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The Effectiveness of Small-Sided Games in Enhancing Technical Skills and Physical Fitness among Adolescent Football Players

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ABSTRACT

Purpose: This study aimed to examine the effectiveness of Small-Sided Games (SSGs) in improving technical skills and physical fitness among adolescent football players. **Methods:** A quasi-experimental design with pre-test and post-test measurements was conducted on 30 male football players aged 13–15 years. The participants underwent an eight-week SSG training program, held three times per week. Technical skills were assessed through passing accuracy, dribbling time, and shooting accuracy tests, while physical fitness was measured using the Yo-Yo Intermittent Recovery Test Level 1, Illinois Agility Test, and Vertical Jump Test. Data were analyzed using paired sample t-tests with a significance level of $p < 0.05$. **Results:** Significant improvements were found in all measured variables. Technical performance showed increases in passing (from 15.3 to 18.6 passes), shooting accuracy (12.6 to 16.1 goals), and reduced dribbling time (from 11.2 to 9.8 seconds). Physical fitness indicators also improved, with increases in Yo-Yo IR1 distance (980 m to 1185 m), vertical jump height (39.2 cm to 43.5 cm), and faster agility performance (from 18.5 to 17.2 seconds). **Conclusion:** Small-Sided Games are an effective and efficient training method for enhancing both technical and physical performance in adolescent football players. Their game-based structure offers a valuable approach to youth football development, combining skill acquisition and conditioning in a realistic and engaging format.

1. Introduction

Football, recognized globally as a widely practiced sport among adolescents, serves not only as a competitive platform but also engenders numerous physical, psychological, and social advantages. Engaging in football fosters essential developmental skills, helping adolescents to enhance their physical fitness, self-esteem, and social integration within peer groups (Eime et al., 2013; Zeng & He, 2024).

Research supports that through sports like football, young individuals gain significant health benefits, including improved physical fitness and mental resilience. Football encourages physical activity, which is vital for healthy growth and development during adolescence. A systematic review by Eime et al. indicates that participation in team sports significantly promotes psychological well-being, reduces feelings of hopelessness, and fosters positive social interactions (Eime et al., 2013). Moreover, engagement in football

activities has been correlated with increased social acceptance and reduced body dissatisfaction (Eime et al., 2013).

In light of the expanding youth development programs, coaches and educators are increasingly turning towards training methods that are both effective and developmentally suitable. Small-Sided Games (SSGs) have emerged as a particularly noteworthy training approach. SSGs provide a conducive environment for practice that enhances skill acquisition and game understanding while accommodating varying skill levels within players (Zheng et al., 2025). This approach aligns with the developmental needs of adolescents, promoting a more engaging and less intimidating atmosphere during training sessions.

Furthermore, the theory of planned behavior illustrates how adolescents' attitudes towards football strongly influence their participation levels. Zeng and He's study demonstrates that positive societal, educational, and familial encouragement significantly enhances adolescents' willingness to engage in football, emphasizing the importance of support systems in their sporting endeavors (Zeng & He, 2024). Such frameworks not only advocate for participation but also facilitate broader acceptance and appreciation of football as a platform for holistic youth development.

Football stands out as a pivotal sport in fostering the physical, psychological, and social growth of adolescents. The strategic focus on innovative training methodologies like SSGs aligns with the needs of young athletes, enhancing their overall engagement and performance in the sport. As youth football initiatives continue to evolve, understanding its multifaceted benefits becomes increasingly critical in shaping future coaching and educational practices.

Small-Sided Games (SSGs) are modified versions of traditional football matches characterized by fewer players, smaller pitch dimensions, and simplified rules. These modifications aim to create a training environment that enhances players' involvement in the game. Research indicates that SSGs effectively increase ball contact, facilitate decision-making opportunities, and elevate physical activity levels among participants. This foundational premise supports the assertion that small-sided games provide unique advantages over traditional training models in enhancing technical and physical skills for football players.

A significant body of evidence supports the idea that SSGs improve technical skills such as passing, dribbling, and shooting. For instance, Maujud et al. demonstrated that SSGs, particularly in formats like 3 vs. 3 and 6 vs. 6, significantly enhance passing techniques among football players, demonstrating enhancements in both physical capabilities and technical skills (Maujud et al., 2021). Similarly, Hardinoto et al. found that SSG practices notably influenced the passing abilities of athletes aged 14-17 years, reinforcing the effectiveness of these modified games in skill development (Hardinoto et al., 2023). These findings highlight the ability of SSGs to create conditions conducive to skill improvement by increasing the frequency of ball interactions and active participation during training sessions.

Moreover, the physical benefits of SSGs are well documented. For example, Fitrian et al. emphasized that participants in small-sided games exhibited increased VO2 max levels, suggesting enhanced aerobic capacity alongside improved passing accuracy (Fitrian et al., 2023). This aligns with findings from research that noted significant improvements in physical endurance in young athletes participating in SSG training methods, showcasing the dual physical and technical enhancements afforded by such training (Perdima et al., 2024). Additionally, Halouani et al. reported that playing SSGs led to increased technical actions and

physiological responses, establishing a clear link between game format and physical exertion (Halouani et al., 2017).

It is also essential to consider the cognitive aspects that SSGs engage. According to Sarmento et al., the tactical decisions made in small-sided games facilitate a better understanding of game dynamics, which is crucial for developing holistic football skills among players (Sarmento et al., 2018). The increased intensity and frequency of decision-making opportunities in SSGs force players to enhance their cognitive processing of game situations, thereby bolstering their overall performance on the field.

Despite the growing popularity of SSGs in youth football training, empirical studies focusing on their holistic impact particularly among adolescent players remain limited. Most existing research tends to isolate either the physiological or technical outcomes, with few studies adopting an integrated perspective. Furthermore, variations in age group, game format, and training duration often produce inconsistent findings, highlighting the need for more context-specific investigations.

This study aims to examine the effectiveness of Small-Sided Games in improving both technical skills and physical fitness among adolescent football players. By implementing a structured SSG intervention and evaluating its outcomes through reliable testing protocols, this research seeks to provide practical insights for coaches, educators, and sports scientists involved in youth football development.

2. Methods

The study employed a quasi-experimental design with a pre-test and post-test approach to examine the effectiveness of Small-Sided Games (SSGs) in enhancing technical skills and physical fitness among adolescent football players. A total of 30 male players aged 13–15 years from a local football academy participated in the study, all of whom had at least one year of playing experience and were free from injury. The intervention was conducted over eight weeks, with training sessions held three times per week, each lasting 60 minutes and consisting of warm-up activities, 30–40 minutes of SSGs (in 3v3 to 5v5 formats), and cool-down exercises. Technical skills were assessed using passing accuracy, dribbling speed, and shooting accuracy tests, while physical fitness was measured through the Yo-Yo Intermittent Recovery Test Level 1, Illinois Agility Test, and Vertical Jump Test. All tests were administered one week before and after the intervention under standardized conditions. Data were analyzed using paired sample t-tests with a significance level set at $p < 0.05$, and statistical analyses were conducted using SPSS version 25.

3. Results

The results showed significant improvements in both technical skills and physical fitness after the eight-week Small-Sided Games intervention. Paired sample t-tests revealed statistically significant increases in passing accuracy, shooting accuracy, and dribbling performance. Similarly, physical fitness indicators such as aerobic capacity (Yo-Yo IR1), agility, and lower-body power also improved significantly. Table 1 presents the pre-test and post-test means, standard deviations, and *p*-values for each variable.

Table 1. Pre- and Post-Test Results of Technical and Physical Variables (N = 30)

Variable	Pre-Test Mean ± SD	Post-Test Mean ± SD	*p*-value
Passing Accuracy (no. of hits)	15.3 ± 2.4	18.6 ± 2.1	0.001 **
Dribbling Time (sec)	11.2 ± 1.5	9.8 ± 1.2	0.002 **
Shooting Accuracy (hits)	12.6 ± 2.7	16.1 ± 2.5	0.001 **
Yo-Yo IR1 Distance (m)	980 ± 215	1185 ± 225	0.003 **
Illinois Agility (sec)	18.5 ± 0.9	17.2 ± 0.8	0.004 **
Vertical Jump (cm)	39.2 ± 4.3	43.5 ± 4.1	0.001 **

Note: p < 0.05 indicates statistically significant difference.

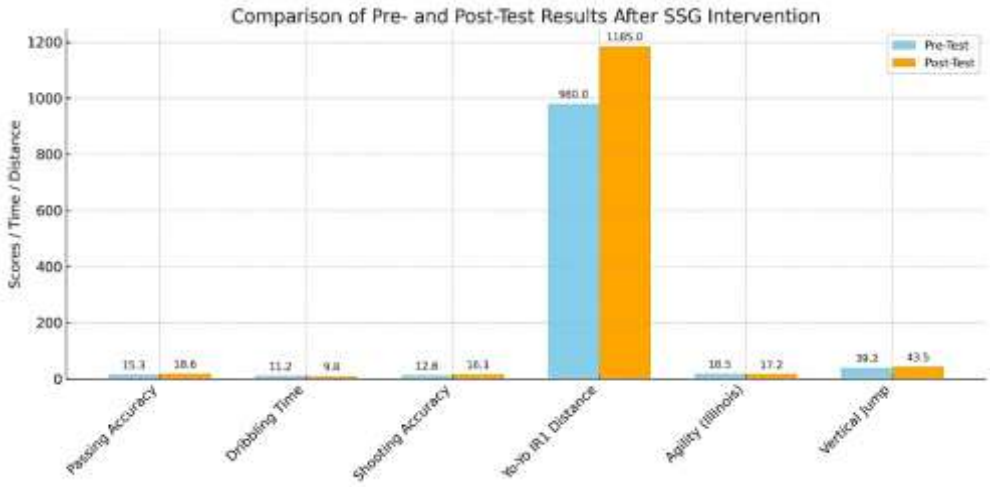

Figure 1. Comparison of Pre and Post-Test Result After SSG Intervention

The bar chart illustrates the comparison between pre-test and post-test results across six key performance indicators related to technical skills and physical fitness of adolescent football players. The light blue bars represent the pre-test scores, while the orange bars show the post-test scores, recorded after an eight-week Small-Sided Games (SSG) training intervention.

Significant improvements were observed in all measured variables. Passing accuracy increased from a mean of 15.3 to 18.6 successful passes, indicating enhanced ball control and coordination. Dribbling time decreased from 11.2 seconds to 9.8 seconds, reflecting better agility and ball-handling speed. Likewise, shooting accuracy rose from 12.6 to 16.1 successful shots, suggesting improved precision and footwork.

In terms of physical fitness, the Yo-Yo Intermittent Recovery Test distance increased markedly from 980 meters to 1185 meters, demonstrating enhanced aerobic capacity. Illinois Agility Test scores improved, with times dropping from 18.5 to 17.2 seconds, indicating quicker directional changes and better body control. Lastly, vertical jump height increased from 39.2 cm to 43.5 cm, suggesting improvements in lower-limb power and explosiveness.
These findings reinforce the effectiveness of Small-Sided Games as a holistic training approach that simultaneously develops both technical skills and physical fitness in youth football training programs.

4. Discussion

The results of various studies highlight that Small-Sided Games (SSGs) serve as an effective training method to enhance both technical skills and physical fitness among adolescent football players. A meta-analysis by Moran et al. emphasizes that SSGs improve both technical and endurance performances in youth soccer players (Moran et al., 2019). This aligns with findings from Maujud et al., who demonstrated that SSGs, specifically formats of 3 vs 3 and 6 vs 6, significantly enhance both aerobic capacity (VO2 max) and skills such as passing accuracy among football players (Maujud et al., 2021). These training methods foster greater engagement with the ball, leading to an increase in the frequency of decision-making opportunities for the players (Maujud et al., 2021).

Statistically significant improvements in skill execution, particularly in passing, dribbling, and shooting, have been documented. For example, Hardinoto et al. reported substantial effects of SSGs on passing abilities in athletes aged 14-17 years, indicating enhancements in technical skills through SSG training (Hardinoto et al., 2023). Similarly, Pamungkas et al. found that small-sided games led to a 14.55% increase in passing skills, indicating a direct correlation between SSG training methodology and skill development (Pamungkas et al., 2024). In further support, Eniseler et al. noted that high-intensity practices in SSG formats typically elicit greater physical demands and engagement than traditional forms of endurance training, which contributes to overall skill acquisition (Eniseler et al., 2017).

Moreover, research by Bahtra et al. confirmed the positive impact of SSGs on aerobic endurance among youth players, suggesting that as players engage more intensely in the game, they also enhance their technical proficiency through continuous movement and interaction with the ball (Bahtra et al., 2023). This notion is backed by evidence presented by Dellal et al. that highlighted the technical and physical demands of small vs. large-sided games, noting the advantage of compact playing fields, which inherently increase ball touches and foster tactical engagement (Dellal et al., 2012).

Additionally, results from Yudi et al. emphasize the necessity of SSGs in developing basic soccer skills; the combination of varied training formats, such as motor skills with SSGs, yielded superior results in skill performance compared to conventional training methods (Yudi et al., 2024). These collective findings reinforce the idea that SSGs not only improve technical abilities such as passing, dribbling, and shooting precision but do so through their design, which emphasizes continual involvement with the ball and cognitive engagement during gameplay.

The evidence drawn from various studies consistently demonstrates that SSGs are an efficient and effective training method for improving the technical skills and physical fitness of adolescent football players, facilitating a conducive environment for increased player engagement and skill acquisition. Small-sided games (SSGs) have been increasingly recognized for their significant contributions to enhancing various physical attributes crucial for soccer performance, such as aerobic capacity, agility, and explosive power. From a physiological perspective, the increased demand for high-intensity efforts in condensed playing environments leads to enhancements in cardiorespiratory fitness, as indicated by improvements in metrics like the Yo-Yo Intermittent Recovery Test (Yo-Yo IR1), the Illinois Agility Test, and vertical jump scores (Hadiana et al., 2019; Ribut Wahidi et al., 2021).

Research supports the premise that the nature of SSGs facilitates repeated bouts of intense activity, necessitating quick transitions in movement patterns, including sprinting, direction changes, and accelerations. These high-intensity activities stimulate various physiological adaptations, resulting in enhanced aerobic endurance and neuromuscular function necessary for peak athletic performance. For instance, previous studies have documented that SSGs significantly improve VO2max, an essential measure for evaluating aerobic capacity (Los Arcos et al., 2015; Sanjaya & Suherman, 2024). Furthermore, evidence suggests that SSGs can yield similar improvements in both aerobic and anaerobic performance metrics, demonstrating their utility as effective training modalities (Bahtra et al., 2023; Radziminski et al., 2013).

The conditioning benefits of SSGs who emphasized that such formats serve dual roles: promoting both physiological improvements and heightened technical execution (Bahtra et al., 2023; Ribut Wahidi et al., 2021). The practicality and effectiveness of SSGs in youth soccer training programs are underscored by studies illustrating notable enhancements in physical performance metrics during and following participation in SSGs (Halouani et al., 2017; Sarmento et al., 2018). Additionally, the structure of SSGs, with their emphasis on reduced space and continuous play, engages players in dynamic scenarios that encourage not only physical conditioning but also tactical awareness and skill application in game-like contexts (Gaurav & Maman, 2022). SSGs provide an invaluable training framework that enhances various dimensions of athletic performance through physiological conditioning, tactical development, and technical skill refinement. The amassed body of evidence confirms that these games are not only effective in improving specific performance metrics but are also critical in fostering an adaptive training environment for aspiring soccer players.

The integration of Small-Sided Games (SSGs) into youth sports training offers substantial benefits, promoting both physical and technical skill development in environments that simulate real competition. The SSG format immerses athletes in game-like scenarios, allowing for the simultaneous enhancement of various athletic skills within a limited timeframe. This dual focus is especially important for young athletes who are at a crucial stage in their physical and skill development. Research indicates that the incorporation of integrative training approaches enhances motivation and engagement among participants, making training sessions more effective and enjoyable (Bergeron et al., 2015; Till et al., 2022). Additionally, the design of SSGs aligns well with principles outlined in the Long-Term Athlete Development (LTAD) model, emphasizing the significance of holistic growth in developing athletes. LTAD promotes structured physical activity that is age-appropriate and skill-

focused, underlining the importance of integrating various physical competencies over time (Till et al., 2022).

Furthermore, the effectiveness of SSGs can be attributed to their ability to maintain high levels of competition and enjoyment, which are essential for sustaining youth participation in sports. The holistic nature of SSGs addresses the psychological and developmental needs of young athletes, fostering life skills alongside athletic abilities. According to Bourdon et al., a comprehensive training framework that monitors athlete loads is crucial for maximizing development; this is particularly pertinent in the SSG context, where continuous feedback and adaptation can help sustain athlete engagement and performance (Bourdon et al., 2017). Similar research has demonstrated that integrated and game-specific practices significantly contribute to athlete motivation and long-term participation in sports (Till et al., 2022).

Moreover, systematic approaches in youth sports that utilize concepts from the LTAD model ensure athletes develop foundational skills progressively and sustainably. The consensus among sports scientists is that skill acquisition should occur in context rather than isolation, particularly within competitive environments like SSGs, which prepare athletes both physically and mentally for higher levels of competition. This aligns with findings presented by Thomas et al., who detailed the benefits of structured development pathways that cater to diverse developmental needs in young athletes (Thomas et al., 2020).

However, it is important to note that the study did not include a control group, and the sample was limited to male players from a single academy, which may limit the generalizability of the findings. Future research is encouraged to explore the effects of different SSG formats (e.g., 2v2 vs. 5v5), longer intervention periods, and their impact across different age groups and skill levels. This study supports the implementation of Small-Sided Games as an effective and efficient training method for adolescent football development, capable of improving key technical and physical attributes in a game-relevant setting.

5. Conclusion

This study concludes that Small-Sided Games (SSGs) are an effective and practical training method for enhancing both technical skills and physical fitness among adolescent football players. Over an eight-week intervention period, participants showed significant improvements in passing accuracy, dribbling speed, and shooting precision, as well as in aerobic endurance, agility, and explosive leg power. These results highlight the dual benefit of SSGs in promoting sport-specific skill development while simultaneously improving physical conditioning in a game-like environment. Given its efficiency, adaptability, and motivational value, SSG-based training is highly recommended for youth football programs aiming to develop well-rounded players. Future studies with control groups and varied sample populations are needed to strengthen and generalize these findings across broader contexts.

6. Author Contribution

1 conducted the experiment. 2 wrote the manuscript with support from 3. 4 collected the XYZ data sample. 5 helped supervise the project. 5 also conceived the original idea and supervised the overall project.

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