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The Impact of Small-Sided Games On Start Speed and Agility in Football Players Under 12 Years Old

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Abstract:

This study aimed to investigate the impact of small-sided game training on the development of start speed and agility in football players under 12 years old. **Methods**: An experimental two-group design was used. The sample consisted of 26 football players under 12 years old divided into experimental (n=13) and control (n=13) groups. The experimental group underwent 12 training units designed using the small-sided game method. Pre- and post-tests were conducted to assess start speed and agility. Independent samples t-tests were used for statistical analyses.

Results: No statistically significant differences were found between the experimental and control groups in terms of the start speed. However, significant differences were observed in agility, with the experimental group demonstrating superior performance compared with the control group.

Conclusion: Small-sided game training positively impacted the development of agility but not the start speed in football players under 12 years old. These findings suggest that small-sided games can be an effective training method for enhancing specific physical qualities in young football players.

Keywords: Small-sided games, start speed, agility**.**

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1. INTRODUCTION

Football, which is widely practiced, popular, and well attended worldwide, has achieved unmatched levels of competition in every tier and category. Experts have been compelled to explore modern demands and to improve various aspects of performance. Scientific studies focusing on different aspects of this game have unveiled its potential for developing innovative training curricula, methods, and techniques. Among the most crucial aspects that have captured researchers' attention are the physical demands essential for playing the game, without overlooking the technical, skilled, and tactical prerequisites. Through an analysis of the French league, Turpin (2002) demonstrated that a football player engages in 72-109 sprints, 40-70 pivots with direction changes, 30 technical movements, 57 tactical movements, and one explosive movement every 43 (Dahbazi & Jibali, 2020, p. 381). At this level, physical preparation has evolved into a process aimed at elevating players' performance through planned indicators to enhance their efficiency in meeting the modern demands of football and as a foundation for building high physical conditions. This enables them to execute technical, skilled, and tactical duties more effectively and positively during a match.

Laith (2010) affirmed that there is a strong correlation between motor abilities and skill performance in a game. He asserts that the success of a player's motor execution during a match is contingent upon the degree of stability and consistency of motor skills and the extent of mastery, regardless of the changing conditions and game situations encountered throughout the match (Adel & Mazroua, 2023, p. 205)

The physical conditions required by players to carry out various responsibilities have become high and characterized by high speed, and tactical movements in attack and defense have become complex. Team preparation relies on diversity in exercises and their objectives to encompass the largest possible number of basic activities and their branches to facilitate the training programming process in line with the players' level and potential for development (Al-Amiri, 2020, p. 548).

One of the most significant factors driving experts to prioritize the physical aspect is the contemporary scheduling of tournaments and competitions, which allows players to participate in three matches per week. Given the substantial volume of physical load, it is imperative to adapt the body and regulate various variables in accordance with this effort and the distinctive characteristics of the game. Consequently, well-designed and standardized training programs must be

built on scientific principles that align with the nature of the competition and the age group of the players. This encompasses the utilization of small-sided games that harmonize with the demands of modern play, employing different means, spaces, and diverse techniques that facilitate the integration of all fundamental and even subsidiary aspects, whether technical, physical, or tactical (tchokonte, 2011, p. 294).

Similarly, Little (2009) posits that training exercises of this nature closely resemble what players will face in actual matches, enabling them to recreate numerous physical, technical, and psychological demands of the game (Qunoun & Si El Arbi, 2021, p. 282).

Batty (1981) posits that training in small spaces allows us to focus on a specific objective while preserving the essential elements of the game in the presence of an opponent. He considered it one of the most diverse and effective methods for achieving training goals (Zighm & Boukratm, 2022, p. 98).

In light of the aforementioned, the focus of the study topic is encapsulated in training with small-sided games and their influence on developing the speed of acceleration and agility among football players under 12 years old.

1.1. Problem statement

In recent years, football has been influenced by a revolution in science and modern technology. This advancement has introduced numerous novel and contemporary training methods that align with the nature of specialization and age group of the trainee. The training process is not merely a collection of skills but rather a multifaceted and interconnected motor performance that occurs within a dynamic system. According to Al-Basati (1999), "Appropriate and organized exercises that can be controlled through the speed of execution and comprehension of the responsibilities placed upon the players must be selected. It is also feasible to manage the training loads by designing appropriate doses to attain the highest levels of skill and physical performance in accordance with the conditions of the competition" (Sahrawī, Bournan , & Al-Sadiq, 2014, p. 424).

Previous studies have focused on investigating the small-sided games training method and its impact on various aspects of performance in football. This modern approach is among the methods that develop motor, skill, tactical, and physical qualities in general, with a particular emphasis on physical qualities. It offers a comprehensive approach to soccer training and provides numerous benefits to both players and teams. Dellal's (2008) study confirmed that these

games enhance endurance, improve physical qualities such as cardiovascular fitness, agility, speed, and strength, and provide opportunities for skill development in a game-like setting. Additionally, small-sided games promote tactical understanding, offer variety in training, increase workout intensity, and foster team bonding and cohesion. By combining physical, technical, and tactical elements in a dynamic and competitive environment, small-sided games contribute to the overall improvement of soccer players' performance in the field, specifically when their intensity is similar to short intermittent exercises in high-level football players.

Aaqli's (2018) study, which examined two types of training methods, yielded positive results in the use of small-sided games (5 Vs. 5 and 2 Vs. 2) in developing physical and skill qualities in players under 23 years old. Saoudi's (2019) study found that small-sided games improve the maximum aerobic speed in players under 17 years old. Hijab & Ben Mesbah (2018) study validated the effectiveness of small-sided games in developing maximum speed, explosive strength, and speed-strength in players aged 17-19. Morsli et al.'s (2018) study confirmed the positive impact of small-sided games on motor response speed and skill performance in young players, consistent with Hajar Khirfan's (2011) findings. Sharit's (2018) study precisely addressed the contribution of small-sided games to improving dribbling technique and agility in players under 13 years old, recommending their inclusion in training programs for their effectiveness in achieving general and specific training goals.

The choice of young football players under 12 years old as the study sample was not arbitrary; rather, it was due to the significance of this training stage for the player, which is called the "golden age." During this stage, the child's muscular and nervous coordination as well as their sense of balance improved. Motor development peaked during this stage. Moreover, it is considered an ideal stage for learning and acquiring motor skills (Zaydan, 2001, p. 39).

Based on the aforementioned and after reviewing the results of previous studies and study, we addressed the following question: Does training with small-sided games affect the development of start Speed and agility in football players under 12 years old?

To facilitate the study process, we divided the general question into the following sub-questions:

- Does training with small-sided games contribute to the development of start Speed in football players under 12 years old?

- Does training with small-sided games contribute to the development of agility in football players under 12 years old?

The study hypotheses propose that training with small-sided games positively affects the development of start Speed and agility in football players under 12 years old.

This study had three primary objectives. First, it aimed to determine the contribution of small-sided game training in developing start speed and agility among football players under 12 years old. Second, we sought to design training units utilizing the small-sided games method to enhance specific physical qualities. Finally, this study aimed to identify some of the distinctive physical qualities of this age group.

The significance of this study lies in its potential scientific and practical contribution. From a scientific perspective, this study aimed to enrich the university library and provide valuable resources for coaches and students. Practically, the findings of this study may enable modification of training approaches for this age group based on the results obtained, potentially leading to more effective training practices.

1.2. Key Terminology:

Small-Sided Games: Small-sided games are a type of competition where the rules of the match are modified, and it can involve either equal or unequal numbers of players on the field (dellal, 2008, p. 53). In practical terms, these are a series of training exercises or drills that mimic competitive scenarios with varying numbers of players and adjusted rules regarding field dimensions, goal size, and the presence or absence of a goalkeeper.

Start Speed: The ability to move from one place to another in the shortest possible time (weinek, 1986, p. 344). Operationally, it is the ability to make the body or its parts cover the greatest distance in a given time or achieve the shortest time over a certain distance (didier & pascal, 2013, p. 361).

Agility: A complex ability that includes components of muscular strength, reaction speed, speed, muscular capacity, accuracy, control, and coordination (Sharit, 2018, p. 70). Operationally, it is the athlete's ability to achieve good coordination of movements, whether with their entire body or a part of it, indicating their agility (Hassan, 1998, p. 229).

2. Methods

2.1.Pilot Study

We performed a pilot study on a sample of four randomly chosen participants who were excluded from the primary study. The purpose of this pilot study was to evaluate the effectiveness of the tests relevant to the study topic in practical applications, prevent mistakes, and uncover the aspects and challenges of the study. Our objectives were to pinpoint any shortcomings in the procedures for administering the tests and collecting data, recognize any obstacles encountered during the application of the main tests, determine the time required to perform these tests, and establish the optimal method for conducting the tests under favorable circumstances.

2.2.Scope

The study was conducted according to the following timeline:

- the pilot study was carried out on 04/02/2022 and repeated three days later on 08/02/2022 at the same time;
- Pre-tests were administered on 11/02/2022
- The experiment was implemented from 12/02/2018 to 01/04/2022
- Post-tests were conducted on 02/04/2022.

The spatial scope of the study was the neighborhood stadium of the M'Sila League.

2.3.Design

An experimental method with a two-group design was used in this study.

2.4.Participants

The Participants consisted of football players under 12 years old for the 2021/2022 sports season, including two teams: Tawasul Al-Ajyal (CSGM) and Hamraa Larouqad (HLM). The total number of players was 30, divided as follows: 13 players as the experimental sample, 13 players as the control sample, and four players as the pilot sample.

2.5.Group Homogeneity

Table 1. Independent samples t-Test Results for Confounding Variables: Control vs. Experimental Group

Confounding Variables		N	Mean	SD	Df	Alpha	t-statistic	Significance
Weight	Control	13	36.92	2.66	24	0.05	0.18	Not Significant
	Experimental	13	36.69	3.56				
Height	Control	13	1.41	0.04			0.54-	Not Significant
	Experimental	13	1.42	0.06				
Age	Control	13	10.84	0.80			0.48-	Not Significant
	Experimental	13	11.00	0.81				

Table 1. presents the results of independent samples t-tests conducted to compare the control and experimental groups on potential confounding variables: weight, height, and age. There were no significant differences between the control group (weight: M = 36.92, SD = 2.66; height: M = 1.41, SD = 0.04; age: M = 10.84, SD = 0.80) and the experimental group (weight: M = 36.69, SD = 3.56; height: M = 1.42, SD = 0.06; age: M = 11.00, SD = 0.81) in terms of weight, $t(24) = 0.18$, $p > .05$, height, $t(24) = -0.54$, $p > .05$, or age, $t(24) = -0.48$, $p > .05$. These findings suggest that the control and experimental groups were homogeneous with respect to these potential confounding variables.

2.6. Measures

Data were collected through questionnaires and semi-structured interviews to inform the selection and design of training sessions that effectively incorporated small-sided games and to identify appropriate physical tests for measuring the targeted physical qualities. The participants included sports training specialists such as professors, doctors, and football coaches. The questionnaires and interviews aimed to gather information on the content, objectives, and arrangement of small-sided games within the training sessions. Furthermore, the experts provided recommendations for the most suitable physical tests for assessing the specific physical qualities under investigation. This process ensured that the training sessions and physical tests were carefully selected and designed

based on the expertise and insights of professionals in the field, thus enhancing the validity and reliability of the study.

2.6.1. Physical Tests

Two physical tests were employed in this study: the 10-Meter Sprint Test from a Standing Position and the Zigzag Run Test Around Four Hurdles.

The purpose of the 10-Meter Sprint Test was to measure the player's start Speed (cazorla, 2016, p. 21). The test was performed on a straight track with a starting line and finish line using a stopwatch and a whistle. The player stands at the starting line in a high starting position and, upon hearing the signal, runs at maximum speed until crossing the finish line. Each player is given two attempts with a rest period in between, and the best attempt is recorded.

The Zigzag Run Test Around Four Hurdles aims to measure agility (Al-Basati, 1999, p. 264). The equipment used included a starting line, four plastic poles, plastic cones, stopwatch, and whistle. The player runs in a zigzag pattern between the four poles arranged in a straight line, with the first pole being 3.2 meters from the starting line and each pole being 2.5 meters apart. The player attempts to avoid touching the poles while running back and forth, and the result is determined by recording the running time from the starting line until returning to it again.

2.6.2. Psychometric Properties of Physical Tests

Reliability

The reliability of the agility and start Speed tests was assessed using the test-retest method. Pearson's correlation coefficient was calculated to determine the reliability of each test. The agility test demonstrated a strong positive correlation between test and retest scores ($r = .98$, $p < .05$). Similarly, the start Speed test showed a strong positive correlation between test and retest scores ($r = .78$, $p < .05$). These statistically significant correlations, as presented in Table 2., indicate that both tests used in this study were reliable measures of agility and start Speed.

Tables 2. Pearson's Correlation Coefficient Results for Test-Retest Reliability: Agility and Start Speed

test	pre-test	P-Value	Significance
Agility	0.98	0.02	The correlation is significant at the alpha level of significance ($\alpha = 0.05$).
Start Speed	0.78	**0.01**	

Validity

The validity of the agility and speed tests was estimated using the "self-validity" method, which involves calculating the square root of the reliability coefficient. The reliability coefficients for the agility and speed tests were 0.96 and 0.98, respectively. By taking the square root of these values, the researchers obtained validity coefficients of 0.98 for the agility test and 0.99 for the speed test, indicating that the tests were valid.

Test Objectivity

Test objectivity refers to the test's independence from subjectivity and its ability to yield the same results regardless of who administers it. In this study, test objectivity was established through the consensus of experts and specialists, eliminating doubts and interpretations. The tests used were easy to perform, clear, and free from researcher bias, ensuring that the results were consistent and reliable.

2.7.Procedure

2.7.1 Experimental Design and Sampling

Experimental and control groups were selected for this study. Both groups underwent pre-physical tests, which were conducted twice, with the best attempt being recorded for each participant.

2.7.2 Intervention

The intervention for the experimental group was designed by consulting specialists, doctors, and coaches. Participants in the experimental group underwent 21 specialized training sessions over a period of six weeks, with sessions held twice a week. Each training session lasted between 85 and 90 minutes and incorporated exercises designed using the small-sided games method. The small-sided games configurations included 1 vs. 1, 2 vs. 1, 2 vs. 2, 3 vs. 3, 4 vs. 2, and 4 vs. 4, with the aim of developing targeted physical qualities. In contrast, the control group practiced under the supervision of their coaches

without any intervention from the researchers. This approach allowed for a comparison of the effects of the small-sided games intervention on the experimental group and the standard training practices of the control group.

2.8.Data Analysis

Data were processed and analyzed using the Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics, including mean and standard deviation, were calculated for each variable. Inferential statistics, such as the Pearson correlation coefficient and independent samples t-tests, were used to examine the relationships between variables and compare the performance of the experimental and control groups.

3. Results

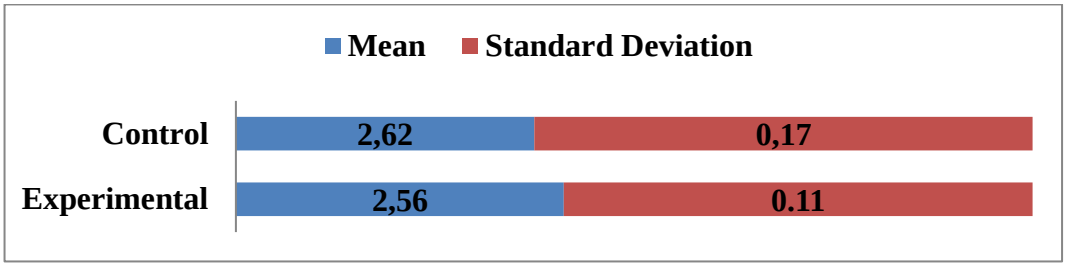
Hypothesis 1

Table 3. Independent samples t-Test Results for Start Speed: Control vs. Experimental Group

Variable		Alpha	Mean	SD	Df	t-statistic	p-value	Significance
Group	Control N = 13	0.05	2.62	0.17	24	1.26	0.21	Not Significant
	Experimental N=13		2.56	0.11				

An independent samples t-test was conducted to compare the start speed between the control and experimental groups. The results are presented in Table 3. There was no significant difference in start speed between the control group (M = 2.62, SD = 0.17) and the experimental group (M = 2.56, SD = 0.11), t(24) = 1.26, p = .21. These findings suggest that the small-sided games training intervention did not have a significant impact on the start speed of the experimental group compared to the control group

Figure 1. Mean and Standard Deviation of Start Speed for Control and Experimental Groups



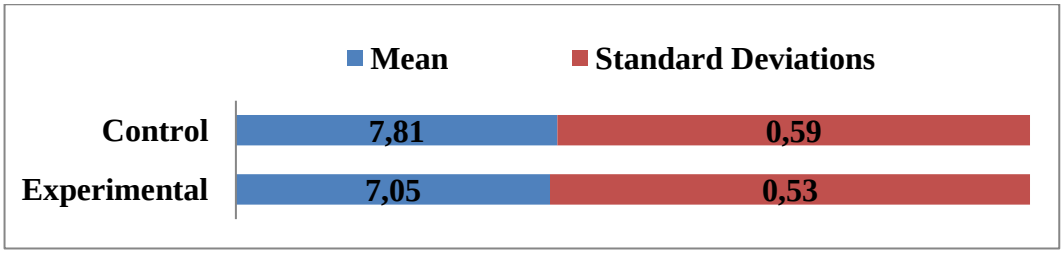
Hypothesis 2

Table 4. Independent samples t-Test Results for agility: Control vs. Experimental Group

Variable		Alpha	Mean	SD	Df	t-statistic	p-value	Significance
Group	Control N = 13	0.05	7.81	0.59	24	3.46	0.002	Significant
	Experimental N=13		7.05	0.53				

Table 4. presents the results of an independent samples t-test conducted to compare agility between the control and experimental groups. The experimental group (M = 7.05, SD = 0.53) demonstrated significantly better agility than the control group (M = 7.81, SD = 0.59), t(24) = 3.46, p = .002. These results suggest that the small-sided games training intervention had a significant impact on improving the agility of the experimental group compared to the control group.

Figure 2. Mean and Standard Deviation of agility for Control and Experimental Groups



4. Discussion

Hypothesis 1

The first hypothesis of this study proposed that small-sided games training would contribute to the development of start speed in football players under 12 years old. However, the results presented in Table 3., which compared the start speed tests of the control and experimental groups, did not support this hypothesis. The null hypothesis, stating that there were no significant differences between the groups, was accepted, contradicting the research hypothesis.

The lack of significant differences between the groups may be attributed to the similarity of the training methods used for both samples, despite slight differences favoring the experimental group. Additionally, the short duration of the training period may have made it difficult to substantially improve start speed. Nevertheless, these findings do not diminish the potential effectiveness of small-sided games training in developing overall physical and motor skills. This method is considered highly valuable for simultaneously achieving the combined goals of enhancing physical qualities and individual skills, ultimately contributing to the formation of motor memory in young players (Hammad, 2008, p. 205).

Previous research supports the benefits of small-sided games training. Dellal (2008) demonstrated that training with small-sided games can improve physical, technical, tactical, and fitness qualities, particularly when the intensity of the games is similar to that of short intermittent exercises. Similarly, Hajar Khirfan (2011) recommended the use of small-sided games training in youth football programs, as it aligns with the specific characteristics of the sport. Furthermore, Dhahiba (2013) found that small-sided games training can help develop certain physical and technical aspects in young football players participating in school sports teams.

while the current study did not find significant differences in start speed between the control and experimental groups, the potential benefits of small-sided games training in football should not be disregarded. Future research could explore the optimal duration, intensity, and specific drills required to enhance start speed and other physical qualities in young football players.

Hypothesis 2

The results presented in Table 4. which compared the agility tests of the control and experimental groups, supported the research hypothesis. By rejecting the null hypothesis that denied the existence of differences, the analysis revealed

statistically significant differences in agility between the two groups, favoring the experimental group.

These findings can be attributed to the effectiveness of the small-sided games training method. Developing agility requires equipping players with a diverse set of motor skills that can be applied in various training situations and conditions. The training structure should be designed to closely resemble game-like scenarios, incorporating a variety of conditions and football-specific exercises (Al-Sayed, 2011, p. 231).

Sharit (2018) corroborated these findings, concluding that small-sided games training forms a fundamental component of training sessions, contributing to the improvement of dribbling skills and the development of agility in football players under 13 years old. Similarly, several studies have investigated the impact of small-sided games on agility development. Hammadi and Fateh (2014) found that training using small-sided games positively influenced flexibility, speed, and agility in fifth-grade primary school male students. Additionally, Asli et al (2018) confirmed the effectiveness of small-sided games in enhancing motor abilities, such as agility and balance, among middle school students aged 13-15 years.

The discussion section examined the two research hypotheses concerning the effect of small-sided games training on start speed and agility in football players under 12 years old. While the results did not support the first hypothesis, as no significant differences were found between the control and experimental groups in start speed, the second hypothesis was confirmed, with the experimental group demonstrating significantly better agility compared to the control group. The lack of improvement in start speed may be attributed to the short duration of the training program and the similarity of training methods used for both groups. However, the significant enhancement in agility highlights the effectiveness of small-sided games training in developing this crucial physical quality. These findings align with previous research that emphasizes the benefits of small-sided games training for improving various physical, technical, and tactical aspects of football performance in young players. Despite the limitations of the current study, the results underscore the potential of small-sided games training as a valuable method for fostering physical and motor development in young football players. Future research should explore the optimal parameters of small-sided games training programs to maximize their impact on start speed, agility, and other essential qualities in youth football.

5. CONCLUSION

This study aimed to investigate the effectiveness of small-sided games training on the development of acceleration speed and agility attributes among soccer players under 12 years old. The results partially support the research hypothesis, as there were statistically significant differences between the control and experimental groups in agility, but not in start speed.

Based on the outcomes and results of this study, several recommendations may be suggested. First, it is recommended that small-sided games training be incorporated into training programs for younger age groups because of its positive impact on the investigated physical attributes. Second, standardizing the training method in terms of volume and intensity by regulating the area, time, number of ball touches, and rest intervals according to the training goals and age group is suggested. Third, motivation is highlighted as a crucial factor in implementing the training method, while managing various variables that may hinder the attainment of training objectives. Finally, conducting further similar studies on basic and compound physical attributes and fundamental skills in soccer that were not addressed in this research is recommended to expand the knowledge base in this area. Furthermore, Future research should explore the long-term effects and optimal implementation strategies of small-sided games to refine and maximize their impact on player development.

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