Scholar, and PubMed, encompassing publications from 2015 to 2025.

Results. The literature review used in this study identified 6 articles suitable for further analysis after a rigorous selection from a total of 878 articles. Among the 6 articles obtained, 5 focused on improving physical performance and 1 article focused on enhancing technical skills. In its implementation, it is necessary to pay attention to the frequency of training, training intensity, training duration, and variation in training. The review results indicate that CT has proven to be effective in improving technical skills and physical performance in youth soccer players.

Conclusions. Based on the analysis results, CT has been shown to improve the physical condition of teenage soccer players, such as physical fitness in preventing injuries, speed, agility, muscle endurance, explosive power, and players' techniques such as passing, shooting, dribbling, interceptions, tackles, and takeovers. To enhance physical aspects, there are training models that can be used, namely HICT, MICT, IT, and CT, while to improve techniques, the CT training model can be applied. It is hoped that the findings of this study can open opportunities for other researchers to apply it to technical skills.

Keywords: circuit training, technical skills, physical performance, literature review, youth soccer players.

Introduction

Circuit training (CT) is a popular methodology in fitness and health programs, as well as in sports, because its modulation induces physiological benefits, such as strength, power, and cardiovascular-respiratory adaptation (Anitha et al., 2018; Giménez & Gomez, 2019; Marín-Pagán et al., 2020). CT consists of several training posts that have specific training objectives that can be adjusted with the appropriate intensity and time that has been tailored to support relevant training (Amna Saleh Team, 2024; Mahalingam et al., 2024; Tereshchenko et al., 2021). In youth football, this type of training is not only useful for improving physical capacity

in terms of endurance, speed, and strength, but also has the potential to be implemented in the development of technical skills (Aaron Francis Niles, 2023; Muez Tsegay et al., 2021; Păun et al., 2022). With the right modifications, CT can be used on the basic skill elements in soccer, where basic skills are also an important component of soccer performance.

The biological and psychological development of adolescents is important in the effort to develop young football players and must be tailored to their age while taking into account the principles of appropriate training (Arenas et al., 2024; Fomichenko & Ivanov, 2023; Wik, 2022). At the age of 12–15 years, players experience rapid growth accompanied by an increase in their capacity to learn movement (Leyhr et al., 2018).

CT plays an important role in enhancing the physical performance of football players. This method allows athletes to train various aspects of physical fitness in one training

session, such as endurance, strength, agility, and speed, all of which are essential in football (Anitha et al., 2018; Badawi & Nasrulloh, 2023; Ferley et al., 2020). This improvement has a positive impact on the players' ability to play optimally in matches with consistent performance. In addition, CT has also been proven to enhance the technical performance of football players, as demonstrated by the research conducted by (Farooque et al., 2023; Sáez de Villarreal et al., 2015) that the CT methodology can improve dribbling and shooting skills. CT is a promising approach because it has flexible characteristics and can be easily adapted to various goals and needs in training programs (Păun et al., 2022).

In improving the performance of football players, it is important to design the right training model that meets the specific needs of the game (Pacholek & Zemková, 2020; Shao, 2024). An effective training model must be able to combine physical exercises and techniques in a balanced and efficient manner, so that each player can achieve their optimal performance (Sautov & Tyshchenko, 2024). Models like CT, which can be customized to physical and technical needs, provide an efficient and practical alternative (Anitha et al., 2018; Farooque et al., 2023). In addition, choosing the right training model can help prevent excessive fatigue and optimize the body's recovery after training or competitions (Biró et al., 2023; Looft & Frey-Law, 2020).

The advantage of CT is that it can create efficient training programs and relatively short time usage (Ratajczak et al., 2024; Salierno et al., 2021). With an organized structure, each training post can focus on one type of skill or specific fitness component, allowing for high functional repetition, which is important in the movement learning process (Ardanari et al., 2023; Beihul et al., 2023; Sakthivel & Rangaraj, 2025). In addition, CT can be easily modified according to the player's skill level and the specific goals of the training session (Alim et al., 2024; Kurkure S & Gharote G, 2024).

CT has been widely used in various sports to improve physical aspects, however research specifically examining the application of CT to enhance the technical performance of young soccer players is still very limited. Most existing research actually focuses more on improving physical conditions, and there is a lack of research that includes technical aspects in the application of CT methods. Until now, no systematic studies have been found that specifically review the role of CT in developing technical skills and physical fitness of young football players. With the advantages of CT and the lack of research on the impact of CT on aspects of Engineering, the goal of this research is to analyze existing evidence to discuss how CT can enhance the technique and physicality of young football players and how to implement it effectively. This finding is expected to provide a reference for researchers in the future and to offer guidance for trainers to develop more effective and sustainable training programs.

Materials and Methods

Research Design

This research employs a comprehensive strategy in data collection for a systematic review, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework as outlined in the literature (Page et

al., 2021). The PRISMA systematic review methodology has become a standard in various fields of research for systematically screening, evaluating, and synthesizing literature (Kwao Dawson et al., 2023; Mahadi, 2023; Shivhare & Shunmugasundaram, 2023). This design was chosen because PRISMA provides a systematic and transparent framework for reporting the results of systematic reviews. The application of inclusion and exclusion criteria is carried out meticulously to ensure that the selected studies have high relevance and quality. This study utilizes 4 databases to find research sources that cover circuit training in improving technique performance and physical performance or fitness. The databases used include Science Direct, Scopus, Google Scholar, and Pubmed. Data source searches using the Boolean Operators 'AND' and 'OR' to systematically obtain sources, the following keywords were used in this research ("circuit training") AND (Technical performance and physical performance) AND (young football player OR youth soccer player).

Inclusion and exclusion criteria

To be included in this review, the research must meet the specific criteria outlined below:

Inclusion Criteria:

- Participants: Young football players aged between 8-18 years.
- Intervention: Circuit training.
- Outcome: Technical performance and physical performance.
- Research design: Randomized Controlled Trial and Quasi-Experimental Experiment.
- Publication Year: The last 10 years or from 2015-2025.

Exclusion Criteria:

- The source does not use English.
- No complete text is available.
- Other sports are excluded.
- Review articles are not used.

Data Extraction

A total of 878 studies were initially extracted from electronic database sources, of which 825 studies were excluded based on their titles. A total of 54 studies were screened for extraction from which 36 others were excluded for not being suitable upon further review, ultimately filtering down to 18 inclusion criteria, and finally leaving 6 studies that met the inclusion criteria. Data extracted from this study and its summary is presented in Table 1, which includes authors & years, article title, sample size, training method, research method, and research results.

Results

In the source search process, a total database of 878 studies was obtained for review. 6 studies remained after meeting the inclusion and exclusion criteria. The final studies included were analyzed narratively. This procedure is depicted in figure 1 using the PRISMA flow diagram (Page et al., 2021).

Based on the research results in Table 1, it shows that there are five articles that found that CT has a significant

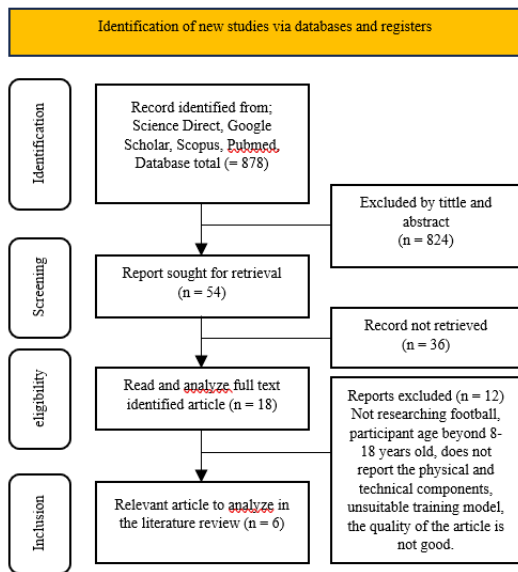


Fig. 1. The article selection process uses PRISMA guidelines

effect on improving physical performance, and one article has an effect on improving technical skills. This proves that there are still few studies on CT concerning technical skills compared to physical performance.

Discussion

In designing a training program, there are important aspects that need to be considered, including frequency, intensity, duration, and variety. The age of the players should also be taken into account when designing the training program; otherwise, the players will be at risk of injury. The training program for youth soccer players will be different from that of professional players, as during adolescence the player’s muscle growth is in a developmental stage, thus requiring adjustments to training that are safe and enjoyable. Here are the aspects that need to be considered.

Training Frequency

The frequency of training is one of the key factors in developing physical aspects and techniques for youth football

Table 1. Research features that are examined for review

Author and years	Article Title	Sample Size	Training Method	Research Method	Result
Muez Tsegay et al., 2021	Effect of Varied Intensity of Football Specific Circuit Training on Agility, Speed and Explosive Strength among U-17 Football Players in Ethiopia	Sample Size total sample N = 60, N1 = 20, N2 = 20, N = 20, average age 15-17 Years.	HICT vs MICT	quasi-experimental	The HICT group showed a significant difference from the MICT group in agility, explosive strength, and speed.
Zein et al., 2020	The effect of short period high-intensity circuit training-modified FIFA 11+ program on physical fitness among young football players	N = 39 young soccer players aged 15-19 years. N = 20 subjects in the EXP group and N = 19 in the CON group.	HICT	quasi-experimental	This research shows that the modified FIFA 11+ HICT and standard FIFA 11+ can enhance physical fitness components in reducing the risk of injury. The modified FIFA 11+ HICT is capable of increasing the intensity of cardiovascular training compared to the standard FIFA 11+.
Păun et al., 2022	Circuit Football Training Customized for Young Players during and after the COVID Period	Sample size N = 16 players aged 11-12 years.	CT	quasi-experimental	Improvement in performance at both the team and individual levels, there has been an increase in assists (passing), shots and goals (shooting), dribbles (dribbling), interceptions, tackles, and takeovers.
Sunarto et al., 2023	The Effect of Circuit Training on Improving the Physical Condition of Northwest Pantar Football Athletes	N = 60 young players aged 12-16 years.	CT	quasi-experimental	The results of this study prove that circuit training models have a positive impact on the physical condition of football athletes.
Monea et al., 2017	Specific training for improving the skill and speed in junior football players	Data was collected from N = 18 junior soccer players, with an age range of 14-15 years.	CT & IT	quasi-experimental	Players experience a significant improvement in physical condition such as motor skills and speed.
Reza Aprianto Putra et al., 2023	The efforts to improve physical condition throughout the circuit training for U-15	N = 20 junior players U-15.	CT	quasi-experimental	The results of this study show that there was an improvement after the circuit training treatment, with significant results in the physical condition of the players, such as Muscle Endurance, Explosive Power, Speed, and Agility.

players. Whether it is optimal or not can be determined by the appropriate training frequency, such as how often players should attend training in a week. The results of the training will be more apparent when the players achieve the right frequency, so it requires consideration from the coach to develop the physical performance and technical skills of the youth football players.

Excessive training without proper consideration of rest can exceed an individual's adaptation threshold, resulting in negative outcomes such as recurrent fatigue, injuries, and decreased performance. Although frequent and well-structured training can promote physiological and motor development, it must be balanced with adequate recovery to avoid overtraining and injury. The appropriate training frequency for young football players is very important because it is directly related to physiological adaptation, motor development, as well as physical and mental health (Rodrigues et al., 2023).

Based on the explanation above, it can be concluded that the frequency of training is an important factor that must be considered. Training can be optimal if the frequency of training is balanced between the frequency applied and sufficient rest to avoid the risk of injury in young players.

Training Intensity

In circuit training, the intensity of the workout is an important aspect in improving the physical performance and technique of the players. Just like in each station, the number of repetitions performed by the players, certainly varies to enhance both physical performance and technique. Basically, the intensity should be adjusted to the player's condition; if the player is used to low intensity, then it is necessary to increase to moderate intensity and then to high intensity, this is to ensure progress or improvement in the player's performance.

One of the studies by (Reuter et al., 2023) It shows that a gradual increase in training intensity results in a higher VO₂max improvement compared to continuous moderate-intensity training, even though the total energy expended is the same. However, what needs to be noted is the development of players in each training session, whether the intensity can be increased or not to ensure optimal training.

In practice, the intensity of training is usually measured using RPE (Rating of Perceived Exertion). RPE has a valid correlation with training intensity, workload, and physiological responses such as heart rate and lactate levels, making it effective for measuring and controlling endurance training intensity (Lee et al., 2024).

The conclusion drawn is that the intensity of training is an important component in the implementation of CT. The results will be more optimal if the intensity is appropriate and aligns with the players' development and physiology, making it essential to continuously monitor the players' progress during training.

Duration of training

The duration of training in CT is one of the important factors that needs to be planned in the training program to effectively support the improvement of the technical and physical performance of youth soccer players. The duration

of training plays a significant role in determining the intensity, effectiveness in repeating technical exercises, and maximizing physical stimulus. Proper planning of duration in each station and total circuit sessions can help ensure that youth soccer players develop comprehensively without neglecting the safety and motivation of the players.

The right duration of training, well-structured and tailored to the development of young players, can effectively improve performance. Study by (Păun et al., 2022) Circuit training specifically designed for ages 10–12 has proven to consistently assist in achieving physical exercise targets and football techniques, in accordance with the characteristics of the players' age. Another study indicates that CT exercises performed for 60 minutes per session can effectively develop players' technical performance (Farooque et al., 2023). In its implementation, the duration is adjusted to the abilities of young players so that training can optimally develop the performance of young soccer players.

Exercise Variations

Variation in training becomes one of the important components in the application of CT. In this context, variation refers to the use of different types of exercises, whether using different weights, movements, or training models. Variations in CT are not only about creativity but also an important strategy to develop physical performance and technique in a balanced way, prevent boredom, and increase training motivation.

During the training phase of adolescence, it is important to maintain the players' motivation to practice by incorporating variety and fun aspects into the training, which is why CT is well-suited for adolescent players (Păun et al., 2022). Other research mentions that high motivation is related to technical skills, tactics, and self-confidence; this is very important for developing players such as teenagers (Forsman et al., 2016).

The conclusion from the explanation above is that training variation is an important aspect and training variation is also one of the components in CT, where each station must consist of different training models with different objectives and different training loads. CT is a training model recommended for teenage players because it has a variety of exercises that are expected to motivate young players to keep practicing and can optimize the performance of young football players.

The Importance of Physical Performance for Soccer Players

Physical condition is always related to an athlete's ability. Physical condition is one of the most important factors for an athlete to participate in various training programs offered by a coach (Gantois et al., 2020). Good training will have a positive impact on an athlete to achieve expected achievements and goals in a club. Talking about physical condition means talking about physical fitness. This is no longer a foreign matter; an athlete's physical fitness is very important to achieve optimal performance (Menting et al., 2019) Physical condition is one of the important factors needed to improve an athlete's performance (Bernardi et al., 2021). Physical condition is the main factor for an athlete, especially a football athlete, and this factor must be

experienced by a football athlete before learning or training about technique, tactics, and mentality. Therefore, a technique is needed (Sarac et al., 2018). Based on the analysis of 5 selected articles according to the inclusion criteria, there are several aspects of physical performance that improved after circuit training, including speed, agility, muscle strength, cardiovascular endurance, balance, coordination, physical fitness, and motor skills. There are several training models used to improve physical performance, including MICT, HICT, IT, and CT. Below are the procedures and training frequency applied to enhance physical performance.

MICT & HICT Training Model to Improve Physical Performance

The training program is designed based on two groups according to the intensity required. Two experimental groups, namely the HICT group and the MICT group, are involved in high-intensity circuit training (HICT) and moderate-intensity circuit training (MICT), respectively, for sixteen weeks three times a day. The intensity is determined based on the relationship between exercise intensity and HR20. The intensity is set at 75% to 85% of H_{max} for moderate intensity and 85% to 90% of H_{max} for high-intensity training using a heart rate monitor. Meanwhile, the measurement test instruments that can be used are the zigzag running test for agility, the 30-meter speed test for speed, and the standing long jump test for explosive strength. The training method with this procedure is conducted by (Muez Tsegay et al., 2021), the research findings indicate that the HICT group showed a more significant improvement in agility, explosive strength, and speed compared to the MICT group.

In another study, HICT modified with FIFA+ has been proven to improve the physical fitness of young football players (Zein et al., 2020). The FIFA+ program is an initiative from the FIFA Medical Research Centre (F-MARC) that has been proven to reduce the risk of injuries in football players by 30-46% across various age groups, for both men and women (Althomali et al., 2024; Sadigursky et al., 2017; Thorborg et al., 2017). Zein et al. (2020) the modified HICT training procedure with FIFA+ intervention is conducted three times a week and lasts for four weeks. The HICT modification is only applied to part 2 of FIFA 11+, which is the strength and balance training. Six core exercises (plank, side-plank, Nordic hamstring, single-leg stance, squat, and vertical jump) are modified into high-intensity versions. Nordic hamstring is replaced with bridge hamstring, and single-leg stance is replaced with deadlift. Each exercise is performed for 30-40 seconds with a 10-second rest between exercises, after one exercise is completed, the subject should move on to the next exercise until they finish all exercises and then repeat for the next cycle (two sets of circuit training).

Based on the explanation of the training procedure described above, it can be concluded that CT is flexible and can be adjusted to the needs of the coach. However, it is important to note that when creating a training program to improve physical performance, the intensity must be adjusted according to the age of the athlete, especially for teenage players (Arnold et al., 2017). It is recommended for coaches to apply the CT training method by following athlete development guidelines with the LTAD program to

prevent injuries in players (Al Ardha et al., 2024; Zampieri, 2024).

IT & CT Training Model to Improve Physical Performance

Interval training (IT) and CT are training models widely used to develop athletes' fitness, but in their implementation, there are differences in terms of execution structure, types of activities, and training goals. However, in the studies obtained, both training models can be used simultaneously to improve the players' fitness. The research conducted by (Monea et al., 2017) concluding that providing a larger portion of the best methods and ways to develop speed and skills in the physical training of junior soccer players, the improvement in motor skill performance becomes significant. The use of appropriate training methods and tools presented and applied in this research determines the performance of junior soccer players in terms of speed and skills, averaging around 50%.

Technical Skills for Young Football Players

Physical fitness does not directly improve technical skills, but plays a role through the development of fundamental movement skills (FMS) and self-perception of competence. FMS and self-confidence serve as important mediators between physical fitness and technical skills in young players (Duncan et al., 2022). At the golden age, technical skills are fundamental that young football players must master, as technique is a basic element in football matches. The youth phase (around 8-14 years old) is the most effective time to develop basic techniques such as passing, dribbling, shooting, and ball control, as the adaptability response is very optimal at this age (Jia et al., 2021). The better the motivation for training, physical fitness, and motor skills of the athletes, the better their level of ability in mastering the basic techniques of football (Nurcahyo et al., 2025).

CT is one of the interesting training models that can enhance the motivation, physical fitness, and motor skills of athlete (Aaron Francis Nilesh, 2023; Sakthivel & Rangaraj, 2025). In the selection process that has been carried out, 1 article was obtained that meets the inclusion criteria for improving technical skills. The research results show that CT can enhance skills in passing, shooting, dribbling, interceptions, tackles, and takeovers (Păun et al., 2022). Here is the model along with the training frequency applied to improve basic techniques.

CT to Improve Basic Techniques

The analysis results found that CT also serves to enhance the technical aspects of young players. Simultaneously, the technical-tactical aspects can significantly improve by using the CT method (Păun et al., 2022). This finding proves that CT can be used not only for physical performance but can also be applied to improve the technical skills of football players.

CT is a Training model that consists of several stations, allowing the coach to vary each station according to the coach's objectives. In study (Păun et al., 2022) applying post-pandemic CT for 11-12 years old athletes, where each station consists of six exercises and focuses on the technical-tactical

aspects of the player. Training is conducted in the middle of a competition for 4 months consisting of two phases (autumn and spring), training is held every Tuesday and Thursday for 20-50 minutes. Training goals in the early season phase: Focus on basic technical training such as passing, dribbling, shooting, and ball control. End of season phase: Application of circuit methods to improve speed, creativity, teamwork, and spatial orientation on the field. By using the CT statistic training method, the team experienced significant improvements in the number of tackles, dribbles, assists, and goals. The decrease in fouls indicates an improvement in sportsmanship and better defensive techniques. There was an increase in shooting efficiency (fewer shots, but more goals scored).

Conclusions

Based on the literature analysis that has been conducted, a total of 6 articles passed through the PRISMA selection process. From these 6 articles, it can be confirmed that CT can be used to improve the physical condition of players such as physical fitness in preventing injuries, speed, agility, muscle endurance, explosive power, and player techniques such as passing, shooting, dribbling, interceptions, tackles, and take-overs. In the application of CT, it is important to pay attention to the frequency of training, duration of training, intensity of training, and variation of training so that CT can be used effectively for players. In addition, from the articles obtained, there is only 1 that researched the effectiveness of CT on the techniques of youth soccer players. In improving physical aspects, there are training models used, namely HICT, MICT, IT, and CT, while for improving technique, the CT training model is used. The author sees opportunities for future researchers to conduct CT research that enhances the technical aspects of young football players. From the literature results, it can be concluded that CT is a flexible training method and very useful for coaches to apply to young football players.

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Conflict of Interest

The authors reported no conflicts of interest.

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Вплив методу колового тренування на поліпшення технічних навичок та фізичної працездатності юних футболістів: Систематичний огляд

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 9 с., 1 табл., 1 рис., 54 джерел.

Мета дослідження. Мета цього дослідження полягала у вивченні впливу методу колового тренування (КТ) на поліпшення технічних навичок та фізичної працездатності підлітків-футболістів, а також у забезпеченні розуміння щодо ефективного застосування КТ.

Матеріали та методи. У представленому дослідженні процес відбору проведено із використанням фільтра рекомендацій із пріоритетних елементів звітування для систематичних оглядів та метааналізів (PRISMA). Для пошуку наукових джерел, що охоплюють метод колового тренування в контексті покращення технічних показників та фізичної працездатності або підготовленості, використовувалися чотири наукометричні бази даних, до яких належать ScienceDirect, Scopus, Google Scholar та PubMed, що містять публікації за період з 2015 по 2025 роки.

Результати. За результатами огляду літератури, проведеного в рамках цього дослідження, після ретельного відбору з 878 статей було визначено 6 статей, прийнятних для подальшого аналізу. Серед отриманих 6 статей: 5 — зосереджувалися на покращенні фізичної працездатності, а 1 стаття була присвячена вдосконаленню технічних навичок. У процесі імплементації необхідно звертати увагу на частоту, інтенсивність, тривалість та різноманітність тренувань. Результати представленого огляду свідчать, що методика КТ довела свою ефективність у поліпшенні технічних навичок та фізичної працездатності юних футболістів.

Висновки. На основі результатів аналізу встановлено, що КТ сприяє поліпшенню фізичного стану підлітків-футболістів, зокрема фізичної підготовленості у запобіганні травматизму, швидкості, спритності, м'язової витривалості, вибухової сили, а також технічних навичок гравців, як-от виконання пасів, ударів, дриблінгу, інтерцепції, відбирання та перехоплення м'яча. З метою покращення фізичних аспектів можна використовувати такі моделі тренувань, як високоінтенсивне колове тренування (ВІКТ), колове тренування помірної інтенсивності (ПІКТ), інтенсивне тренування (ІТ) та безперервне тренування (БТ), тоді як для вдосконалення техніки можна застосовувати модель КТ. Очікується, що результати цього дослідження відкриють можливості для інших науковців щодо застосування зазначеної моделі з метою розвитку технічних навичок.

Ключові слова: колове тренування, технічні навички, фізична працездатність, огляд літератури, юні футболісти.

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