

# COMPARISON OF SOME PHYSIOLOGICAL AND MOTORIC CHARACTERISTICS OF FEMALE SOCCER AND FUTSAL PLAYERS<sup>3</sup>

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## ABSTRACT

This study aimed to compare some physiological and motoric characteristics of female soccer and futsal players. Thirty (30) female soccer players with the mean age of 20.60±1.610 years, mean training age of 8.50±1.676 years, average height of 161.47±5.649 cm and average body weight of 54.91±6.623 kg and 30 female futsal players with the mean age of 20.33±1.918 years, mean training age of 8.37±1.752 years, average height of 163.40±5.393 cm and average body weight of 55.00±4.906 kg voluntarily participated in this study. Study subjects were tested for skinfold thickness, VC, FVC, FEV<sub>1</sub>, flexibility, hand grip strength, leg strength, 10m acceleration and 30m speed test, agility, Yo-yo 1 and counter movement jump factors. In order to document the differences to be revealed at the end of the study, Independent Simple T-test was performed for data analysis and significance was set at "α=0.05". A statistically significant difference was recorded in 10m acceleration and 30m speed run test and agility test in favour of female futsal players (p<0.05) and in Yoyo-1 and counterpart movement jump tests in favour of female soccer players (p<0.05).

**Key Words:** Female, Soccer, Futsal, Physiological, Motoric Characteristics

## KADIN FUTBOLCULAR İLE FUTSALCILARIN BAZI FİZYOLOJİK VE MOTORİK ÖZELLİKLERİNİN KARŞILAŞTIRILMASI

### ÖZ

Bu çalışmanın amacı, kadın futbolcular ile futsalcıların bazı fizyolojik ve motorik özelliklerinin karşılaştırılmasıdır. Çalışmaya, yaş ortalamaları 20.60±1.610 yıl, antrenman yaşı ortalamaları 8.50±1.676 yıl, boy uzunlukları ortalamaları 161.47±5.649 cm, vücut ağırlıkları ortalamaları 54.91±6.623 kg olan 30 kadın futbolcu ile yaş ortalamaları 20.33±1.918 yıl, antrenman yaşı ortalamaları 8.37±1.752 yıl, boy uzunlukları ortalamaları 163.40±5.393 cm, vücut ağırlıkları ortalamaları 55.00±4.906 kg olan 30 kadın futsalcı, toplamda 60 sporcu gönüllü olarak katılmıştır. Deneklere deri kıvrım kalınlığı, VC, FVC, FEV<sub>1</sub>, esneklik, el pençe kuvveti, bacak kuvveti, 10 m ivmelenme koşusu, 30 m sürat koşusu, çeviklik, Yoyo-1, çoklu sıçrama testleri uygulanmıştır. Verilerin istatistiksel analizinde, çalışma sonunda elde edilen farklılıkları ortaya koymak için α=0.05 anlamlılık düzeyinde Independent Simple T- testi uygulandı. 10 m ivmelenme, 30 m sürat ve çeviklik testi ölçüm değerlerinde (p<0.05) kadın futsal oyuncularını lehine, Yoyo-1 ve çoklu sıçrama testi ölçüm değerlerinde (p<0.05) kadın futbol oyuncularını lehine anlamlı bir fark olduğu tespit edilmiştir.

**Anahtar Kelimeler:** Kadın, Futbol, Futsal, Fizyolojik, Motorik Özellikler

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## INTRODUCTION

Soccer is a sports discipline where aerobic and anaerobic power are used successively and which is directly affected by such factors as speed, strength, balance, agility, muscle and heart-circulation and respiratory system<sup>18</sup>. Soccer players must perform numerous single maximal intensity exercises, including jumping, kicking, accelerating and decelerating, actions that might precede most of the goals scored in competitive leagues, and correlate with competition success<sup>29</sup>. Derived from the words “Futebol De Salao” in Portuguese or “Futbol De Salo” in Spanish<sup>15</sup> and being the only official form of indoor soccer recognized by FIFA<sup>1</sup>, futsal is a variant of soccer, which is played at amateur, semi-professional and professional levels by two teams of 5 players each in indoor places which are generally smaller than soccer pitches<sup>21</sup> and which is performed at much higher tempo than soccer. Futsal is an intermittent high intensity sports with both aerobic and anaerobic overloads<sup>30</sup>.

Comparison between soccer and futsal shows that they have similarities. As in the case of futsal, soccer is also an intermittent high intensity strenuous team sport that places heavy emphasis on strength, running speed, endurance<sup>13</sup>, acceleration and agility<sup>30</sup>. However, soccer and futsal are sports modalities with their own characteristics, in which there is a complex variety of factors that can influence the performance of a team<sup>23</sup>. Despite its similarities to soccer, futsal requires players to make fast decisions and show high sprint capabilities under pressure during attack and defend phases due to the reduced pitch dimensions and the frequent turnovers during futsal match-

play<sup>6</sup>. In the light of the analysis on heart rate and time-movement factors during the highly competitive game, researchers have shown that futsal is a sport which has higher intensity phases than soccer and which includes many sprint activities<sup>20</sup>. While the heart rate of a futsal player increases up to 90%’s during an intense futsal game<sup>5</sup> maximum heart rate of a soccer player during an intense soccer game is recorded to be lower, changing in 80-90% range<sup>26</sup>. In futsal, 13.7% of the total distance covered throughout a game consists of high intensity run and 8.9% of sprint activities<sup>5</sup> while such high intensity runs consists only 9-11% of the total distance covered during a soccer game<sup>10</sup>.

This intensity may be an indicator of the fact that, when compared to soccer, futsal has higher anaerobic metabolism<sup>19</sup>. Physical characteristics such as reaction, alactic and lactic anaerobic endurance, flexibility and speed are vital not only for the futsal players who show high intensity performance in a small play field<sup>3</sup> but also for the soccer players. Movements which require high and maximum intensity motor skills and technical features to be shown in a bordered playground are important for soccer as well as futsal<sup>19</sup>.

Key to success at sports is to firstly find the players who are equipped with the physical structure, body composition, physiologic and motoric characteristics appropriate for the related branch and then to improve the performance of the players<sup>16</sup>. It is important to know which physical, physiological and motoric factors should be improved to which extent for a specific branch. This study is suggested to be a useful guide in the selection of female players suitable for soccer and futsal and to give important clues about the exercises

which should be performed during trainings to develop specific features. Large-scale studies have been made to define the characteristic structures of the players who perform different sports branches. However, there are only a limited number of scientific studies in the literature on female soccer players and particularly female futsal players. It is

## MATERIAL AND METHOD

**Sampling:** Participant group of the study consisted of 30 female soccer players of the two soccer clubs to have competed in and succeeded to complete TFF Female's League in the first four ranks in 2015-2016 season and 30 female futsal players of the two futsal clubs competing in and succeeded to complete Ünilig ("UNILEAGUE" - Universities Sports League) in the first 8 ranks.

### Data Collection Tools

**Height and Body Weight:** Body weight of the study participants were calculated using an electronic weighing scale at 0.1 kg sensitivity and their height using digital height measuring device at 0.01 cm sensitivity.

**Body Fat Percentage (BFP):** A Holtain Ltd. Ciymeh U.K. brand skinfold calliper, with  $\pm 0.2$  mm sensitivity and a constant spring pressure of 10g/mm, was used to measure body fat percentage by using Durning-Womersley formula which was appropriate for the characteristics of the group (age, sex).

Durning-Womersley Formula (for Female Players in 20-29 Age Range)

considered that the results to be produced by the scientific studies to be made on female soccer and futsal players will speed up developments in this field and guide the related future studies in this field. In this scope, this study aimed to detect the differences between specific physiological and motoric characteristics of female soccer and futsal players.

$$X = (\text{Biceps} + \text{Triceps} + \text{Subscapular} + \text{Suprailiac})$$

$$D = [1.1599 - (0.0717 \times \text{Log}X)]$$

$$\text{BFP}\% = [(4.95 / D) - 4.5] \times 100$$

**Respiratory Function Test:** Respiratory functions were recorded using spirometer measuring apparatus. Personal information of the study participants (sex, age, height, weight) were recorded to the spirometer. After a participant took a deep breath, her nostrils were occluded by a pin and the "Record" button of the spirometer was pushed. Then the participant exhaled the whole air in her lungs into the tube (special attention was paid to prevent escape of any air). This procedure was repeated twice and the better result was recorded in the form as the test result.

**Flexibility Test:** A "lie and reach" table was used for flexibility measurement. Measurements were repeated twice and the higher score was recorded in cm as the test result.

**Hand Grip Strength:** Grip strength measurements were performed using Takei brand hand dynamometer. Measurements were repeated twice for both hands and the higher score for each hand was recorded as the test result.

**Leg Strength:** Leg strength measurements were performed using Takei brand back and leg dynamometer. Traction was repeated twice for both legs and the higher value achieved by each participant was recorded as the best test score.

**10m Acceleration ve 30m Speed Test:** A 10m and 30m fields with predetermined starting and ending lines were created in the sports hall. Test starting and ending points on these fields were equipped with photocell (Newtest Powertimer) at 0.01sensitivity. Tests were repeated twice with intermittent rests and the higher results were recorded as the test results.

**Yo-Yo Intermittent Recovery Test:** To detect running distance of the participants, Yo-Yo Intermittent Recovery Level 1 Test, which was designed by Bangsbo as a field test, was used in the scope of the study. This test is controlled by 10-second automatic signals, involves active recovery periods interjected between 2x20 m shuttles at gradually increasing speeds, during which the subject must walk or jog. In the present study, cones were used to mark out 2x20 m shuttle lines. For each line, a cone was located 5 m behind the starting line. This area represented active recovery area. The test was ended when a participant run out of her all power or failed to reach ending point twice.

**Counter Movement Jump:** Newtest Powertimer was used for data collection. Participants were instructed to stare at a fixed point to the possible extent to ensure

their landing on the same position of the contact mat as they took off from and to keep their hands on the hips when jumping as high as possible for 30 seconds with minimum touch on the ground.

**Illinois Agility Test:** Illinois Agility Test was used in the scope of the study to test agility. The width of the course is 5 m and the length 10 m. There are three cones located on a straight line at the centre of the test area with 3.3 m intervals. The test consists of 40-m flat racing and 20-m between-the-cones slalom run with 180° turns at every 10 m.

In the present study, after preparation of the test course, two closed loop photocell activated electronic chronometer systems were placed, one at the begging and the other at the ending point, with 0.01 sec measurement sensitivity (Newtest Powertimer). Participants lied on their front and hands by their shoulders in contact with the ground and got off the ground quickly upon instruction. Course completion time was recorded in seconds. Test was repeated twice for each participant and the better score was recorded as the test score<sup>30</sup>.

**Data Analysis:** T-test (Independent Samples T-Test) was applied for independent groups at statistical significance of  $\alpha=0.05$  in order to reveal any statistically significant difference between specific physiological and motoric characteristics of female soccer and futsal players.

## FINDINGS

Flexibility, hand grip strength, leg strength, 10m acceleration, 30m speed run, agility, Yo-yo 1 and counter movement jump test results and BFP, FEV<sub>1</sub>, VC, FVC values of the study participants are shown in the tables below.

Table 1: Motoric Test Scores of the Participant Female Soccer and Futsal Players and The Statistical Analysis of These Scores

Variable	Soccer Mean ± sd.	Futsal Mean ± sd.	t
Flexibility (cm)	22.80 ± 7.047	24.70 ± 7.401	1.108
Right Hand Grip Strength (kg)	26.29 ± 4.044	27.07 ± 2.246	0.075
Left Hand Grip Strength (kg)	24.52 ± 3.802	25.76 ± 2.902	0.924
Leg Strength (kg)	71.39 ± 12.186	71.60 ± 9.930	1.428
10 m (sc)	1.92 ± 0.114	1.62 ± 0.081	-11.543*
30 m (sc)	4.78 ± 0.208	4.31 ± 0.358	-6.209*
Agility (sc)	17.65 ± 0.522	17.23 ± 0.821	-2.352*
Yo-yo 1 (m)	965.33 ± 151.242	924.67 ± 263.645	-0.733*
Jumping Height (cm)	28.65 ± 4.215	23.22 ± 2.201	-6.249*
Absolute Peak Power (W)	2402.08 ± 484.155	1205.09 ± 80.388	-13.359*
Mean Power (W)	2307.74 ± 405.761	1141.65 ± 74.420	-15.482*

\*p<0.05

Comparison of the scores of the study groups showed that mean 10m acceleration (1.62±0.081 sc), 30m speed run (4.31±0.358 sc) and agility (17.23±0.821 sc) scores of the futsal players were higher than the 10m acceleration (1.92±0.114 sc), 30m speed run (4.78±0.208 sc) and agility (17.65±0.522 sc) scores of the soccer players at a statistically significant level.

Running distance (965.33±151.242 m), jumping height (28.65±4.215 cm), absolute peak powers (2402.08±484.155 W) and mean power (2307.74±405.761 W) scores of the soccer players were, on the other hand, were statistically significantly higher than the running distance

(924.67±263.645 m), jumping height (23.22±2.201 cm), absolute peak powers (1205.09±80.388 W) and mean power (1141.65±74.420 W) of the futsal players.

Meanwhile, comparison between the mean flexibility (22.80±7.047 cm), right hand grip strength (26.29±4.044 kg), left hand grip strength (24.52±3.802 kg) and leg strength (71.39±12.186 kg) of the soccer players and the mean flexibility (24.70±7.401 cm), right hand grip strength (27.07±2.246 kg), left hand grip strength (25.76±2.902 kg) and leg strength (71.60±9.930 kg) of the futsal players produced no statistically significant difference between the two groups.

Table 2: Physiological Test Scores of the Participant Female Soccer and Futsal Players and The Statistical Analysis of These Scores

Variables	Soccer Mean $\pm$ sd.	Futsal Mean $\pm$ sd.	t
BFP (%)	23.99 $\pm$ 2.144	23.75 $\pm$ 2.288	0.431
VC (lt)	3.66 $\pm$ 0.561	3.78 $\pm$ 0.761	0.716
FVC (lt)	3.46 $\pm$ 0.647	3.57 $\pm$ 0.623	0.699
FEV <sub>1</sub> (lt)	1.81 $\pm$ 0.609	2.55 $\pm$ 0.696	4.355

No statistically significant difference was revealed between the mean BFP (%23.99 $\pm$ 2.144), VC (3.66 $\pm$ 0.561 lt), FVC (3.46 $\pm$ 0.647 lt) and FEV<sub>1</sub> (1.81 $\pm$ 0.609 lt) values of the soccer players and the mean BFP (%23.75 $\pm$ 2.288), VC (3.78 $\pm$ 0.761 lt), FVC (3.57 $\pm$ 0.623 lt) and FEV<sub>1</sub> (2.55 $\pm$ 0.696 lt) scores of the futsal players.

## DISCUSSION

Although most of the movement structures in futsal and soccer are very similar, the rules of the two sports (court dimensions, match duration, number of players on the court and their substitutes etc.) are significantly different. To sum up, the shorter match duration and the unlimited number of player substitutions mean that futsal players in average spend less time playing than the soccer players, with shorter distance covered, but on the other hand, they spend more time sprinting and performing high intensity activities<sup>11</sup>. As a consequence of the different characteristics of futsal and soccer, it has been argued that different physical fitness and anthropometric characteristics should exist between futsal and soccer players<sup>13</sup>. While there are many literature studies addressing various characteristics of female athletes/players, there are only a limited number of studies analysing different characteristics of female futsal and soccer players. Present study aimed at comparing specific physiological and motoric characteristics of female soccer and futsal players. At the end of the study, statistically significant differences were

revealed (statistical significance:  $p < 0.05$ ) in 10m acceleration, 30m speed and agility values in favour of futsal players and in running distance and counter movement jump values (statistical significance:  $p < 0.05$ ) in favour of soccer players. There are literature studies supporting these results. For instance, in his study on female soccer and futsal players; Ünveren, 2015 revealed a statistically significant difference between the 10m acceleration and 30m speed values of the female futsal and soccer players in favour of the former<sup>30</sup>. Göral, 2014 made a study on the relationship between sprint speed, anaerobic power and vertical jumping in female futsal and soccer players and found that 30m speed values of the futsal players were higher than those of the soccer players<sup>15</sup>. In their study comparing acceleration characteristics of the male futsal and soccer players, Matos et al., 2008 revealed that futsal players had statistically significantly higher ( $p < 0.05$ ) acceleration scores than the soccer players in “acceleration phase” which is the first phase of sprint speed<sup>23</sup>. Ten meter (10m) acceleration and 30m speed scores achieved by the female futsal players in

the scope of the present study were found to be higher than those recorded in previous literature studies on female soccer players<sup>2, 4, 18, 24, 25, 28, 31</sup>.

In his study on female soccer and futsal players, Ünveren, 2015 detected that agility values of the female futsal players were statistically significantly higher than those of the female soccer players<sup>30</sup>. Benvenuti et al., 2010 also found in their study comparing agility values of female futsal and soccer players that reactive visual stimuli agility field test (RVS-T) and decision-making time (DMT) of the female futsal players were better than those of the female soccer players<sup>6</sup>. Agility test scores obtained in the scope of the present study have been found to be higher than the values obtained by female soccer players analysed in previous literature studies<sup>25, 28</sup>. The reason why the female futsal players' acceleration, speed and agility values were better than soccer's can be considered as the effect of characteristic features of the branch on the athletes<sup>30</sup>. Despite the apparent similarity between these two sports, in futsal the reduced pitch dimension and temporal duration of the actions, the higher number of game situations that the players have to learn, memorize, and select, and their concurrent participation in both attacking and defensive actions of match-play probably sustain the development of high cognitive and coordinative skills in players<sup>6</sup>.

Running distance covered by the female futsal players who participated in the present study were found to be shorter than the distances recorded in previous literature studies on female soccer players<sup>8, 22, 27</sup>. In the study by Datson et al., 2014, mean Yoyo-1 test scores of the

female soccer players competing in the Denmark league was found to be 1379 m (600-1960 m) and of those competing in the Spanish league to be 1224 m $\pm$ 255 m<sup>9</sup>. These values are also higher than the running distances covered by the futsal players in the present study and support the conclusion drawn by this study.

Vertical jumping values obtained in the scope of the study conducted by Göksu and Yüksek, 2003 on the changes recorded in specific physical and physiological parameters of the female soccer players during the season<sup>14</sup>; squat jump (SJ) and countermovement jump (CMJ) values scored by the A, U19 and U17 category female soccer players in the scope of a study made by Castagna and Castellini, 2012 on the vertical jumping performance of the players of the Italian national male and female soccer teams<sup>7</sup>; vertical jump values of the experimental group players of a study by Mengesh et al., 2015 on female soccer players<sup>25</sup>; countermovement jump (CMJ) values of the female soccer players who participated in the study by Ramirez-Campillo et al., 2015<sup>28</sup>; squat jump (SJ) and countermovement jump (CMJ) values of the female soccer players, obtained in a study by McFarland et al., 2016<sup>24</sup> on the players in male and female colleague soccer teams are parallel to the counter movement jump height values produced by the female soccer players and are higher than the values produced by the futsal players who participated in the present study.

Moreover, in the study by Gorostiago et al., 2009 on male futsal and soccer players, countermovement jump (CMJ) values of the soccer players were found to be statistically significantly higher than

those of the futsal players<sup>13</sup>. These results are parallel with the results produced by the present study. Thirty seconds (30s) repetitive vertical jump power (Wt) values produced by female futsal players in the study by Harmancı et al., 2013 were lower than the values obtained by the soccer players who participated in the present study<sup>17</sup>. Absolute peak power and mean power values produced by the female futsal players in this study were found to be lower than the values recorded in the previous literature studies on female soccer players<sup>10, 29</sup>. These results also support the findings of the present study.

Taking into consideration all these results, it can be concluded that specific characteristics distinctly vary between female soccer and futsal players. Female futsal players come to the forefront in acceleration, speed and agility factors which reflect the characteristics of the sports branch they perform. Female soccer players, on the other hand, are more dominant in terms of endurance and jumping.

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Although the reasons for these differences are unknown, they may have several origins, as follows: (1) differences in physical demands between futsal and soccer plays and games. (2) the differences may also be related to differences between the amount and type of training that futsal and soccer players underwent aside from actual game time, as well as overall neuromuscular proficiency on the tests performed, (3) finally, the more likely explanation could be attributed to the fact that futsal, due to lower financial incentives and number of players, has more difficulty in recruiting physically gifted talented players compared to soccer<sup>13</sup>.

## CONCLUSION

As a result, while female futsal players 10m-30m speed run test and agility test results significantly higher than female footballers, footballers Yo-yo 1 and counter movement jump test results significantly higher than female futsal player.

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