DIFFERENCE IN PHYSICAL PERFORMANCE BETWEEN YOUNG ELITE AND SUB-ELITE FOOTBALL PLAYERS

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Abstract: The aim of this study was to determine the differences in speed, agility, and quickness between young elite and sub-elite football players. Participants were youth football players from two different competition levels. The sub elite-level participants were from second league (n=48; 15.9 ± 1.0 years), while the elite-level participants were from the first league (n=42; Age=15.6 ± 1.5 years). Players were tested for speed (sprint 5,10, 20m), agility (Illinois test, change of direction test left and right, reactive agility) and repeated sprint ability. We found a statistically significant difference between two teams in all performance tests ($p<0.05$), favoring the elite team. This research highlights significant differences in physical performance between elite and sub-elite young football players, driven by a combination of factors including training intensity, coaching expertise, access to resources, and psychological attributes.

Keywords: speed, agility, testing, soccer, adolescents.

INTRODUCTION

Football, often referred to as the most popular sport worldwide, holds a unique place in both youth and professional athletic development. At its core, football requires a blend of technical skills, tactical understanding, mental acuity, and, most notably, physical performance (Sarmento et al., 2018). Among the critical components of physical performance are speed, agility, and quickness (SAQ), which are fundamental to a player's success on the field (Kaplan et al., 2009). Specific physical attributes like lower-body power and coordination have been identified as key predictors of speed and agility performance in adolescent male football players (França et al., 2022). These attributes allow players to execute rapid sprints, sudden changes of direction, and swift reactions, which are essential in both offensive and defensive play. For young football players, the development of SAQ abilities is crucial

as it forms the foundation for success in both individual performance and overall team dynamics (Dragijsky et al., 2017). The ability to accelerate, decelerate, and react quickly to changes in the game environment is a distinguishing factor between elite and sub-elite youth players (Gatti et al., 2024). As such, training programs and performance assessments often focus on enhancing these qualities to optimize player potential and ensure their progression through the ranks of competitive football.

In this context, various studies have sought to understand the performance differences between elite and sub-elite young football players, particularly in terms of physical abilities (Comfort et al., 2013; Trecroci et al., 2018; Trecroci et al., 2019; Waldron & Murphy, 2013). Trecroci et al. (2018) conducted a study comparing the physical performance of under-15 elite and sub-elite players and found that elite athletes consistently outperformed their sub-elite counterparts in speed, agility, and explosive power—key attributes that influence their effectiveness on the field. Another study by Trecroci et al. (2019) focusing on middle-adolescent soccer players also found that elite players not only exhibit higher physical performance levels but are better able to sustain these qualities throughout a match. Similarly, Waldron and Murphy (2013) highlighted the superiority of elite under-14 soccer players in both physical abilities and match-related performance characteristics, reinforcing the importance of SAQ in differentiating elite players from their sub-elite peers. These findings underscore the necessity of regular testing and training aimed at improving SAQ attributes, particularly during the critical stages of youth development, as they are integral to player progression and success in competitive football.

Despite the growing body of research on physical performance in youth football, there remains a gap in understanding the specific differences in SAQ performance between elite and sub-elite players. While existing studies have demonstrated the superiority of elite athletes in various physical abilities, there is still limited research that comprehensively addresses how these differences manifest in specific contexts, such as sprint performance, agility tests, or quickness assessments. Moreover, the extent to which training interventions can effectively bridge this gap remains underexplored. The aim of this study was to address this research gap by investigating the differences in speed, agility, and quickness between young elite and sub-elite football players. By identifying the specific variables in which elite players excel, this research aims to enhance the understanding of the differences between elite and sub-elite players, ultimately contributing to the broader knowledge of youth football performance.

METHODS

Participants

This cross-sectional study included a sample of youth football players from two different competition levels. The subelite-level participants were from second league (n=48), while the elite-level participants were from the first league (n=42). The selection of these participants was based on the research topic, which aimed to analyze differences in motor abilities between players of different competitive levels. Consent was obtained from the parents and coaches of the players, as the

sample involved minors. The study was approved by the ethical committee of University of Novi Sad and was conducted in accordance with the principles established in the Declaration of Helsinki.

The total number of participants and their demographic information (age, training experience, etc.) were recorded and included in the analysis (Table 1).

Table 1. Descriptive characteristics of young football players

Group	Age (years)	Height (cm)	Mass (kg)	Number of training (n per week)	Experience (years)
Elite	15.6 ± 1.5	177.1 ± 5.6	67.5 ± 7.2	5-6	6.1 ± 1.4
Sub-elite	15.9 ± 1.0	176.4 ± 5.9	69.3 ± 7.0	5-6	5.9 ± 1.7

Procedures

Data collection took place at two separate locations, Leskovac and Subotica, and was conducted by the lead researcher in collaboration with the teams' coaches, as well as assistants from the Faculty of Sport and Physical Education, University of Novi Sad. The measurements focused on the players' motor abilities, including speed, change of direction speed, agility, and repeated sprint. All measurements were conducted in June 2022.

The following tests were used to assess physical performance:

Speed Test: Sprint times for distances of 5m, 10m, and 20m were recorded using a 20-meter sprint test with a standing start. Sprinting speed and acceleration were monitored for the first 5 meters and 10 meters, as well as the 20 meters. The Witty Gate (Microgate, Bolzano, Italy) wireless timing system was used for precise measurements, and the total time was reported to the nearest 0.01 s.

Repeated Sprint Ability (RSA) Shuttle Run 6x40m: The Repeated Sprint Ability (RSA) test is designed to assess an athlete's capacity to perform repeated sprints with short recovery periods, a crucial fitness component in football. According to Impellizzeri et al. (2008), the test simulates the high-intensity, intermittent nature of football, where players frequently sprint, recover, and sprint again. The RSA test measures both sprint performance and the ability to recover between efforts, capturing key aspects of anaerobic power and endurance. This test assessed the players' ability to repeatedly sprint 40 meters (20 meters forward and 20 meters back) six times, with a 20-second rest between sprints. The Witty Gate (Microgate, Bolzano, Italy) system recorded the sprint times.

Illinois Agility Test: Agility was measured on a 10m x 5m grass field, with four cones marking the course. Participants began the test in a prone position and completed the course as quickly as possible. The time was recorded using a Witty Gate (Microgate, Bolzano, Italy) wireless timing system, with each player completing three attempts, and the best time was recorded.

Change of Direction (COD) Test: The COD (Y agility test) assessed pre-planned directional changes at a 45-degree angle. Witty Gate (Microgate, Bolzano, Italy) timing gates were used to record performance, with each player attempting the test three times to the left side and to the right side, with the best result recorded and used for analysis.

Reactive Agility Test (RAT): This test evaluated the players' reactive agility, which involves the ability to change direction based on an external stimulus. Players ran a 5-meter linear sprint, followed by a visual cue (a left or right arrow on a monitor) indicating the direction of movement. Besite Witty time gate, the Witty SEM lights were used for visual stimuli. The test was repeated three times, with the best result recorded.

Statistical Analysis

All collected data were processed using statistical software SPSS software, version 23.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were calculated to provide an overview of the sample's characteristics. The Kolmogorov–Smirnov test was conducted and all data met the normality test assumption. To determine the differences in physical performance between the subelite and elite players, an independent t-test was conducted. Statistical significance was set at $p < 0.05$.

RESULTS

This part presents the results of previous research on the given topic. Researches are analyzed in detail and presented as follows: first author of the study and the year of publication; sample, ie. basic parameters of respondents participating in the research; experimental program (duration of the program and exercises that were applied during it); the results that the researchers reached during the research.

Table 2. Difference in physical performance between young elite and subelite football players

Varijables	Group	Mean	SD	t	p
Sprint 5m	Sub-elite	1.35	0.13	6.091	0.001*
	Elite	1.15	0.07		
Sprint 10m	Sub-elite	2.39	0.21	7.861	0.001*
	Elite	1.98	0.12		
Sprint 20m	Sub-elite	4.38	0.54	7.125	0.001*
	Elite	3.49	0.27		
Ilinois test	Sub-elite	21.05	1.79	6.746	0.001*
	Elite	17.82	1.16		
Codl test	Sub-elite	2.52	0.34	5.294	0.001*
		1.93	0.27		

	Elite				
Codr test	Sub-elite	2.49	0.46	4.356	0.001*
	Elite	1.92	0.40		
Rat test	Sub-elite	2.82	0.61	4.952	0.001*
	Elite	2.33	0.32		
RSA test	Sub-elite	8.30	0.41	6.379	0.001*
	Elite	7.07	0.42		

*Legend: Codr change of direction right; Codl test change of direction left; Rat reactive agility test; RSA repeated sprint ability; p < 0.05 * statistical significance.*

Table 2 shows the significance of the differences in physical performance tests between the subelite team from Leskovac and the elite team from Spartak in the youth category. It can be seen that there is a statistically significant difference between these two teams in all performance tests, favoring the elite team, as all significance values of the tests are less than 0.05 (p = 0.001).

DISCUSSION

The aim of this study was to determine the differences in speed, agility, and quickness between young elite and sub-elite football players. The main results showed that the elite players have better results in the sprint speed tests at 5m, 10m, and 20m, and that this difference becomes greater as the distance increases, meaning that the elite players were faster in every aspect. Regarding the Illinois test and change of direction speed test, the elite players also achieved significantly better results, showing a difference of almost three seconds. When looking at reaction speed to the left and right, the sub-elite team again performed worse, with similar results for both directions. In the reactive agility test, the results are again in favor of the elite team compared to the subelite team.

When comparing our results with those from previous studies by Trecroci et al. (2018, 2019) and Waldron and Murphy (2013), several potential reasons for the observed differences in physical performance between elite and sub-elite young football players emerge. Both Trecroci et al. (2018) and Waldron and Murphy (2013) found that elite players demonstrated superior performance in various physical tests, including sprinting speed, agility, and endurance, compared to their sub-elite counterparts. This aligns with our findings, where elite players consistently outperformed the sub-elite players in sprint tests over distances of 5m, 10m, and 20m, as well as in agility tests. The significant differences in speed become more pronounced as the distance increases, a trend noted in Trecroci et al. (2019), indicating that elite players tend to excel in longer sprints due to better aerobic conditioning and sprinting mechanics.

One possible reason for these performance discrepancies is the structured training environment provided to elite players. Trecroci et al. (2018) emphasized the importance of training frequency and intensity in developing physical attributes, suggesting that elite players engage in more specific and higher-quality training

sessions. Similarly, our findings suggest that elite players have a training regimen that focuses on developing speed, agility, and endurance, resulting in notable performance advantages. The experience of coaching staff in elite programs, as highlighted in Waldron and Murphy (2013), further enhances the training quality and may lead to more effective performance gains.

Another factor contributing to the differences observed in both our study and those of Trecroci et al. is the level of competition faced by players. Elite players regularly compete against higher-caliber opponents, pushing them to elevate their performance standards. Trecroci et al. (2019) noted that this exposure leads to improved physical capacities over time. In contrast, sub-elite players may not encounter the same level of competition, limiting their opportunities for growth and development.

Furthermore, psychological factors and motivation levels among elite players can significantly influence performance outcomes. The drive to excel and succeed in a competitive environment fosters a stronger work ethic and commitment to training, which has been consistently associated with better physical performance in the studies referenced.

In summary, our results align with previous findings that illustrate the significant performance gaps between elite and sub-elite young football players. These differences may be influenced by various factors related to training exposure, competitive experience, and physical development. A better understanding of these differences could offer valuable insights into the performance characteristics of elite and sub-elite players in youth football.

In general, differences in physical performance between elite and sub-elite young football players can be attributed to several interrelated factors. Elite players often have access to more rigorous training programs that include higher volumes and intensities compared to sub-elite players. This includes not only more frequent training sessions but also a greater emphasis on specific skill development, strength training, and conditioning (Milanović & Trecroci, 2019). The expertise of coaches also plays a significant role in developing players' physical abilities; elite players typically benefit from coaching staff with advanced knowledge of sport-specific training techniques, biomechanics, and injury prevention, enhancing overall performance. Additionally, elite players generally have access to superior training facilities, equipment, and sports science resources, such as nutritionists, physiotherapists, and strength and conditioning coaches, which can lead to improved performance in various physical tests and in-game situations (Hoff & Helgerud, 2004).

The process of selecting and recruiting players for elite teams often involves rigorous screening for physical and technical skills, resulting in a higher baseline of physical fitness and ability among elite players (Davis & McKay, 2012). Furthermore, elite players regularly compete against other high-level athletes, pushing them to continually improve their performance, while the competitive environment fosters a stronger desire to excel, leading to higher training efforts and better results. Psychological factors also play a role; elite athletes often exhibit greater motivation, focus, and mental toughness, which can directly influence their physical performance (Fletcher & Arnold, 2011). Elite youth football clubs typically have

structured developmental programs that emphasize physical, technical, and tactical skills from an early age, leading to significant differences in physical capabilities compared to sub-elite programs, which may lack similar structure and focus.

Moreover, elite players have better access to injury management and recovery protocols, allowing them to maintain higher training loads and avoid setbacks, while proper recovery techniques enhance physical performance over time (Kumar & Purohit, 2016). Nutrition is another important aspect; elite young players often receive guidance on dietary practices that optimize their performance, recovery, and overall health (Powers & Howley, 2018). Lastly, elite programs may emphasize long-term athletic development, ensuring players build a strong foundation of physical capabilities for their careers, whereas sub-elite programs may prioritize immediate results over long-term growth, potentially leading to gaps in physical performance (Malina & Bouchard, 1991). In summary, the differences in physical performance between elite and sub-elite young football players are multifaceted, stemming from a combination of training, coaching, resources, and personal factors, and addressing these differences can help improve the overall development of young athletes, regardless of their current level (Waldron & Murphy, 2013).

Physical performance tests for speed, speed endurance, reaction time, agility, and repeated sprints are excellent indicators of a team's preparedness and ability. This was confirmed in the current study where significant differences were found in these indicators between subelite and elite teams even in the youth categories. This difference is probably more pronounced due to the number of training sessions the children have, the expertise of the coaches working with them, the equipment, training aids, and the conditions in which they train, along with many other factors that influence performance beyond mere talent. Teams that are sub-elite are mostly from a smaller environment compared to teams that are elite, and the training conditions are more limited. To further improve and reduce this gap in testing, it is essential to enhance the conditions, increase the number of training sessions, and the results will follow.

Despite all the above, some limitations must be acknowledged. The study's focus on specific clubs from Leskovac and Subotica may not capture the full range of training methodologies, competition levels, and player backgrounds present in other regions or countries. Additionally, the cross-sectional design limits the ability to draw causal conclusions about the observed differences in physical performance between elite and sub-elite players. Factors such as variations in training intensity, coaching quality, and player commitment may not have been adequately controlled for, potentially introducing confounding variables that could influence the results. Lastly, self-reported measures of training frequency and intensity may suffer from response bias, leading to discrepancies in the data that affect the validity of the findings.

CONCLUSION

This research highlights significant differences in physical performance between elite and sub-elite young football players, driven by a combination of factors including training intensity, coaching expertise, access to resources, and psychological attributes. The findings underscore the importance of structured training programs and comprehensive support systems in fostering the development of young athletes. By addressing the disparities identified in this study, coaches and sports organizations can enhance training practices and resources for sub-elite players, ultimately promoting their physical capabilities and overall performance. Continued exploration of these differences can provide valuable insights into the effective development of youth athletes and contribute to the long-term success of football programs at all levels.

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