A Comparative Study of the Anthropometric Features and Physical Fitness of Professional Soccer and Futsal Players

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Abstract

Background and objective: Physical fitness as well as body form and composition have a crucial role in the success of athletes. A thorough knowledge of the required physical and physiological characteristics in each sport is an influential factor of the success of athletes. This study aims at a comparative study of the anthropometric features and physical fitness of professional soccer and futsal players.

Research method: The population of this study consists of futsal and soccer players in Iran's Division 1 League. Purposeful sampling (convenient sampling technique) was used to select 16 soccer players and 16 futsal players from this population. The measured anthropometric features include height, weight, arm span, sitting height, BMI, and WHR, and the physiological features related to physical fitness include general agility, lower extremity power, and anaerobic power. Data analysis was conducted using SPSS v26. We used both descriptive measures such as mean score and standard deviation and inferential statistical techniques such as independent t-test.

Findings: The results of data analysis show that there was no significant difference between soccer and futsal players in terms of age, weight, and WHR, but there was a significant difference in height, arm span, sitting height, WHR, and BMI. Also, comparison of physiological features and physical fitness indicators shows that there is no significant difference in anaerobic power between the two groups while there is a significant difference in lower extremity power and agility.

Conclusion: There are many similarities in the anthropometric and physical fitness factors of soccer and futsal players. The significant difference in some of these factors could be explained by the different physical requirements of these two types of sport. But in general, the majority of anthropometric features of both groups of athletes are the same due to the similarities in the techniques of these games.

Keywords: Anthropometric, physical fitness, soccer, futsal

Introduction

Sport skills are performed correctly if anthropometric, physiological, psychological, and biomechanical factors are involved simultaneously. A good knowledge of these factors helps athletes to recognize their points of strength and weakness and improve their abilities [1]. Appropriate anthropometric features are of great importance in many sports. A successful sport career requires specific anthropometric, biomechanical, and bioenergetic features [2]. Strength-muscular features, flexibility, and agility are factors that play a major role in the success of prominent athletes [3]. The amount of exercise can affect body composition and anthropometric features by reducing weight and the percentage of fat in the body [4]. Different sports have different requirements in terms of the physical features of athletes.

Anthropometric features of athletes (e.g. height, weight, body composition, size of bones, and circumference of extremities) are sometimes intricately related to performance [5]. When

selecting young soccer players, their physiological and anthropometric features should be taken into account [6]. The aim of the present study is to investigate the relationship between some anthropometric indicators and physical fitness (physiological) tests of young soccer players.

Recognition of anthropometric and physiological features is important in the performance of athletes in any sport [25]. A knowledge of these features is helpful in comparisons of athletes, identification of weaknesses, and development of effective exercise plans.

Many studies have indicated that successful athletes in different sports have distinguished physiological and anthropometric features. Toriola et al. (1987) showed that lack of an appropriate physique could negatively affect the successful performance of athletes. They maintain that morphological differences between athletes have a strong effect on their performance [7].

Soccer has various physiological requirements. In soccer, balance between these requirements depends on the player's performance, the position in which they play, and the team arrangement. Professional soccer players must fulfill different needs such as aerobic capacity for intensive activity for 90 minutes (up to 120 minutes), ability to accelerate in a short distance, and ability to suddenly reduce acceleration or change direction. In addition, they must frequently produce high anaerobic power for jumping, tackling, and shooting. Soccer is distinguished from many other sports due to its various and complex physiological requirements [8, 9]. Physical and physiological indicators help to determine the position of the player in the team arrangement. Individual values of players also provide the coach with useful findings [9].

Over the last two decades, a vast literature has been produced on the physiology and medicine of soccer. In general, previous studies have investigated the ideal anthropometric and physiological profile of successful soccer players with an emphasis on European and Latin American players [10, 11, 12, 13, 14]. Thus, descriptive information about the physiological and anthropometric features of skillful Asian soccer players, especially Iranian ones, is scarce. Today, it is widely agreed that physiological and anthropometric features as well as the physique of soccer players have a key role in the success or failure of soccer teams in competitions. In addition, factors such as body composition, strength, balance between aerobic and anaerobic power, and physiological abilities are among the most important criteria for the assessment of soccer players which are used by coaches to design and modify exercise programs [15, 16, 17]. The team's physiological profile determines its general and specific readiness and may transform various dimensions of its activity such as exercise methods and the number of competitions [17].

Futsal is a sport which requires high levels of activity. The nature of this sport and the size of the pitch entails a high level of physical fitness on the part of players. Professional futsal players need to do specialized exercises for improving their physical fitness [18]. To achieve their best levels of performance, they must improve their neuromuscular coordination, cardiovascular strength, power, strength, agility, and speed [19]. As achieving these aims requires a relatively long time, coaches try to develop exercise plans that help players to accomplish their objectives in the shortest time possible. Research findings have indicated that a futsal player has very intensive physiological needs in an official match [20]. In 2006, Dogramaci and Watsford concluded that futsal is a high-impact sport in which physical activities alter in an average period of 3 minutes and 28 seconds. They estimated that, a futsal player has high-impact activity in 26 percent of the total time of a match [21].

All athletes need to improve their coordination, resistance, strength, agility, and speed in order to achieve their highest performance [22]. On the one hand, good performance in soccer and futsal requires a certain level of physiological features such as aerobic power, anaerobic power,

sprinting, and agility. On the other hand, anthropometric features such as body composition, weight, percentage of fatty tissue, and muscle mass contributes to performance in high levels [19]. This knowledge can help players to identify their required features and reinforce those features. It can also help coaches in developing appropriate exercise plans. As selection of players is a permanent process ahead of coaches, development of criteria for identifying outstanding players will be of great use. Some of these criteria include skills, physiological and anthropometric features, and body composition. Since skills are more difficult to measure, physiological and anthropometric features as well as body composition are particularly important. Therefore, it is necessary for the coach to have a good knowledge of these features to select more talented soccer and futsal players. Unfortunately, little research has been done into the anthropometric and biomechanical needs of Iranian soccer and futsal players.

Few studies have compared anthropometric features and physical fitness of professional soccer and futsal players. Due to the importance of these features and their role in the selection of players for a team, the present study aims to compare soccer and futsal players in terms of their anthropometric features and physical fitness.

Research method:

This research is descriptive and has a cross-sectional design. The population of this study consists of futsal and soccer players in Iran's Division 1 League. Purposeful sampling (convenient sampling technique) was used to select 16 soccer players and 16 futsal players from this population. All the participants were informed about the study and voluntarily participated in the study after expressing their consent. Measurement of anthropometric features and body composition were done on one day and physiological as well as physical fitness tests were performed on two consecutive days. The anthropometric and physiological features of all subjects were measured using recommended standard methods. The tests were conducted in a roofed pitch. All measurements were based on the standard methods recommended by McDougall and Wenger [23]. The measurements were performed by a single person and a single instrument. Weight and height were measured using digital scale and tape meter with accuracy of 0.1kg and 0.1cm, respectively. BMI (body mass index) and WHR (waist-to-height ratio) were also measured. Next, ISAC method was used to measure the circumference of body parts (waist, hip, and core) and length of body and extremities (standing height, arm span, and leg length) using an anthropometric meter on the right side of the body [24].

The physical fitness features considered in this study include general agility, lower extremity power, and anaerobic power. Agility was tested by 4*9 run [25], lower extremity power by Sargent jump [26], and anaerobic power by 45-meter sprint [27].

Data analysis was conducted using SPSS v26. When the normality of data distribution was confirmed by Kolmogorov-Smirnov test, the data were analyzed using descriptive and inferential statistics. We used both descriptive measures such as mean score and standard deviation and inferential statistical techniques such as independent t-test. The level of significance was determined as $P \leq 0.05$.

Results

Mean and standard deviation of the anthropometric features and body composition of the participants are listed in Table (1) and their physiological and physical fitness profile is presented in Table (2).

Table 1. Description and comparison of anthropometric features

Variables	Soccer group M±SD	Futsal group M±SD	t	P
Age (years)	26.78 ± 2.24	23.68 ± 6.89	1.758	0.089
Weight (kg)	73.31 ± 4.78	73.78 ± 7.49	-0.253	0.802
Height (cm)	182.75 ± 2.81	176.00 ± 3.77	5.730	0.000*
Sitting height (cm)	89.87 ± 2.12	86.68 ± 3.49	3.116	0.005*
Arm span (cm)	181.31 ± 2.65	174.06 ± 7.65	3.580	0.001*
WHR (cm)	0.693 ± 0.016	0.673 ± 0.49	1.579	0.126
BMI (kg/sq m)	21.86 ± 0.93	23.85 ± 2.47	-3.008	0.005*

* Significant difference in the mean scores of variables (P≤0.05)

Table 2. Description and comparison of physiological and physical fitness features

Variables	Soccer group M±SD	Futsal group M±SD	t	P
Anaerobic power (45-meter sprint)	6.93 ± 0.54	6.94 ± 0.46	-0.035	0.972
Lower extremity power (Sargent jump)	60.43 ± 1.96	57.56 ± 3.22	3.046	0.005*
Agility (4×9)	9.37 ± 0.44	7.57 ± 0.39	12.101	0.000*

* Significant difference in the mean scores of variables (P≤0.05)

Table 1 describes and compares two groups of Iranian soccer and futsal players in terms of anthropometric features including age, weight, height, arm span, sitting height, WHR, and BMI. The results of data analysis using independent t-test show that there was no significant difference between soccer and futsal players in terms of age, weight, and WHR, but there was a significant difference in height, arm span, sitting height, WHR, and BMI (P<0.05).

Table 2 describes and compares the two groups in terms of physiological and physical fitness features including anaerobic power, lower extremity power, and agility. The results show that there is no significant difference in anaerobic power between the two groups but the difference in lower extremity power and agility is significant (P<0.05).

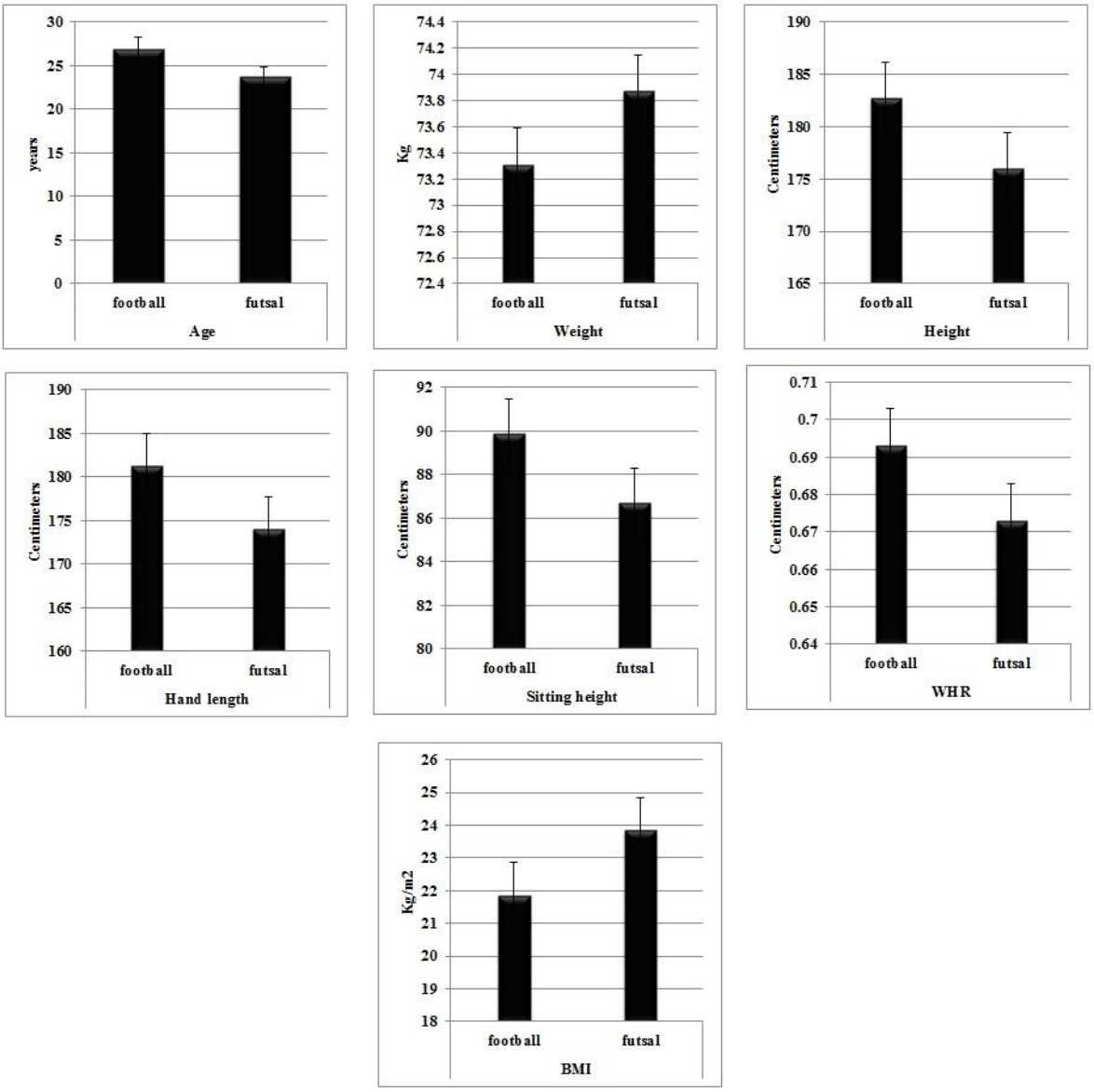

Figure 1. Summary of the results of anthropometric features

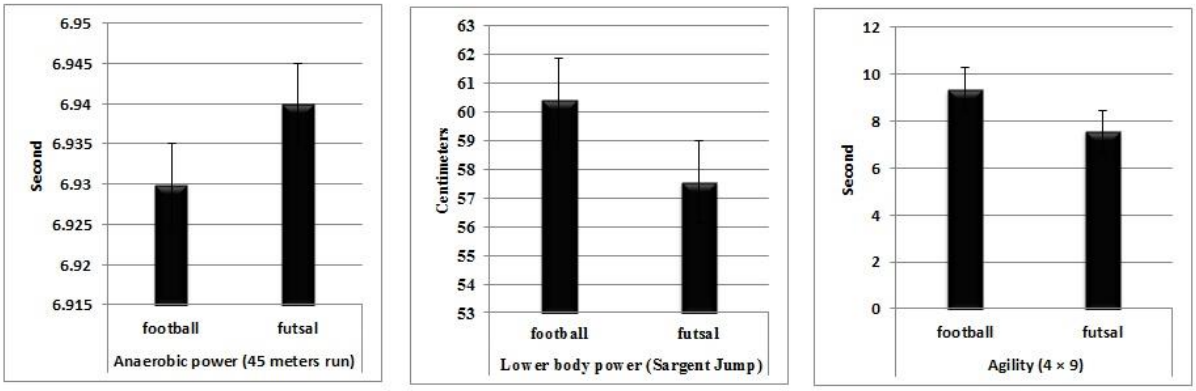

Figure 2. Summary of the results of physiological and physical fitness features

Discussion and Conclusion

This study aimed at a comparative study of the anthropometric features and physical fitness of soccer and futsal players. The results are indicative of differences between the two groups in some of these features. The results of our data analysis show that there is no significant difference between soccer and futsal players in terms of age, weight, and WHR while there is a significant difference in height, arm span, sitting height, WHR, and BMI. Also, our comparison of physical fitness and physiological features indicate that the two groups do not differ in anaerobic power but there is a significant difference in lower extremity power and agility.

The average height of soccer players was 182.75cm and the average height of futsal players was 176cm. The difference is explained by the fact that having a greater height is an advantage for soccer players, which has been confirmed by other studies (29). The futsal players participating in this study had normal heights and weights that conformed to the norms obtained by research studies (30, 31). Although little research has been done about the effect of body composition and anthropometry in futsal, studies of top futsal teams suggest that the majority of futsal players have a normal body size, and average height of 170-180cm, an average weight of 70kg, and a fat percentage of 8-12% [32].

Futsal players move at higher speeds and require lower heights so that their center of gravity would become closer to the ground. In general, higher speeds and agility could be more easily achieved with medium height [28].

The mean sitting height of soccer players was calculated as 89.87 and that of futsal players was 86.68. Of course, it should be mentioned that the ratios of sitting height to standing height in both groups are equal (0.48), which is indicative of the appropriateness of anthropometric features in soccer and futsal players. As indicated in the literature, the ratio of sitting height to standing height in athletes is around 0.5, which has also been proved by our results [33].

The average arm span of soccer players was 181.31cm and that of futsal players was 174.06cm. It is an anthropometric fact that the arm span of normal individuals is almost equal to their height, and the participants of this study are not exceptions. As the average height of soccer players is greater than the average height of futsal players, their average arm span is also greater [33].

The mean BMI of soccer players in our study was 21/76 kg/m^2 and that of futsal players was 23.85 kg/m^2. BMI is the result of the division of weight in kilograms by the square of height in

meters [33]. The mean weights of both groups were very close but their difference in height led to the difference in the mean BMI.

The vertical jump of soccer players was higher than futsal players. As shown in the table, the mean value of Sargent jump is 60.43cm for soccer players while it is 57.56cm for futsal players. Cuadrado et al. have also confirmed the fact that there is a significant difference in Sargent jump between professional soccer players and futsal players [34]. This difference is explained by the requirements of both types of sport [35]. In soccer, delivering high passes and heads are important ways of scoring goals. This is rarely the case in futsal and. For this reason, soccer players need higher vertical jumps.

The agility of futsal players (7.57s) in the 4×9 run test was higher than soccer players (9.37s) [28]. This finding is explained by the nature of futsal where a player needs quick movements with or without ball in a small pitch in contrast to soccer in which the pitch is much larger and the agility of players needs not be as high as in futsal. According to Alvurdu (2013), futsal players must control the ball and move between the defenders at high speeds in order to impose their status and advantage [36]. Therefore, agility is more crucial in futsal than in soccer [37].

Overall, through this study and a review of the literature we found out that there are many similarities between the anthropometric features and physical fitness indicators of soccer and futsal players [38]. The significant difference in some of these factors could be explained by the different physical requirements of these two types of sport. But in general, the majority of anthropometric features of both groups of athletes are the same due to the similarities in the techniques of these games.

Some studies maintain that, in the selection of talented players in soccer and futsal, skill-related and psychological indicators should be taken into account in addition to anthropometric and physiological features [39]. Therefore, it is suggested that, while bearing in mind the importance of technical and tactical aspects as well as the player's obedience to the coach's instructions, soccer and futsal coaches can make use of physical fitness and physiological tests, particularly lower extremity power and agility, along with anthropometric features in the process of selecting players for a team. Also, it is suggested that the identified factors and indicators be studied as a whole in future research. Of course, partial studies such as the present study can be useful for coaches and other individuals who are in charge of selecting players.

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