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Effect of Circuit Training on Speed of Under-15 Male Football Players of Pune City

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ABSTRACT: Football performance is strongly influenced by physical fitness components, especially speed, which determines acceleration, movement efficiency, and tactical responsiveness during match play. The purpose of this study was to investigate the effect of a structured circuit training program on speed among under-15 male football players of Pune city. An experimental single-group pre-test and post-test design was employed. Participants completed a systematic circuit training program incorporating sprint drills, plyometric exercises, agility training, and functional strength movements. Speed performance was assessed using a standardized 50 m dash. Statistical analysis revealed significant improvement in speed performance following the intervention. The findings indicate that circuit training is an effective training modality for improving speed in adolescent football players and supports the integration of multidimensional conditioning strategies in youth development programs.

KEYWORDS: Circuit training, speed, U-15 football, sprint performance and Pune city.

I. INTRODUCTION

Football is a high-intensity intermittent sport requiring rapid accelerations, repeated sprinting actions, and fast decision-making under dynamic conditions. Speed is a decisive physical attribute influencing performance outcomes such as attacking efficiency, defensive recovery, and overall match success.

Modern football demands multidimensional physical preparation. Speed encompasses acceleration, maximal velocity, and movement coordination. Adolescent players, particularly those in the under-15 age category, represent a critical developmental stage where neuromuscular adaptations occur rapidly. Structured training during this phase contributes significantly to long-term athletic development.

Circuit training has gained popularity as an integrated conditioning method combining strength, agility, coordination, and endurance exercises. Unlike traditional isolated sprint training, circuit training provides varied stimuli that enhance neuromuscular efficiency and explosive performance.

Despite growing interest, limited research has examined the specific effect of circuit training on speed among under-15 football players in Indian contexts, particularly in Pune city. Therefore, the present study aims to evaluate the effectiveness of circuit training on speed development.

II. RESEARCH GAP AND JUSTIFICATION

Although international research has widely supported circuit training as an effective conditioning strategy for improving physical fitness and sports performance, several important gaps remain within the existing body of literature. First, the majority of studies have focused primarily on adult, elite, or professional athletes, while relatively limited attention has been given to adolescent populations, particularly under-15 football players who are at a critical stage of physiological and psychological development. Adolescence represents a sensitive period for neuromuscular adaptation, motor skill acquisition, and physical growth, making it essential to investigate training methods specifically tailored to this age group.

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Second, many previous investigations have examined circuit training in relation to multiple physical fitness variables simultaneously, such as endurance, strength, agility, flexibility, and overall motor fitness. While these multidimensional studies provide valuable insights, they often fail to isolate speed as a primary dependent variable. As a result, the specific contribution of circuit training to speed development remains insufficiently explored. Given that speed is a decisive performance factor in modern football—affecting acceleration, reaction time, sprint ability, and tactical execution—there is a need for research that focuses exclusively on this critical variable.

Third, there is a notable scarcity of studies conducted within the Indian context, particularly among youth football players. Training environments, climatic conditions, cultural influences, coaching methodologies, and infrastructural resources vary significantly across regions. Therefore, findings derived from Western populations cannot always be generalized to Indian athletes without contextual validation. Research involving Indian youth populations is essential to generate locally relevant evidence that can inform coaching practices and sports development programs.

Furthermore, existing literature frequently combines multiple fitness interventions or mixed training protocols, making it challenging to determine the independent effectiveness of structured circuit training on speed performance. This lack of specificity highlights the need for focused experimental studies that evaluate clearly defined training variables and outcomes.

The present study aims to address these research gaps by examining the isolated effect of a structured circuit training program on speed among under-15 male football players in Pune city. By concentrating on a specific age group, a single performance variable, and a region-specific training context, this research seeks to contribute meaningful empirical evidence to the fields of sports science, physical education, and youth athletic development.

III. METHODOLOGY

Research Design

The present study employed an experimental single-group pre-test and post-test research design to examine the effect of circuit training on speed performance among under-15 male football players. This design involves assessing the same group of participants before and after the implementation of a specific intervention, allowing researchers to evaluate changes attributable to the treatment.

In this approach, participants were initially assessed using standardized speed testing procedures to establish baseline performance levels (pre-test). Following the pre-test assessment, the participants underwent a structured circuit training program designed to enhance speed through sprint drills, agility exercises, plyometric movements, and strength-based activities. After completion of the training intervention, the same speed test was administered again (post-test) under similar conditions to measure any improvement or change in performance.

Participants

Under-15 male football players from Pune city selected using purposive sampling.

Training Intervention

Station	Exercise / Drill	Week 1–2 (Initial Phase)	Week 3–4 (Progressive Phase)	Week 5–6 (Advanced Phase)
1	Cone Weave Sprints	30 sec @ 70% intensity	40 sec @ 80% intensity	45 sec @ 90% intensity
2	Bodyweight Squats / Jump Squats	30 sec bodyweight squats	35 sec with small jumps	40 sec explosive jump squats
3	Push-Ups	Standard push-ups (30 sec)	35 sec with incline/decline variation	40 sec explosive clap push-ups
4	Medicine Ball Slams (2–3 kg)	30 sec	35 sec	40 sec
5	Ladder Drills	Basic in–out footwork	Two-foot hops progression	Single-leg and complex patterns
6	Plank Hold	30 sec	35 sec	40 sec

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Station	Exercise / Drill	Week 1–2 (Initial Phase)	Week 3–4 (Progressive Phase)	Week 5–6 (Advanced Phase)
7	Shuttle Runs (10 m)	3 repetitions per set	4 repetitions per set	5 repetitions per set
8	Ball Dribble Around Cones	Slow controlled dribbling	Faster dribbling with tighter turns	High-speed dribbling using weaker foot

Statistical Analysis

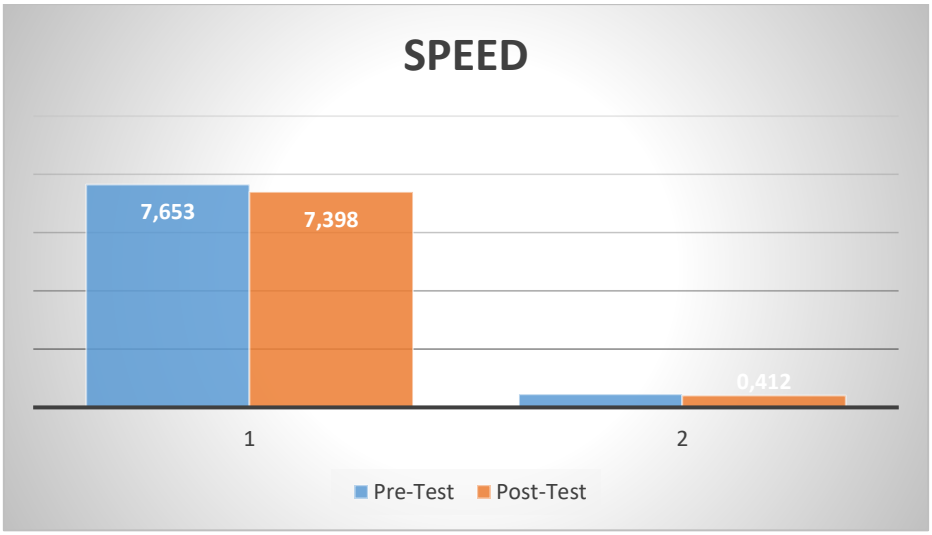
- Mean
- Standard deviation
- Paired sample t-test

Table no.1
50 Meter Dash

Test	N	Mean	SD	MD	df	Cal T	Tab T
Pre-Test	**30**	7.653	0.450	0.255	29	2.289	2.045
Post-Test	**30**	7.398	0.412				

Table no.1: A total of 30 participants (N = 30) were included in the study. The mean score for the pre-test was 7.653 with a standard deviation of 0.450, while the mean score for the post-test decreased to 7.398 with a standard deviation of 0.412. Since speed was measured in terms of time taken to complete the sprint test, a lower mean value in the post-test indicates an improvement in speed performance after the training program. The mean difference (MD) between pre-test and post-test scores was 0.255, reflecting a positive change in performance. A paired sample t-test was conducted to determine whether the observed difference was statistically significant. The calculated t-value (Cal T) was 2.289, which is greater than the tabulated t-value (Tab T) of 2.045 at the 0.05 level of significance with 29 degrees of freedom (df = 29).Since the calculated t-value exceeds the tabulated value, the result is statistically significant. Therefore, it can be concluded that the circuit training program produced a significant improvement in speed among under-15 male football players. The findings support the effectiveness of circuit training as a conditioning method for enhancing speed performance in youth athletes.

Graph No.1



Graph no.1: Graphical representation of Mean and S.D of Speed

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IV. DISCUSSION

The present study demonstrates that circuit training significantly improves speed performance among under-15 football players. The observed improvement may be attributed to neuromuscular adaptations resulting from plyometric, agility, and sprint-based exercises incorporated within the circuit training program. These exercises enhance motor unit Recruitment, muscle coordination, and acceleration capacity, which directly contribute to improved sprint performance.

These findings are consistent with previous research indicating that multidimensional training approaches are more effective in enhancing speed compared to isolated training methods. For example, **Michailidis et al. (2022)** reported that short-term circuit training interventions significantly improved sprint performance and acceleration ability among youth football players by enhancing neuromuscular efficiency and repeated sprint capacity. **Similarly, Lohar et al. (2023)** observed significant improvements in speed and dribbling skills among adolescent football players following a structured circuit training program, emphasizing the role of integrated physical conditioning in performance enhancement.

Research conducted by **Sakthivel (2025)** also demonstrated that circuit training effectively improves motor fitness variables, including speed, endurance, and agility, due to its combined focus on explosive strength and coordination. Furthermore, **Boraczyński et al. (2021)** highlighted that total-body circuit training protocols contribute to improvements in sprint speed and overall physical fitness among young athletes by stimulating both anaerobic power and neuromuscular control.

These findings align with the broader literature suggesting that circuit training stimulates explosive strength, coordination, and movement efficiency, all of which are essential components of sprint performance. Unlike traditional repetitive sprint drills, circuit training provides varied movement patterns that enhance overall athleticism and reduce training monotony.

Additionally, the varied and dynamic nature of circuit training promotes motivation and engagement among adolescent athletes, potentially enhancing adherence to training programs and improving performance outcomes. Previous studies have suggested that engaging training formats increase participation levels and psychological readiness, which indirectly contribute to improved physical performance and skill acquisition

V. CONCLUSION

Circuit training has emerged as an effective and practical training method for improving speed among under-15 male football players due to its multidimensional structure and ability to target various physiological and neuromuscular components simultaneously. By integrating sprint drills, agility exercises, plyometric movements, and strength-based activities within a structured training framework, circuit training promotes enhanced motor coordination, explosive power, reaction ability, and acceleration capacity, all of which are essential for speed development in football. The present findings suggest that incorporating circuit-based conditioning into youth football training programs can significantly contribute to improved athletic performance. Unlike traditional isolated training methods, circuit training provides a dynamic and engaging environment that encourages consistent participation and enhances motivation among adolescent athletes. This is particularly important during the developmental stage, where training should focus not only on performance enhancement but also on building fundamental movement skills and long-term physical literacy.

Furthermore, circuit training aligns well with the principles of long-term athlete development (LTAD), as it allows progressive overload, variation in training stimuli, and adaptability to individual skill levels. These characteristics make it a safe and effective training approach for young players who are still undergoing physiological growth and neuromuscular maturation. The structured yet flexible nature of circuit training enables coaches to modify exercise intensity, duration, and complexity according to the developmental needs of athletes.

In addition to immediate performance benefits, integrating circuit training into youth football programs may support long-term player development by improving physical fitness foundations, reducing injury risk through balanced muscular development, and enhancing movement efficiency. Consequently, coaches, physical educators, and sports academies are encouraged to adopt scientifically designed circuit training protocols as part of comprehensive training strategies aimed at optimizing speed performance and fostering sustainable athletic development among youth football players.

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