

Comparison of Certain Physical and Performance Parameters of Young Football Players Based on Positions

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Abstract

This study, which included 50 young amateur male footballers aged between 16 and 18, aims to compare certain physical and performance parameters of young football players based on positions. Based on their positions, the footballers were divided into two groups as “central” and “wing” positioned players. The body composition, anaerobic power, speed and flexibility values have been determined using field tests. The data were analyzed using SPSS 22 statistics program. Shapiro-Wilk test was used to determine the normality distribution of the data. The independent t-test was used because of the normal distribution of the data. Confidence interval for statistical processes was considered to be $p < 0.05$. The average values and comparison results obtained from the physical parameters of the central and wing players have showed that there is a statistically significant difference between central and wing players in terms of height (cm), body weight (kg), fat mass (kg) and lean mass (kg) parameters ($p < 0.05$), whereas there is no statistically significant difference in age (years) and fat rate (%) parameters ($p > 0.05$). The average values and comparison results obtained from the physical parameters of the central and wing players have showed that there is a statistically significant difference between central and wing players in terms of vertical jump (cm), 30-m sprint (s) and anaerobic power (kgm/sec) parameters ($p < 0.05$), whereas there is no statistically significant difference in 10-m sprint (s) and flexibility (cm) parameters ($p > 0.05$). The results of this study showed that, in terms of physical parameters, the height, body weight, fat mass and lean mass values of the central players were statistically higher than the wing players. In terms of performance parameters, the vertical jump and 30-m sprint performance of the wing players were found to be statistically better than the central players, while the anaerobic power values of the central players were found to be statistically higher than the wing players.

Keywords: Central position, Flexibility, Speed, Vertical jump, Wing position

1. Introduction

Football is defined as a sports branch characterized by short sprints, sudden acceleration and deceleration, turns, jumps and struggles (Dellal et al., 2010). Movements at a certain time during a competitive football match have a significant effect on the success. The studies reported that the players run between 10.50 and 11.77 km per game and 9.2% of the physical loads are considered to be high density. The study by Di Salvo et al. (2007) reported that there is a decrease in the total distance covered over time in high-intensity games. Moreover, the study by Bradley et al. (2009) indicated that the total distance run at high intensity in the last 15-min of the match was 20% less than the distance covered in the first 15-min period. The studies reported that these physical parameters are analyzed based on different position roles (Barros et al., 2007; Bloomfield et al., 2007).

Moreover, a midfielder runs a significantly longer distance than a defender or a striker in a professional match. A defender dribbles at a shorter distance than players in other positions, whereas they do much more sprinting than a striker, a defender, or a midfielder (Rampinini et al., 2007). In addition to the different physiological parameters between the positions, professional football players have position differences in terms of anthropometric aspects such as total body mass, height and body mass index (Wong et al., 2009). This suggests that certain physiological requirements and anthropometric prerequisites exist for different positions, and therefore young players with physiological performance and anthropometric superiority remain ahead of the game (Gil et al., 2007; Gravina et al., 2008).

However, the requirements during the match vary in youth team categories, and therefore the physical and physiological profiles of the players differ from the adult players. Independent factors such as age, biological maturity, training age, morphology and anthropometry have an effect on the physical and physiological profile of the players (Da Silva et al., 2008; Wong et al., 2008). The average running distance for the U18 and U12 categories is about 9 and 6.2 km, respectively, and the game intensity is lower for the young footballers. Heart rate responses and blood lactate concentrations are lower in young football players compared to adult players. Therefore, the selection of players for a certain position based on their physiological performance is not suitable for young age groups (Capranica et al., 2001; Stolen et al., 2005). Accordingly, there is a limited number of studies investigating positional differences in physiological performance among young football players, however, the results vary (Gil et al., 2007). The study by Malina et al. (2000) including 14-year-old elite young footballers with 4.5 years of training experience, reported that there is no difference between defenders, midfielders and strikers in terms of vertical jump values, 30-m sprint time and aerobic endurance values.

The study by Gil et al. (2000) reported that goalkeepers have significantly lower aerobic capacity compared to defenders, midfielders, and strikers. Moreover, strikers have the best performance in 30-m sprints and vertical jumps compared to goalkeepers, defenders and midfielders. The study by D. P. Wong and S. H. S. Wong (2009) examined 70 male football players in the U14 category with five years of training experience and reported that there are

significant anthropometric position differences among young football players, but there is no significant positional difference in terms of physiological performances.

The study by Reilly et al. (2000) examined 31 young male footballers and reported that top-level elite players have lower body weight, more aerobic strength, and more tolerance to fatigue than mid-level players. The study by Da Silva et al. (2008) indicated that young Brazilian players present different physical and physiological profiles than European football players, especially their height is shorter and their aerobic capacity is lower. Based on the results of the studies, it has been considered that there is a requirement for further research to provide a complete physical and physiological profile based on different positions.

The primary purpose of this study is to help young football players create anthropometric and physiological profiles based on their positions. The secondary purpose is to determine the suitability of these profiles and features for competitive success. It is believed that these findings can facilitate talent identification, selection of young players, and training design.

2. Method

2.1 Participants

The study included 50 young amateur male footballers aged between 16 and 18. Based on their positions, the footballers were divided into two groups as “central” and “wing” positioned players. The group of central players (n: 25) included central back, central midfield and central forward players (average age, 17.46±2.71 years; average height, 178.54±5.69 cm; average body weight, 72.47±9.83 kg; average fat rate, 7.62±3.52%; average fat mass, 6.45±3.36 kg; and average lean mass, 66.02±7.41 kg), and the group of wing players (n: 25) included wing back, wing midfield and wing forward players (average age, 17.63±2.36 years; average height, 174.51±5.44 cm; average body weight, 69.24±7.63 kg; average fat rate, 7.18±2.84%; average fat mass, 5.46±2.31 kg; and average lean mass, 63.78±5.83 kg).

2.2 Research Design

The body composition, anaerobic power, speed and flexibility values have been determined using field tests. The height measurements of the participants were made with a sensitivity of 0.1 cm using a stadiometer. Body weight (kg), body fat ratio (%), body fat mass (kg) and lean body masses (kg) were determined by a body fat analyzer. The vertical jump measurements were made using a digital jump meter with a sensitivity of 0.1 centimeter (cm), and their speed performance was determined by a 10-m and 30-m sprint tests. Sit and reach flexibility test was applied for the flexibility parameter. The calculation of anaerobic power was performed using the formula of $P = \sqrt{4.9} \times (\text{Weight}) \times \sqrt{\text{Dn}}$. “P” stands for power in kilogram-meters/second, and “Dn” stands for vertical jump distance in meters (Karakulak et al., 2019).

2.3 Data Collection Tools

2.3.1 Vertical Jump Test

A digital jump meter with a 0.1 cm accuracy was used for vertical jump measurements in the performance tests. After the digital indicator of the jump meter was connected to the waist area and the rope was adjusted, the participant made the jump upward by stretching on his knees. After the jump, the participant tried to fall into the circular plastic area that was connected to the jump meter and placed on the ground. In the event of the participant taking a step forward or backward after landing, the jump was deemed invalid and repeated. The test was carried out twice, and the highest value was recorded in “cm”.

2.3.2 10 and 30-m Speed Test

10 and 30-m sprint tests were applied to determine the speed performance of the participants. Photocells were placed at distances of 0 and 10-30-m. Before starting the test, the participants performed a warm-up protocol with 7-min of dynamic stretching and short sprinting after a 10-min warm-up run. The participants performed the test twice, after a 5-min rest interval. The best time of the two attempts was recorded. When the participant was ready, he started from 1 m behind the starting photocell; after reaching the end photocell at 10 and 30-m distance with the highest speed that he could reach, the running time was recorded automatically. The test was carried out twice; and the highest value was recorded in “s”.

2.3.3 Sit and Reach Flexibility Test

The flexibility test measurement of the athletes participating in the study was carried out with a sit and reach test box with a length of 35 cm, a width of 45 cm, and a height of 32 cm. The participants sat on the ground and put their bare feet flat against the test box. The participants then stretched their hands in front of their body as far as they could by bending their torso forward, without bending their knees. The participants waited in this state for 1-2 s at the farthest point. The test was repeated twice, and the best value was determined in “cm”.

2.4 Analysis of Data

The data were analyzed using SPSS 22 statistics program. Shapiro-Wilk test was used to determine the normality distribution of the data. The independent t-test was used due to the normal distribution of the data. Confidence interval for statistical processes was considered to be $p < 0.05$.

3. Results

The average values and comparison results obtained from the physical parameters of the central and wing players in Table 1 have showed that there is a statistically significant difference between central and wing players in terms of height (cm), body weight (kg), fat mass (kg) and lean mass (kg) parameters ($p < 0.05$), whereas there is no statistically significant difference in age (years) and fat rate (%) parameters.

Table 1. Average values and comparison results obtained from physical parameters of central and wing players

Physical Parameters	Central Players	Wing Players	T	P
Age (years)	17.46±2.71	17.63±2.36	1.63	0.22
Height (cm)	178.54±5.69	174.51±5.44	3.22	0.01*
Body Weight (kg)	72.47±9.83	69.24±7.63	3.60	0.02*
Fat Rate (%)	7.62±3.52	7.18±2.84	1.58	0.39
Fat Mass (kg)	6.45±3.36	5.46±2.31	2.17	0.03*
Lean Mass (kg)	66.02±7.41	63.78±5.83	3.39	0.01*

Note. * $p < 0.05$.

The average values and comparison results obtained from the performance parameters of the central and wing players in Table 2 have showed that there is a statistically significant difference between central and wing players in terms of vertical jump (cm), 30-m sprint (s) and anaerobic power (kgm/s) parameters ($p < 0.05$), whereas there is no statistically significant difference in 10-m sprint (s) and flexibility (cm) parameters.

Table 2. Average values and comparison results obtained from performance parameters of central and wing players

Performance Parameters	Central Players	Wing Players	T	P
Vertical Jump (cm)	54.62±6.21	58.11±4.76	-2.28	0.01*
10-m Sprint (s)	1.78±0.18	1.75±0.11	1.16	0.29
30-m Sprint (s)	4.33±0.19	4.27±0.26	2.62	0.02*
Anaerobic Power (kgm/s)	119.41±19.27	113.25±13.47	2.47	0.01*
Flexibility (cm)	28.36±6.52	29.74±5.33	-1.13	0.42

Note. * $p < 0.05$.

4. Discussion

This study, which included 50 young amateur male footballers aged between 16 and 18, aims to compare certain physical and performance parameters of young football players based on positions. According to the results of this study, physical parameters such as height, body weight, fat mass and lean mass of central players were determined to be higher than wing

players. It was observed that the performance parameters of wing players such as vertical jump and 30-m speed were higher than the central players. In addition, the anaerobic power values of the central players were found to be higher than the wing players.

As one of the important results of the study, the height and body weight values of the central players were found to be higher than the wing players. When many studies conducted to evaluate the physical and performance parameters of football players who play in different positions are examined, it is possible to come across various studies that support the results of this study. The studies indicated in terms of physical characteristics that the average height of an average football player is 180 cm and the percentage of body fat is between 7% and 14% (Rico-Sanz, 1998). Accordingly, it was suggested that especially low-fat percentage gives a player an advantage in both running and jumping performances (Strudwick et al., 2002).

The study by Aslan and Koç (2015) examined 70 amateur footballers with an average age of 22.11 ± 2.71 years based on their positions and body weights, and stated that forward players have higher body weight than midfielders and defenders. The study by Akçınar (2009) reported that the average height of defensive football players and offensive football players is 181.92 ± 5.12 cm and 178.75 ± 5.91 cm, respectively. Midfielders have characteristics of running so much due to their position, and defenders are tall since they have to fight and interfere with the air balls, which provides an advantage over the opposing team (Tourney & Leroy, 2002). When the results of the studies are examined, the results of this study support previous findings.

Independent factors such as age, biological maturity, training age, morphology and anthropometry have an effect on the physical and physiological profile of the players (Da Silva et al., 2008; Wong et al., 2008). Features such as height and body weight in football provide advantages over different positions of the game. In football, it is expected feature for central back players to be taller. This enables central back players to defend better against air balls and corners in football. Central midfield players are also the players who are mostly in tandem struggle, so their height and body weight should be higher. In addition, central forward players are expected to have higher height and body weight in order to gain advantage in air balls and corners during attack. Moreover, central forward players can turn these features into an advantage, as they are constantly in a struggle with defenders. According to the results of the study, it is thought that the fact that the central players have better height and body weight values compared to the wing players is due to these reasons.

As one of the other important results of the study, the fat mass and lean mass values of the central players were found to be higher than the wing players. Based on the current results in terms of body mass index, it has been considered that anthropometric features contribute to success in certain high-level positions. For example, players who are taller and have higher body weight are more suitable for the central position, while players who are shorter and have lower body weight are more suitable for the wing position (Di Salvo et al., 2009). The study by Al-Hazza (2001) found the average body fat ratio of professional football players to be 12.3%, whereas the study by Rico-Sanz (1998) found the average body fat ratio of La Liga players to be 10%. In a study, including 20 football players who have played in the Turkish

Football Federation Third League, the body fat ratio was $11.27\pm 2.29\%$. In another study including 33 professional footballers in the Second League, this rate was $10.81\pm 0.27\%$ (Kayatekin et al., 1993). In a study including 18 football players in the Second League, the body fat ratio varied between 9.66 ± 1.10 and $11.52\pm 1.05\%$ (Koç et al., 2000). The studies conducted with senior football players reported that the sprint duration of players with low body fat rate are positively low, in other words, there is an increase in their sprint performance (Turgay et al., 2003). When the results of the studies are examined, the results of this study support previous findings.

In addition to the different physiological parameters between the positions, professional football players have position differences in terms of anthropometric aspects such as total body mass, height and body mass index (Wong et al., 2009). Considering the structure of the game in football, it is seen that wing players are more active. In football, it is expected that the wing players will be faster than the central players due to the position. Wing players run more intensely than central players and also perform more sprint performance. In this direction, height and body weight ratios of wing players are important in performing these performances. Especially wing players are expected to have a shorter height and less body weight. For these reasons, as a result of the study, it is thought that the body composition values of wing players are lower than the central players.

According to another result of the research, 30-m speed performance values of wing players were found to be higher than central players. When studies with similar results are examined, in a study on speed performance, the average 30-m sprint values based on the positions in the First League teams and the Second League teams were 4.07 ± 0.12 and 4.10 ± 0.11 s, respectively, and the average 30-m sprint values of 29 players in the Third League and 29 players in the Amateur League was 4.13 ± 0.10 and 4.16 ± 0.12 s, respectively (Eniseler et al., 2000). Another study found the average 30-m sprint values of professional football players to be 4.28 ± 0.16 s (Kızılet et al., 2004). The study by Turgay et al. (2003) including 77 football players in the Amateur League, reported that the average 30-m sprint value of goalkeepers, defenders, midfielders and strikers is 5.06 s, 4.59 s, 4.57 s and 4.59 s, respectively. The study by Köse and Atlı (2020) reported the average 30-m sprint values (4.04 ± 0.08 s) of the young football players. Moreover, the study by Cometti et al. (2001) revealed the 10-m sprint values (1.80 s) and 20-m sprint values (4.22 s) of the football players. The results obtained in this study has indicated that the strikers have the best 10, 20 and 30-m sprint values (10-m: 1.67 ± 0.09 ; 20-m: 2.94 ± 0.16 ; 30-m: 4.15 ± 0.20). Another study by Kızılet et al. (2004) indicated that central defenders have a higher 30-m speed performance compared to wing defenders. When the results of the studies are examined, the results of this study support previous findings.

Football is defined as a sports branch characterized by short sprints, sudden acceleration and deceleration, turns, jumps and struggles (Dellal et al., 2010). Movements at a certain time during a competitive football match have a significant effect on the success. Due to the position in football, wing players make more effort because they play in a wider area. Wing players perform a lot of repeated sprint performance in this wide area. Wing players practice both aspects of the game, especially during defense and offense. In addition, the physical

characteristics of wing players are thought to provide an advantage in sprint performance compared to the central players. For these reasons, it can be said that the speed values of wing players are better than central players in the study.

According to another result of the study, vertical jump values of wing players were found better than central players, while central players achieved better results in anaerobic power performance than wing players. In previous studies, Reilly et al. (2000) stated the vertical jump average as 58.00 ± 1.12 cm in their study with English league football players. Ek et al. (2007) determined the average of vertical jump test as 53.65 ± 5.34 cm in the study conducted with 26 football players. Malina et al. (2000) reported that goalkeepers achieved the best vertical jump values according to their positions, while wing midfield players achieved the lowest vertical jump values. Stolen et al. (2005) reported that goalkeepers have the highest jump height compared to strikers and defenders, while midfielders have the lowest jump height. When the results of the studies are examined, the results of this study support previous findings.

Bangsbo (1994) emphasized that for successful competitiveness, the development of speed, agility, strength with combination of aerobic and anaerobic (even maximal) abilities are important for successful, competitive football careers. In football, especially in amateur leagues, physical struggle takes place more than technical and tactical features. Players perform constant strength and power during the match. Especially physical properties and lower extremity strength are more important. This allows the players to perform better jump performance. For these reasons, it can be thought that central players have better vertical jump values than wing players in the study. Moreover, the calculation of anaerobic power was performed using the formula of $P = \sqrt{4.9} \times (\text{Weight}) \times \sqrt{Dn}$. “P” stands for power in kilogram-meters/second, and “Dn” stands for vertical jump distance in meters. According to this formula used in the calculation of anaerobic power, the height of the jump distance is very important. Height is quite an advantage for a good jumping distance. In this respect, it is thought that the anaerobic power values of the central players are higher than the wing players due to the greater height of the central players in the study.

5. Conclusion

The results of this study showed that, in terms of physical parameters, the height, body weight, fat mass and lean mass values of the central players were statistically higher than the wing players. In terms of performance parameters, the vertical jump and 30-m sprint performance of the wing players were found to be statistically better than the central players, while the anaerobic power values of the central players were found to be statistically higher than the wing players. According to these results, physical and performance parameters should be taken into consideration while choosing the appropriate position especially for young football players. It is very important to evaluate these physical and performance parameters in the selection of central and wing players in football.

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