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Investigation of Physical Performance of Young Elite Football Players: "Positional Comparison"

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Abstract

This study aims to compare the positional physical performances of young elite A league football players. A total of 38 players from MKE Ankaragücü's U17 and U19 categories, competing in the young elite league during the 2023-2024 season, participated in the research. A Shapiro-Wilk normality test was applied to the data obtained in the study, and based on the results of the normality test, the Spearman test was used for correlation analysis. The Kruskal-Wallis test was used to determine the differences between groups, and the Mann-Whitney U test was used to define these differences. Additionally, Spearman correlation analysis was used to examine the relationship between the participants' physical performance data. When the vertical jump variable was examined, it was found that defenders performed better than goalkeepers in vertical jump ($p<0.05$), midfielders performed better than goalkeepers ($p<0.01$), and forwards also performed better than goalkeepers ($p<0.05$). Regarding the long jump variable, it was found that midfielders performed better in vertical jump than goalkeepers ($p<0.01$). When the 20-meter sprint variable was examined, it was found that defenders performed better than goalkeepers in the 20m sprint ($p<0.01$), midfielders performed better than goalkeepers ($p<0.01$), and forwards also performed better than goalkeepers ($p<0.05$). For the 40m sprint performance variable, it was found that defenders performed better than goalkeepers in the 40m sprint ($p<0.05$), midfielders performed better than goalkeepers ($p<0.01$), and forwards also performed better than goalkeepers ($p<0.05$). In conclusion, the findings of the study reveal that defenders, midfielders, and forwards exhibit significant superiority in vertical jump, long jump, and sprint performances compared to goalkeepers.
Keywords: Physical performance, Young football players, Positional difference

Genç Elit Futbolcuların Fiziksel Performanslarının İncelenmesi: "Mevkisel Karşılaştırma"

Öz

Bu çalışmanın amacı, genç elit A ligi futbolcularının pozisyonel fiziksel performanslarını karşılaştırmaktır. Araştırmaya 2023-2024 sezonunda genç elit liginde mücadele eden MKE Ankaragücü'nün U17 ve U19 kategorilerinden toplam 38 oyuncu katılmıştır. Çalışmada elde edilen verilere Shapiro-Wilk normallik testi uygulanmış, normallik testi sonuçlarına göre korelasyon analizi için Spearman testi kullanılmıştır. Gruplar arası farklılıkları belirlemek için Kruskal-Wallis testi, bu farklılıkları tanımlamak için Mann-Whitney U testi kullanılmıştır. Ayrıca katılımcıların fiziksel performans verileri arasındaki ilişkiyi incelemek için Spearman korelasyon analizi kullanılmıştır. Dikey sıçrama değişkeni incelendiğinde dikey sıçramada defans oyuncularının kalecilerden daha iyi performans gösterdiği ($p<0,05$), orta saha oyuncularının kalecilerden daha iyi performans gösterdiği ($p<0,01$) ve forvetlerin de kalecilerden daha iyi performans gösterdiği ($p<0,05$) bulunmuştur. Uzun atlama değişkeninde, orta saha oyuncularının dikey sıçramada kalecilerden daha iyi performans gösterdiği bulunmuştur ($p<0,01$). 20 metre sprint değişkeni incelendiğinde, 20 metre sprintte defans oyuncularının kalecilerden daha iyi performans gösterdiği ($p<0,01$), orta saha oyuncularının kalecilerden daha iyi performans gösterdiği ($p<0,01$) ve forvetlerin de kalecilerden daha iyi performans gösterdiği ($p<0,05$) bulunmuştur. 40 metre sprint performans değişkeninde, 40 metre sprintte defans oyuncularının kalecilerden daha iyi performans gösterdiği ($p<0,05$), orta saha oyuncularının kalecilerden daha iyi performans gösterdiği ($p<0,01$) ve forvetlerin de kalecilerden daha iyi performans gösterdiği ($p<0,05$) bulunmuştur. Sonuç olarak araştırmanın bulguları, defans oyuncularının, orta saha oyuncularının ve forvetlerin kalecilere kıyasla dikey sıçrama, uzun atlama ve sprint performanslarında anlamlı üstünlükler sergilediğini ortaya koymaktadır.
Anahtar kelimeler: Fiziksel performans, Genç futbolcu, Mevkisel farklılık

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INTRODUCTION

Due to the structure of football, players need to possess various physical abilities, and there are many factors that affect their success in training and on the field. The physical characteristics of football players, such as sprinting and anaerobic power are fundamental elements that determine success on the field (Oliva et al., 2020). With the advancement of technology today, modern football has become a branch of sport that can present scientific solutions to reflect speed, tactics, technique, strength, power, and endurance performance on the field (Bădescu, 2022). In football, which is aerobically based but has anaerobic characteristics, it is necessary to continuously develop various variables (morphological, physiological, psychological, biomechanical, cognitive, etc.) to maintain high performance. In football, it is important to constantly develop and optimize players' mental and technical skills as well as their physical abilities. Developments in these various areas play a critical role in enhancing football players' performance and gaining a competitive edge (Hermassi et al., 2019). Scientific studies frequently examine the physical and physiological needs of football and the different movement forms applied by football players on the field (Asimakidis, 2024).

Understanding how the physical characteristics of young football players differ according to their positions is important for increasing the efficiency of training programs and helping young players better understand their positions (Miçooğulları, 2024). The goal of modern football is to develop the responsibilities of players in every position (Berber, 2020). While football differs from other sports branches in terms of game structure, it also differs within itself according to the positions in the game (Söyler & Kayantaş, 2020). Every player on the field is important and assumes variable roles. With these roles constantly changing on the field, the physical demand on each player increases (Dolci et al., 2020). Research indicates that the distance covered, variety of movements, and frequency of these movements vary according to the positions played by football players (Modric et al., 2019). However, in football today, players in all positions, including goalkeepers, need to possess almost all motor skills. Offensive and defensive players should assist each other's positions depending on the situation of the game (Berber et al., 2020).

As a result, due to the multidisciplinary nature of football, which includes an intermittent structure involving jumps, sudden changes in direction, sprints, and high-intensity movements on the field, many scientific studies have been conducted to develop versatile movement skills (Dong et al., 2022; Lee et al., 2024; Živković et al., 2024). Studies have observed differences in the distances covered by players, the movements they perform, and the frequency of these movements based on their playing positions (Lorenzo-Martinez et al., 2021; Low et al., 2020; Modric et al., 2020). Bujnovsky et al. (2019), in their study examining the physical and physiological capacities of young footballers according to their playing positions, reported a statistically significant difference (Bujnovsky et al., 2019). In this context, studies conducted on the field requirements of football and the positional needs of players are important for the development of the game (Arjol-Serrano et al., 2021).

In this study, the aim is to examine the basic needs of football, such as VO2max, vertical jump, standing long jump, and 10 m, 20 m, 30 m, and 40 m sprint performances based on positions, and to reveal the differences. It is believed that this research will contribute to both the field of sports science and the athletes, especially in relation to young footballers playing in elite leagues (League A).

METHOD

Research Model

In this study, a cross-sectional research model was used to examine the physical performance of young elite football players, determine the relationship between physical performances, and reveal the differences between positions.

Research Groups

Young football players who have been licensed for at least 3 years and train at least 3 days a week participated in the study. The research was conducted in April, during the second half of the 2023-2024 season, with football players from the U17 and U19 categories of MKE Ankaragücü, competing in the elite youth A league. As seen in Table 1, a total of 38 individuals participated in the study.

Table 1. Demographic characteristics

Variables	Groups	N	$\bar{X}$	SS	Min.	Max.
Age (Years)	Goalkeeper	6	17.666	1.211	16.000	19.000
	Defender	12	17.666	1.154	16.000	19.000
	Midfielder	16	17.875	1.147	16.000	19.000
	Forward	4	18.000	1.154	17.000	19.000
Height (Cm)	Goalkeeper	6	185.166	4.070	180.00	190.000
	Defender	12	180.916	6.006	170.00	191.000
	Midfielder	16	177.625	4.588	170.00	185.000
	Forward	4	179.500	2.886	176.00	183.000
Body Weight (Kg)	Goalkeeper	6	76.000	10.373	60.000	85.000
	Defender	12	71.416	6.612	64.000	86.000
	Midfielder	16	70.187	6.389	58.000	80.000
	Forward	4	73.250	3.593	68.000	76.000

In this study, which compares some motoric characteristics of football players playing in different positions, it was found that the average age of goalkeepers is 17.6 years, average height is 185.1 cm, and average body weight is 76 kg; the average age of defenders is 17.6 years, average height is 180.9 cm, and average body weight is 71.4 kg; the average age of midfielders is 17.8 years, average height is 177.6 cm, and average body weight is 70.1 kg; and the average age of forwards is 18 years, average height is 179.5 cm, and average body weight is 73.2 kg (Table 1).

Procedures

Two days before the start of the study, a meeting was held with the football players and detailed information was given about the purpose of the study, its duration, the tests to be applied, possible risks and benefits. After the meeting, the participants who agreed to participate in the study were asked to read and sign a form prepared in accordance with the Declaration of Helsinki, indicating their voluntary participation and providing detailed information about the study. The test equipment to be used was then introduced to the participants. On the first day, the players' height and body weight were measured in accordance with the procedure and the Vo2max test was applied on the same day. On the second day, standing long jump, vertical jump and sprint tests were performed.

Ethical Approval

In order to conduct the research, an ethics committee approval dated 27/06/2024 and numbered E-95674917-108.99-259799 was obtained from the Gümüşhane University Ethics Committee. In addition, permission to work with players was obtained from the MKE Ankaragücü youth athletic performance coordinator team before applying to the ethics committee.

Data Collection Tools

Height: The height of the football players was measured using a stadiometer with the players standing barefoot and in an upright position, their heels together, and the device aligned with the highest point of their head.

Body Weight: The body weight of the players was measured using Tanita BC-418 (Tanita, Japan) in a standing position wearing only shorts, and recorded in kilograms.

Yo-Yo Intermittent Recovery Level 1 Test: The Yo-Yo intermittent recovery test, used as a field measurement method, was used in the study. In this test, players performed runs back and forth over a 20-meter distance, followed by a recovery run (active recovery) in a 5-meter area. The test is conducted with two signal sounds. The player starts the test at a speed of 10 km/h with the first signal sound and must reach the line at the end of the 20-meter distance by the second signal sound. Upon hearing the second signal sound, the player returns to the starting line and performs active recovery for 10 seconds in the 5-meter area until the next signal. The test continues with increased running speed at each level. Players who miss two consecutive signals end the test, and the distance covered is recorded (Bangsbo et al., 2008; Krustrup et al., 2003).

Standing Long Jump: The test was conducted with players standing and jumping forward from a standing position with feet parallel. The distance between the starting point and the landing point was measured and recorded in centimeters. The test was performed twice, and the best result was noted (Karavelioğlu, 2008).

Vertical Jump: The vertical jump performance of the players was tested using the Smartspeed (Smartspeed, Fusion Sport Pty Queensland, Australia) device. The vertical jump performance was measured using a countermovement jump (CMJ) with free arms. Players participated in

the test in their training attire and sports shoes. Players were subjected to three technically correct jumps. Each test was repeated three times, and the best result was used (Glatthorn et al., 2011).

10-20-30-40 Meter Sprint: The test was conducted with photocells (Microgate brand) placed at the start and finish lines. Players started the test from a point 1 meter behind the starting photocell. Four separate sprint tests of 10m, 20m, 30m, and 40m were applied to the players. Players performed the test twice in total, and the best results were recorded. Full rest periods were given to the players between tests.

Analysis of Data

Shapiro-Wilk normality test was applied to the data obtained in the study and Spearman test was used for correlation analysis according to the normality test results obtained. Kruskal-Wallis test was used to determine the difference between groups. Mann-Whitney U test was used to define the difference between groups. In addition, Spearman correlation analysis was used to examine the relationship between the physical performance data of the participants.

RESULTS

In this study, a comparison was made between the goalkeeper, defender, midfielder and forward positions and the values with significant differences are shown in the tables below.

Statistical data on VO2max, vertical jump, long jump and sprint test results of football players are shown in Table 2.

Table 2. Descriptive statistics

Variable	N	$\bar{X}$	SS	Min.	Max.
VO_2max (ml/kg^{-1}/min^{-1})	38	52.320	3.454	45.500	60.900
Vertical jump (cm)	38	38.090	4.348	30.100	48.500
Long jump (cm)	38	208.55	16.270	174.360	241.000
10m sprint (sec)	38	1.660	0.073	1.500	1.780
20m sprint (sec)	38	2.670	3.770	2.950	0.190
30m sprint (sec)	38	3.820	4.880	4.140	0.180
40m sprint (sec)	38	4.940	6.110	5.370	0.230

When examining the data in Table 2, it is observed that the participants' average VO2 max values are 52.32 ml/kg/min, vertical jump values are 38.09 cm, standing long jump values are 208.55 cm, 10m sprint times are 1.66 seconds, 20m sprint times are 2.67 seconds, 30m sprint times are 3.82 seconds, and finally, 40m sprint times are 4.94 seconds.

Table 3. Correlation analysis

Variable		VO_2max	Vertical	Long jump	10m	20m	30m	40m
VO_2max	*r*	1	-0.056	0.115	-0.108	0.342	0.267	0.324
(ml/kg^{-1}/min^{-}	*p*	.	0.738	0.493	0.517	0.035*	0.105	0.047*
	N	38	38	38	38	38	38	38
Vertical	*r*	-	1.000	.511**	-.112	-.310	-.296	.452**
(cm)	*p*	-	.	0.001	0.505	0.058	0.071	0.004
	N	-	38	38	38	38	38	38
Long jump	*r*	-	-	1.000	0.-338*	0.-174	0.-261	0.-258
(cm)	*p*	-	-	.	0.038	0.295	0.114	0.117
	N	-	-	38	38	38	38	38
10m	*r*	-	-	-	1.000	0.432**	0.508**	0.422**
(sec)	*p*	-	-	-	.	0.007	0.001	0.008
	N	-	-	-	38	38	38	38
20m	*r*	-	-	-	-	1.000	0.833**	0.878**
(sec)	*p*	-	-	-	-	.	0.000	0.000
	N	-	-	-	-	38	38	38
30m	*r*	-	-	-	-	-	1.000	0.848**
(sec)	*p*	-	-	-	-	-	.	0.001
	N	-	-	-	-	-	38	38
40m	*r*	-	-	-	-	-	-	1.000
(sec)	*p*	-	-	-	-	-	-	.
	N	-	-	-	-	-	-	38

*p<0,05; **p<0,01.

A positive but low-level correlation was detected between VO2 max and 20m and 40m sprints; a positive moderate significant relationship was found between vertical jump and long jump; and a negative moderate significant relationship was detected between vertical jump and both 20m and 40m sprints. A negative moderate relationship was identified between long jump and 10m sprint. Additionally, a positive moderate relationship was found between 40m and 10m sprints, while a positive high-level relationship was determined between 40m and both 20m and 30m sprints (Table 3).

Table 4. Kruskal Wallis analysis between positions

Variable	F	p
VO_2max (ml/kg^{-1}/dk$^{-1)}$	2.405	0.493
Vertical jump (cm)	9.261	0.026*
Long jump(cm)	10.279	0.016*
10m (sec)	3.478	0.324
20m (sec)	14.288	0.002**
30m (sec)	7.730	0.015*
40m (sec)	15.492	0.004**

*p<0,05; **p<0,01.

A significant difference was detected between positions for the variables of vertical jump, long jump, 20m sprint, 30m sprint, and 40m sprint (p<0.05), while no significant difference was

found between positions for the variables of VO2 max and 10m sprint (p>0.05) (Table 4). The variables that cause the difference are shown in Table 5.

Table 5. Bonferroni test comparison of football players across positions

Variable	N	Groups	$\bar{X}$	SS	Rank Average	Z	P
Vertical jump (cm)	6	Goalkeeper	33.660	2.900	5.750	-2.113	.035*
	12	Defender	38.460	4.800	11.380		
	6	Goalkeeper	33.660	2.900	5.000	-2.882	.004**
	16	Midfielder	38.750	3.280	13.940		
	6	Goalkeeper	33.660	2.900	3.500	-2.566	.010*
	4	Forward	40.970	5.240	8.500		
Long jump (cm)	6	Goalkeeper	191.570	13.610	4.500	-3.098	.002**
	16	Midfielder	216.090	10.750	14.130		
20m (sec)	6	Goalkeeper	3.300	0.270	15.250	-3.238	.001**
	12	Defender	2.890	0.090	6,630		
	6	Goalkeeper	3.300	0.270	19.500	-3.551	.000**
	16	Midfielder	2.880	0.080	8.500		
	6	Goalkeeper	3.300	0.270	7.500	-2.566	.010*
	4	Forward	2.890	0.010	2.500		
30m (sec)	6	Goalkeeper	4.420	0.250	14.580	-2.861	.004*
	12	Defender	4.080	0.100	6.960		
	6	Goalkeeper	4.420	0.250	17.670	-2.732	.006*
	16	Midfielder	5.270	0.120	9.190		
	6	Goalkeeper	4.420	0.250	7.500	-2.566	.010*
	4	Forward	5.280	0.000	2.500		
40m (sec)	6	Goalkeeper	5.750	0.240	14.420	-2.767	.006*
	12	Defender	5.350	0.190	7.0400		
	6	Goalkeeper	5.750	0.240	19.500	-3.542	.000**
	16	Midfielder	5.270	0.120	8.500		
	6	Goalkeeper	5.750	0.240	7.500	-2.566	.010*
	4	Forward	5.280	0.000	2.500		

*p<0,05; **p<0,01.

When examining Table 5, it is determined that in the vertical jump variable, defenders perform better in vertical jump than goalkeepers (p<0.05), midfielders perform better in vertical jump than goalkeepers (p<0.01), and forwards perform better in vertical jump than goalkeepers. In the long jump variable, midfielders perform better in long jump than goalkeepers (p<0.01). When examining the 20-meter sprint variable, defenders perform better in the 20m sprint than goalkeepers (p<0.01), midfielders perform better in the 20m sprint than goalkeepers (p<0.01), and forwards perform better in the 20m sprint than goalkeepers (p<0.05). Regarding the 40m sprint performance variable, defenders perform better in the 40m sprint than goalkeepers (p<0.05), midfielders perform better in the 40m sprint than goalkeepers (p<0.01), and forwards perform better in the 40m sprint than goalkeepers (p<0.05).

DISCUSSION and CONCLUSION

The aim of this study is to reveal positional differences by examining VO2 max, 10, 20, 30, and 40-meter sprints, standing long jump, and vertical jump performances, which are fundamental needs of football, positionally. Due to the limited number of studies related to footballers playing in elite A leagues within the scope of this study, it is thought that it will contribute to both the field of sports science and the athletes.

Due to the nature of football, players need to have various physical abilities, while many factors affect their success in training and on the field. The physical characteristics of football players, especially elements such as sprinting and anaerobic power, are among the fundamental factors affecting their success on the field (Oliva et al., 2020). Sprinting is a critical physical ability that includes elements requiring speed, agility, and sudden movements in football. Sprinting ability is important for players in situations such as outpacing opposing defenders, gaining possession of the ball, stopping the opponent, or quickly moving to their position (Haugen et al., 2014). Quick sprints help a footballer gain an advantage during competition, achieve positional superiority, and thus increase the efficiency of their team. Additionally, it should not be overlooked that quick sprints require intense energy and are mostly performed using the anaerobic energy system (Ramirez et al., 2020).

In general, midfielders run along the line between defensder and forward. It has been stated that while defenders and forwards competing in top leagues cover the same average distance, midfielders cover this distance less (Bloomfield et al., 2007). When comparing the distances covered at high speeds among footballers, no differences were obtained between the groups, but it was found that midfielders covered the distance at a lower speed compared to forwards and defenders (Can, 2009). Some studies have concluded that forwards run longer and at higher maximum speeds compared to midfielders and defenders (Bloomfield et al., 2007). According to the literature; Cometti et al. (2001) reported that the 10-meter sprint values of footballers were 1.80 s and the 20-meter sprint values were 4.22 s. According to the results of this study, the best sprint values for 10, 20, and 30 meters were found in forwards: 1.67±0.09 s for 10 meters, 2.94±0.16 s for 20 meters, and 4.15±0.20 s for 30 meters. Additionally in another study, 30-m sprint performance of the wing players were found to be statistically better than the central players (Atlı, 2021). In another study Significant differences were found in the acceleration profiles and sprint variables of the central defender (CD), full-back (FB), forward (FW), midfielder (MF) and wide midfielder (WMF) (Vardakis et al., 2024). In the research conducted by. In this study, the 20m sprint values of goalkeepers, defenders, midfielders, and forwards were found to be 3.30, 2.89, 2.88, and 2.89 on average, respectively, while the 30m sprint values were 4.42, 4.08, 5.27, and 5.28 on average, respectively, and the 40m sprint values were 5.75, 5.35, 5.27, and 5.28 s on average, respectively.

Yapıcı et al. (2016), the standing long jump values of footballers playing as midfielders, defenders, and forwards were determined to be 2.38 ± 0.095 m, 2.41 ± 0.096 m, and 2.41 ± 0.130 m, respectively. In the study conducted by Karavelioğlu (2008), the standing long jump values of midfielders, defenders, and forwards were reported to be 2.27 ± 0.193 m, 2.30 ± 0.186 m, and 2.23 ± 0.191 m, respectively. Additionally, the physical fitness profiles of elite young

football players were examined according to different positions. In the study, vertical jump values were found as Defenders: 51.8±4.9 cm, Midfielders: 48.6±4.8 cm, Strikers: 52.3±4.4 cm. The results of the research showed that forwards and defenders have slightly better explosive power performance than midfielders (Wong et al., 2009). Additionally in another study, the vertical jump performance of the wing players were found to be statistically better than the central players (Atlı, 2021). When the vertical jump values of another study were examined, it was determined that defenders had the highest jump value and that forward players were close to defenders (Arslan, 2024) .In this study, the standing long jump results, the average values for goalkeepers, defenders, midfielders, and forwards were found to be 191.57 cm, 206.09 cm, 216.09 cm, and 211.29 cm, respectively. Additionally, the average vertical jump results for midfielders, goalkeepers, and forwards were found to be 38.46 cm, 33.66 cm, 38.75 cm, and 40.97 cm, respectively.

Overall, these findings show that football players have different physical and performance profiles according to their positions, and these differences are shaped by their roles and duties in the game. While midfielders perform more balanced and continuous runs, forwards perform sudden accelerations and high-speed runs. Defenders contribute to the game mostly by taking positions and short-distance accelerations. This information emphasizes the need to customize training programs according to the positions of the players. Defenders have to expend 20-40% more energy than forwards due to having to run more backward and sideways (Cerrah et al., 2011). Many studies have proven that the physical profiles and performance criteria of football players are shaped in line with the roles and tasks they undertake in the game and Full-backs: While a larger physical structure provides an advantage in aerial balls and physical contact, defensive backs can be more agile and speed-oriented (Gao & Yu, 2023). Midfielders: Durability and agility are at the forefront; Players in this position require greater aerobic endurance because they are active in both aspects of the game (Sloth et al., 2013). Offensive Players: Sprint performance and explosive power (e.g. vertical jump) are at the forefront. Speed and rapid acceleration abilities are critical for these players (Liu et al., 2024). Additionally in another study, anaerobic power values of the central players were found to be statistically higher than the wing players (Atlı, 2021). Additionally, the skills exhibited by players vary depending on their positions; for example, footballers in forward and defensive midfield positions jump more to gain superiority in aerial duels, while defenders make more sliding tackles (Cerrah et al., 2011). In another study, statistically significant differences were determined in the aerobic power parameter between defenders, goalkeepers and midfielders in favor of defenders (Koç, 2021). In a study, it was found that defenders covered less distance during a match, but their high-intensity runs were shorter, and their strength was better. On the contrary, it was concluded that forwards performed more sprints and had more high-intensity activities compared to defenders (Modric et al., 2021). In the research conducted by Bujnovsky et al. (2019) examining the physical and physiological abilities of young footballers according to their positions, it was stated that there were statistically significant differences between goalkeepers and fullbacks in sprint tests and between fullbacks and central midfielders in repeated sprint abilities (Bujnovsky et al., 2019). In the research conducted by Yapıcı et al. (2016), a statistically significant difference was found in terms of speed between forward and midfield positions. In this study, it was found that in the vertical jump variable, defenders

perform better in vertical jump than goalkeepers ($p<0.05$), midfielders perform better in vertical jump than goalkeepers ($p<0.01$), and forwards perform better in vertical jump than goalkeepers. In the long jump variable, midfielders perform better in long jump than goalkeepers ($p<0.01$). When examining the 20-meter sprint variable, defenders perform better in the 20m sprint than goalkeepers ($p<0.01$), midfielders perform better in the 20m sprint than goalkeepers ($p<0.01$), and forwards perform better in the 20m sprint than goalkeepers ($p<0.05$). Regarding the 40m sprint performance variable, defenders perform better in the 40m sprint than goalkeepers ($p<0.05$), midfielders perform better in the 40m sprint than goalkeepers ($p<0.01$), and forwards perform better in the 40m sprint than goalkeepers ($p<0.05$). These findings indicate that players have different physical and physiological requirements according to their positions, and training programs should be shaped according to these requirements. Especially conducting special training sessions for the skills needed by players in specific positions will play an important role in improving their performance.

In this study, while a positive but low-level correlation was detected between VO2 max and 20m and 40m sprints, a positive moderate significant relationship was found between vertical jump and long jump, and a negative moderate significant relationship was detected between vertical jump and both 20m and 40m sprints. A negative moderate relationship was identified between long jump and 10m sprint. These results may be due to various biomechanical and physiological interactions between different physical performance measures. Since VO2 max is an indicator of aerobic capacity, it is expected to show a lower level of correlation with short-distance sprint performances. Sprint performances typically rely on anaerobic energy systems, which is why VO2 max is thought to show a weaker relationship with short sprints. Additionally, a positive moderate relationship was found between 40m and 10m sprints, while a positive high-level relationship was determined between 40m and both 20m and 30m sprints. The findings obtained in this study indicate that there are significant relationships between different athletic performance measures, and these relationships provide important information for optimizing athletes' training programs and performance evaluations.

When the studies conducted in this field are examined; VO2 max is expected to show low correlation with short distance sprints (20m, 40m). Because VO2 max represents aerobic capacity and sprints represent anaerobic energy systems. However, training methods such as HIIT (high-intensity interval training) can enhance both VO2 max and sprint performance by bridging the gap between the two systems. This type of training enhances both aerobic capacity and the activation of fast-twitch muscle fibers, which indirectly affects sprinting ability (Liu et al., 2024). It has been found that 40m sprint performance is highly correlated with other short distance sprints (such as 10m and 20m). This may be due to the similarity of anaerobic energy systems and acceleration mechanics. Especially 0-10m sprints are directly related to linear acceleration ability, and training in these areas has been proven to increase sprint performance (Sloth et al., 2013). The positive correlation between vertical jump and long jump shows that explosive power and muscle hypertrophy are effective in both skills. Recent studies confirm that activation of fast-twitch fibers and movements requiring explosive strength (e.g. vertical jump and long jump) exhibit a strong relationship (Widodo et al., 2023).

The negative relationship between sprint and jumping performances may stem from biomechanical differences. During sprinting, energy is focused more on horizontal movement, while vertical jumping directs energy production upward. This difference may limit the relationship between the two performance measures (Liu et al., 2024).

Positive relationships between sprint distances (10m, 20m, 30m, 40m) show that acceleration and maximal speed develop together. Research indicates that the correlation between various sprint distances is often influenced by the specificity of training. For example, short-distance sprint workouts can improve acceleration, while longer distances can improve speed endurance (Liu et al., 2024).

In this study, it was concluded that the physical performance of young elite football players competing in League A varies depending on their positions. According to these findings, defenders, midfielders, and forwards demonstrated significant superiority in vertical jump, long jump, and sprint performance compared to goalkeepers. The study is limited to young elite A league footballers. Conducting similar studies with footballers of different age groups and league would provide valuable insights into positional differences from a broader perspective. Long-term monitoring of changes in footballers' physical performance is crucial for assessing their development processes and the effects of training. Comparing footballers' physical performances across different periods (e.g., pre-season, mid-season, and post-season) is recommended to evaluate performance changes and the effectiveness of training programs. In addition to the tests used in the study, examining the positional differences of footballers using other physical performance tests (e.g., strength test, flexibility test) may yield additional insights.

Conflicts of Interest: The author(s) of the article do not have any personal or financial conflict of interest within the scope of the study.

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REFERENCES

Arjol-Serrano, J. L., Lampre, M., Díez, A., Castillo, D., Sanz-López, F., & Lozano, D. (2021). The influence of playing formation on physical demands and technical-tactical actions according to playing positions in an elite soccer team. *International Journal of Environmental Research and Public Health*, *18*(8), Article 4148. [CrossRef]

Arslan, O., & Bekir, Ç. A. R. (2024). *Anaerobic power values and sprint performances of amateur football players in different positions.* İksad Publishing.

Asimakidis, N. D., Mukandi, I. N., Beato, M., Bishop, C., & Turner, A. N. (2024). Assessment of strength and power capacities in elite male soccer: A systematic review of test protocols used in practice and research. *Sports Medicine, 54*(10),1-38. [CrossRef]

Bădescu, D., Zaharie, N., Stoian, I., Bădescu, M., & Stanciu, C. (2022). A narrative review of the link between sport and technology. *Sustainability*, *14*(23), Article 16265. [CrossRef]

Bangsbo, J., Iaia, F. M., & Krustrup, P. (2008). The Yo-Yo intermittent recovery test: A useful tool for evaluation of physical performance in intermittent sports. *Sports Medicine*, *38*, 37-51. [CrossRef]

Berber, E., McLean, S., Beanland, V., Read, G. J. M., & Salmon, P. M. (2020). Defining the attributes for specific playing positions in football match-play: A complex systems approach. *Journal of Sports Sciences, 38*(11-12), 1248–1258. [CrossRef]

Bloomfield, J., Polman, R., & O'donoghue, P. (2007). Physical demands of different positions in FA Premier League soccer. *Journal of Sports Science and Medicine*, *6*, 63-70.

Bujnovsky, D., Maly, T., Ford, K. R., Sugimoto, D., Kunzmann, E., Hank, M., & Zahalka, F. (2019). Physical fitness characteristics of high-level youth football players: Influence of playing position. *Sports, 7*(2), 46. [CrossRef]

Can, İ. (2009). *Comparison of Aerobic Power Performance of 16-18 Age Group Basketball, Football, and Handball Players: An Experimental Study*. Published Master's Thesis, Karadeniz Technical University, Institute of Social Sciences, Department of Physical Education and Sports, Trabzon.

Cerrah, A. O., Polat, C., & Ertan, H. (2011). Evaluating some physical and technique chracteristics of super amateur soccer players according to their playing positions. *Nigde University Journal of Physical Education And Sport Sciences, 5*(1),1-6.

Cometti, G., Maffiuletti, N. A., Pousson, M., et al. (2001). Isokinetic strength and anaerobic power of elite, subelite and amateur French soccer players. *International Journal of Sports Medicine*, *22*, 45-51. [CrossRef]

Dolci, F., Hart, N. H., Kilding, A. E., Chivers, P., Piggott, B., & Spiteri, T. (2020). Physical and energetic demand of soccer: a brief review. *Strength & Conditioning Journal*, *42*(3), 70-77. [CrossRef]

Dong, K., Jeong, G., & Chun, B. (2022). The effects of different training interventions on soccer players' sprints and changes of direction: A network meta-analysis of randomized controlled trials. *Applied Sciences*, *13*(1), Article 446. [CrossRef]

Gao, J., & Yu, L. (2023). Effects of concurrent training sequence on VO2max and lower limb strength performance: A systematic review and meta-analysis. *Frontiers in Physiology*, *14*, Article 1072679. [CrossRef]

Glatthorn, J. F., Gouge, S., Nussbaumer, S., Stauffacher, S., Impellizzeri, F. M., & Maffiuletti, N. A. (2011). Validity and reliability of Optojump photoelectric cells for estimating vertical jump height. *The Journal of Strength & Conditioning Research, 25*(2), 556-560. [CrossRef]

Haugen, T. A., Tønnessen, E., Hisdal, J., & Seiler, S. (2014). The role and development of sprinting speed in soccer. *International Journal of Sports Physiology and Performance, 9*(3), 432-441. [CrossRef]

Hermassi, S., Schwesig, R., Aloui, G., Shephard, R. J., & Chelly, M. S. (2019). Effects of short-term in-season weightlifting training on the muscle strength, peak power, sprint performance, and ball throwing velocity of male handball players. *Journal of Strength and Conditioning Research, 33*(12), 3309-3321. [CrossRef]

Karavelioğlu, M. B. (2008). *Investigation of Physical, Physiological, and Psychomotor Characteristics of Amateur Football Players by Positions (The Case of Kütahya Province)*. Published Master's Thesis, Dumlupınar University, Institute of Social Sciences, Department of Physical Education and Sports, Kütahya.

Krustrup, P., Mohr, M., Amstrup, T., Rysgaard, T., Johansen, J., Steensberg, A., ... & Bangsbo, J. (2003). The yo-yo intermittent recovery test: Physiological response, reliability, and validity. *Medicine & Science in Sports & Exercise, 35*(4), 697-705. [CrossRef]

Lee, Y. S., Lee, D., & Ahn, N. Y. (2024). SAQ training on sprint, change-of-direction speed, and agility in U-20 female football players. *Plos One, 19*(3), e0299204. [CrossRef]

Liu, Y., Abdullah, B. B., & Abu Saad, H. B. (2024). Effects of high-intensity interval training on strength, speed, and endurance performance among racket sports players: A systematic review. *Plos one, 19*(1), Article e0295362. [CrossRef]

Lorenzo-Martinez, M., Kalén, A., Rey, E., López-Del Campo, R., Resta, R., & Lago-Peñas, C. (2021). Do elite soccer players cover less distance when their team spent more time in possession of the ball?. *Science and Medicine in Football, 5*(4), 310-316. [CrossRef]

Low, B., Coutinho, D., Gonçalves, B., Rein, R., Memmert, D., & Sampaio, J. (2020). A systematic review of collective tactical behaviours in football using positional data. *Sports Medicine, 50*, 343-385. [CrossRef]

Miçooğulları, B. O. (2024). Comparison physical attributes of young football players with their playing positions. *Online Journal of Recreation & Sports, 13*(1), 11-16. [CrossRef]

Modric, T., Versic, S., & Sekulic, D. (2020). Playing position specifics of associations between running performance during the training and match in male soccer players. *Acta Gymnica, 50*(2), 51-60. [CrossRef]

Modric, T., Versic, S., Drid, P., Stojanovic, M., Radzimiński, Ł., Bossard, C., ... & Sekulic, D. (2021). Analysis of running performance in the offensive and defensive phases of the game: Is it associated with the team achievement in the UEFA Champions League?. *Applied Sciences, 11*(18), Article 8765. [CrossRef]

Modric, T., Versic, S., Sekulic, D., & Liposek, S. (2019). Analysis of the association between running performance and game performance indicators in professional soccer players. *International Journal of Environmental Research and Public Health, 16*(20), Article 4032. [CrossRef]

Oliva-Lozano, J. M., Gómez-Carmona, C. D., Pino-Ortega, J., Moreno-Pérez, V., & Rodríguez-Pérez, M. A. (2020). Match and training high intensity activity-demands profile during a competitive mesocycle in youth elite soccer players. *Journal of Human Kinetics, 75*(1), 195-205. [CrossRef]

Ramirez-Campillo, R., Castillo, D., Raya-González, J., Moran, J., de Villarreal, E. S., & Lloyd, R. S. (2020). Effects of plyometric jump training on jump and sprint performance in young male soccer players: A systematic review and meta-analysis. *Sports Medicine, 50*, 2125-2143. [CrossRef]

Sloth, M., Sloth, D., Overgaard, K., & Dalgas, U. (2013). Effects of sprint interval training on VO 2max and aerobic exercise performance: A systematic review and meta-analysis. *Scandinavian Journal of Mmedicine & Science in Sports, 23*(6), e341-e352. [CrossRef]

Söyler, M., & Kayantaş, İ. (2020). Examination of seasonal changes of some physical and technical parameters according to the positions of professional league players. *International Journal of Applied Exercise Physiology*, *9*(8), 99-108.

Vardakis, L., Koutsokosta, M., Michailidis, Y., Mandroukas, A., Stafylidis, A., Kanaras, V., ... & Metaxas, T. I. (2024). Differences in physical indexes between football players of different playing positions and correlation to the weekly training load. *Applied Sciences*, *14*(11), Article 4469. [CrossRef]

Widodo, S., Indraswari, D. A., & Adyaksa, G. (2023). Correlation between VO2 max, speed, and limb muscle explosive power with agility in soccer players. *Diponegoro International Medical Journal*, *4*(2), 40-45. [CrossRef]

Wisloeff, U., Helgerud, J., & Hoff, J. (1998). Strength and endurance of elite soccer players. *Medicine and Science in Sports and Exercise, 30*(3), 462-467. [CrossRef]

Wong, P. L., Chamari, K., Dellal, A., & Wisløff, U. (2009). Relationship between anthropometric and physiological characteristics in youth soccer players. *The Journal of Strength & Conditioning Research, 23*(4), 1204-1210. [CrossRef]

Yapıcı, A., Aydın, E., Çelik, E., & Başkaya, G. (2016). The comparison of motoric characteristics of young soccer players according to their playing positions. *Sportif Bakış: Spor ve Eğitim Bilimleri Dergisi, 3*(1), 49-60.

Živković, M., Stojiljković, N., Trajković, N., Stojanović, N., Đošić, A., Antić, V., & Stanković, N. (2022). Speed, change of direction speed, and lower body power in young athletes and nonathletes according to maturity stage. *Children*, *9*(2), Article 242. [CrossRef]