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Full Length Research paper

A comparison of somatotypical values from the players of two football teams playing in Turkcell Turkish super league on the basis of the players' positions

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The present study focuses on the characteristics of the somatotypical profiles of high performance, adult, male, Turkcell super league football players in Turkey. The somatotypical values of 24 Gençlerbirliği football team (GB) and 24 Gençlerbirliği Oftaş Football Team (GBO) players are elaborated for this study. It is aimed to identify football players' physical profile and somatotypical values in correlation with the positions they play. Anthropometric standardization reference manual (ASRM) and international biological program (IBP) references were pursued for antropometrical measurements. Triceps, subscapular, supraspinale measurements and the thickness of calf and skin, humerus bicondylar, femur bicondylar, bicepsgirth, weight, and height measurements were used in somatotypical calculations. The somatotypical calculations and analyses were completed using Somatotype 1.1 programme, and statistic program for social sciences (SPSS) is used for statistical evaluation and ANOVA analyses. Consequently, no significant differences were found among the team players.

Key words: Turkey, football, soccer, antropometric, somatotype, high performance.

INTRODUCTION

Football is the most common and popular sport across the world. It is actively played and watched by great number of people with close interest in all countries around the world (Herbin and Rethacker, 1984).

Playing football requires great extent of antropometric and physiological properties besides skill, experience and intelligence (Wade, 1979; Sheldon et al., 1954). Amount of body fat is used as one of decisive factors of being healthy and it is also used as one of the most important criterion of optimal efficiency in high performance sports today (Zorba, 2005). Football is played for at least 90 min in official competitions. There are technical, tactical, physiological and psychological factors affecting the accomplishment. Football players' body composition can increase their performance in games and affect their success (Sheldon et al., 1954). High amount of fat in tissues and low amount of muscle quantity negatively affects athlete's performance in almost all sports. The amount of body fat is related with the athlete's strength, speed and internal body heat affecting his achievement in sports (Zorba, 2005). Somatotypical measurements are applied based on external features of body structure and it is accepted as one of the indicator of physical body structure (Zorba, 2005). The most common method of determining somatotypical quantity is Heath-Carter Method (Koca et al., 2003). This method involves a three phase classification: endomorphy, mesomorphy, ectomorphy (Zorba, 2005; Carter and Heath, 1990). There are stationary positions in the football game plan such as defence, middle and forward. Every player takes part in the position that they are assigned and they improve their skills with practices fitting that responsibility. These individual players in their positions have to function as a team to be able to be most efficient. Another factor affecting their achievement is their somatotype structure (Dogan, 2005). Recent studies suggest that antropometric properties have an influence on football players' performance (Gurses and Olgun, 1984;

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Table 1. The statistical data of GBO football players.

Variable	Median	Mean	S.D.	Range
Endomorphy	2.20	2.28	0.41	1.5 - 3.3
Mesomorphy	4.20	4.40	1.05	2.3 - 6.9
Ectomorphy	2.35	2.31	0.64	1.2 - 3.5
Age	23.36	23.29	2.12	19.92 - 28.3
Height	180.05	179.28	5.71	167.7 - 190.4
Mass	76.70	76.86	5.39	64.1 - 88.7
Triceps SF	6.95	7.01	1.63	4.05 - 10.55
Subscapular SF	9.60	9.61	1.32	6.9 - 12.3
Supraspinale SF	5.82	6.42	1.81	4.8 - 11.6
Calf SF	4.63	4.93	1.25	3.65 - 9.75
Arm girth	29.80	30.18	2.60	26.5 - 34.9
Calf girth	40.10	40.81	3.56	35.1 - 47.5
Humerus B.	6.85	6.78	0.48	6 - 7.6
Femur B.	9.20	9.22	0.60	7.6 - 10.1

Gunay et al., 1994; Ziyagil et al., 1997). The body composition related to performance is usually evaluated on the basis of somatotype and body fat determination in performance- related issues (Turnagol et al., 1992). It is suggested that appropriate body structure plays a key role to reach high performance in sports.

MATERIALS AND METHODS

The purpose of this study is determining the somatotypical structures of professional football players playing in different positions. Total of 48 male players were selected from Genclerbirligi football team (GB) and Genclerbirligi Oftas football team (GBO) playing in first level of professional Turkish football league.

According to the techniques suggested by anthropometric standardization manual (ASRM) and international biological program (IBP), triceps, subscapular, supraspinale, and calf skin convolution thickness measurements were taken with skinfold Kaliper (Holtain country) from each player twice in order to minimise the possible errors. After the measurements the averages of measurements were calculated. Humerus bicondylar and femur bicondylar were measured with a small-size compasses, biceps and calf were measured with a tape measure, weight with digital scale (100 g sensitive), and height was measured using an anthropometer. The somatotypical calculations and analyses were completed using somatotype 1.1 programme, and statistic program for social sciences (SPSS) is used for statistical evaluation and ANOVA analyses.

Heath and Carter's Protocol (1990) is used to calculate somatotypes of players.

Endomorphy

- 0.7182 + 0.1451(x) - 0.00068 (x^2) + 0.0000014 (x^3).
X = triceps dkk (mm) + subscapular dkk (mm) + supraspinale dkk (mm).
Height correction formula: x*170, 18/boy (cm).

Mesomorphy

0.858* humerus bicondylar (mm) + 0,601*. Femur bicondylar (mm) + 0.188* corrected upper arm girth (cm) + 0.161 *corrected calf girth (cm) - (height* 0.131) + 4.50.

Ectomorphy

HWR*0.732 - 28.58.
HWR = boy (cm)/weight $^{1/3}$(kg)
HWR < 40.75 but if HWR > 38.25; then ectomorphy = HWR*0.463 - 17. 63.
If HWR < 38.25; ectomorphy = HWR*01.

RESULTS

This research aims to compare the somatotypes of the professional football players in terms of their position on the field. After the measurements, following findings were obtained. The average age of the Gençlerbirliği footballers was 25.12 and 23.29 for Gençlerbirliği Oftaş. Gençlerbirliği football players' height was 179.08 cm and their weight was 76.6 kg and Gençlerbirliği Oftaş football players' height was 179.28 cm and their weight was 76.86 kg on average (Tables 1 and 2). In the same tables, it can be seen that somatotypical values of both teams (endomorphy, mesomorphy, ectomorphy) are very similar. Evaluation of GBO football players showed that their average somatotype measurement was balanced mesomorphic (Table 1). When we correlate the results to the positions that they play, it was found that 9 of the players were completely mesomorphic, 7 were mesomorphic with slightly endomorphic, 5 were mesomorphic with slightly ectomorphic characteristics (Figure 1). The evaluations of GB football players showed that their average somatotype was balanced mesomorphic. When we correlate the results to the positions that they play, 6 of the players were mesomorphic, 6 were mesomorphic with slightly endomorphic, and 6 were mesomorphic with slightly

Table 2. Statistical data of GB football players

Variable	Median	Mean	Sd	Range
Endomorphy	2.35	2.34	0.44	1.6 - 3.3
Mesomorphy	4.30	4.35	0.93	2.4 - 6.2
Ectomorphy	2.35	2.30	0.61	1.4 - 3.8
Age	25.06	25.12	3.60	18.55 - 32.03
Height	179.05	179.08	5.73	169.9 - 194.0
Mass	76.75	76.60	6.56	64.9 - 92.6
Triceps SF	7.35	7.15	1.70	4.7 - 9.7
Subscapular SF	9.20	9.57	1.69	7.3 - 15.65
Supraspinale SF	6.30	6.86	1.53	4.4 - 9.9
Calf SF	5.28	5.32	1.22	3.75 - 7.9
Arm Girth	29.10	29.05	2.00	25 - 33
Calf Girth	37.80	37.99	2.16	33.1 - 42.2
Humerus B.	7.10	7.01	0.43	6.2 - 8
Femur B.	9.85	9.87	0.42	9.2 - 10.8

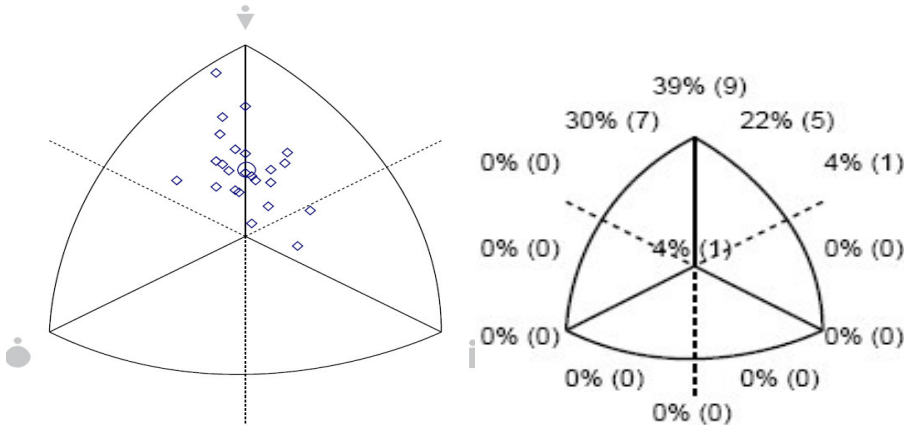

Figure 1. Distribution of GBO players' somatotypical values based on positions.

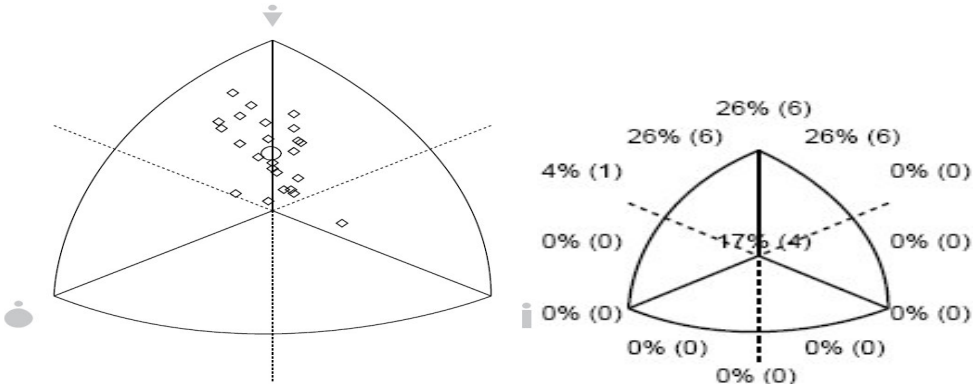

Figure 2. Distribution of GB players' somatotypical values based on positions.

ectomorphic characteristics (Figure 2). When we examine the goal keeper's data from both teams, we have found that GBO goal keeper was ectomorphic mesomorph whereas GB goal keeper was mesomorph with slightly endomorphic characteristics (Figure 3). Application of ANOVA test showed that there were no significant

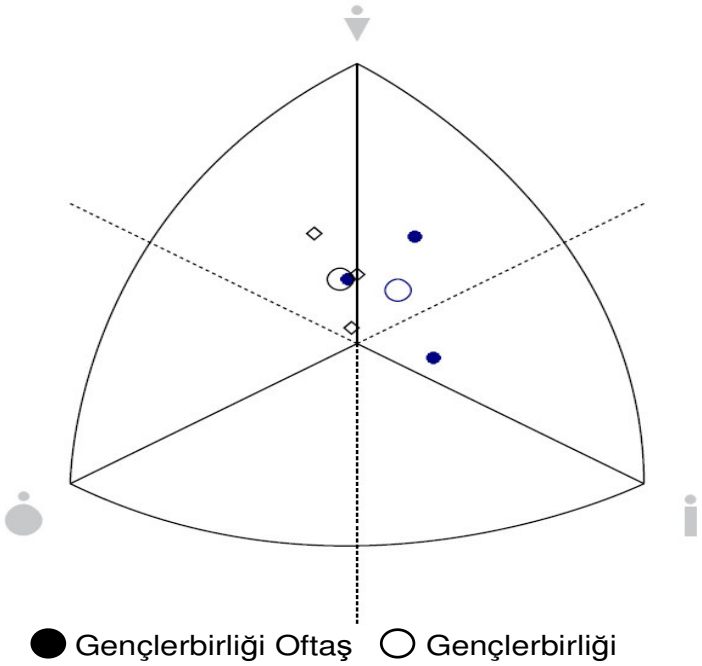

Figure 3. Distribution of the GB and GBO goalkeepers' somatotype.

Table 3. The Somatotype variance analysis concerning Gençlerbirliği Oftaş and Gençlerbirliği goalkeepers.

Group	Count	Mean	S.D.
GBO	3.00	2.20 - 3.77 - 3.07	0.46 - 1.37 - 0.49
GB	3.00	2.67 - 3.90 - 2.33	0.21 - 0.66 - 0.57
ANOVA	F = 0.76	P = 0.436	

Table 4. The somatotype variance analysis of GBO and GB defenders.

Group	Count	Mean	S.D.
GB	7.00	2.26 - 4.26 - 2.56	0.32 - 0.77 - 0.36
GBO	6.00	2.20 - 4.42 - 2.37	0.42 - 0.76 - 0.76
ANOVA	F = 0.2	P = 0.334	

Table 5. The Somatotype Variance Analysis Concerning Gençlerbirliği Oftaş and Gençlerbirliği Mid-fielders

Group	Count	Mean	S.D.
GB	10.00	2.34 - 4.64 - 2.20	0.42 - 1.17 - 0.83
GBO	11.00	2.35 - 4.33 - 2.01	0.45 - 1.12 - 0.52
ANOVA	F= 0.35	P = 0.432	

differences between the goal keepers' somatotype structures (Table 3). The defenders of both GBO and GB were balanced mesomorph; yet the defenders of Gençlerbirliği club displayed slightly ectomorphic characteristics. The ANOVA test showed no significant differences (Table 4). The somatotypes of the GBO mid-fielders were balanced mesomorph with slightly endomorphic characteristics. The ANOVA test showed no significant difference between the mid-fielders of both teams (Table 5). As can be observed in (Figure 4-6), the somatotypes of Gençlerbirliği Oftaş club and Gençlerbirliği club forwarders were balanced mesomorph

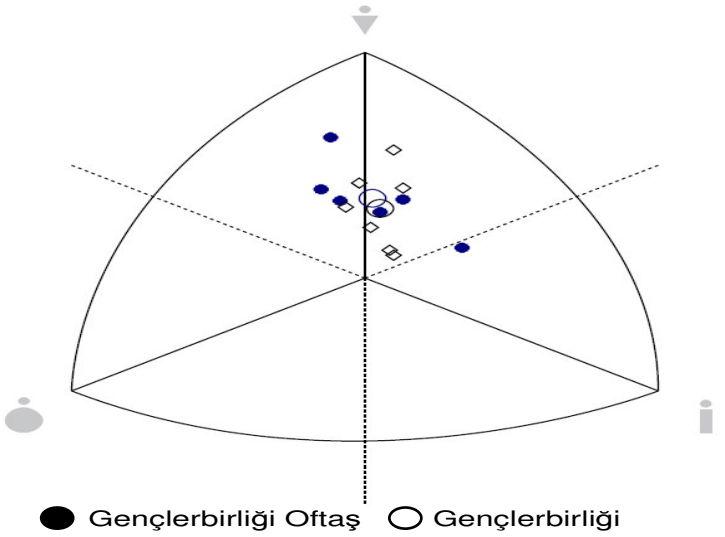

Figure 4. The distribution of the GBO and GB defenders' somatotype.

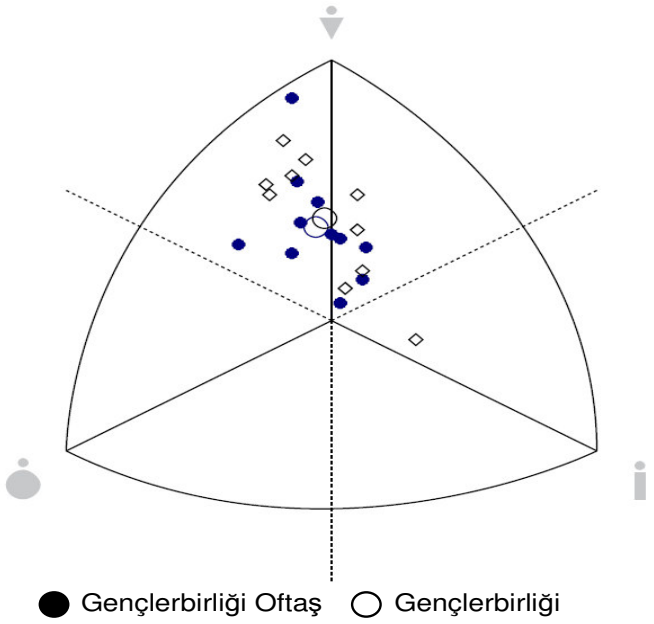

Figure 5. The distribution of the Gençlerbirliği Oftaş Club and gençlerbirliği club mid-fielders on somatotype graph.

in general sense. The ANOVA test done to establish the significance of the differences showed that there were no significant differences (Table 6).

DISCUSSION

In this research, the somatotypes of the players of the two teams (Gençlerbirliği Oftaş club and Gençlerbirliği) playing in Turkcell super league were compared on the basis of their playing positions, and the results were evaluated with the relevant litearature.

Akkurt found the average age as 23.6, the average height as 178.0 cm, and average weight as 73 kg for the footballers playing in the first football league (Akkurt and Gür, 1994). In Jankovic and his friends findings, the age of the 47 footballers playing in the second Yugoslavian League was 21.6, height was 176.5 cm, and weight was 76.01 kg on average (Jankovic et al., 1991).

Heller and his friends found the average age of the 1

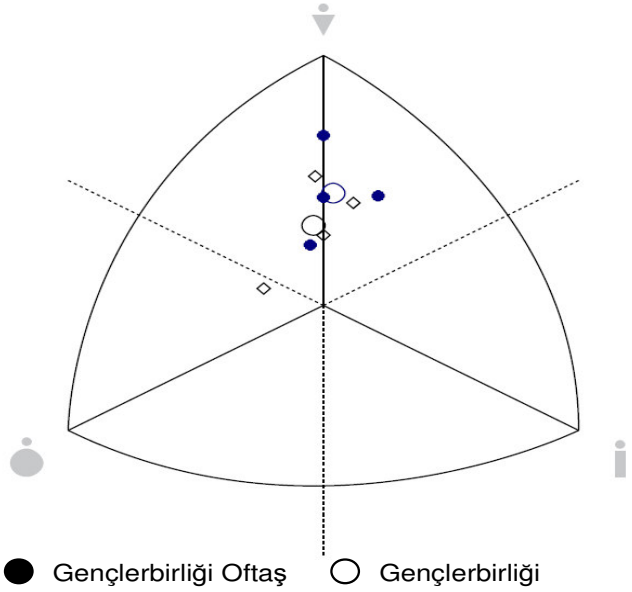

Figure 6. The Distribution of the Gençlerbirliği Oftaş club and Gençlerbirliği club forwarders on somatotype graph.

Table 6. The Somatotype Variance Analysis Concerning Gençlerbirliği Oftaş and Gençlerbirliği Mid-fielders

Group	Count	Mean	S.D.
GBO	4.00	2.23 - 5.05 - 2.48	0.39 - 1.08 - 0.36
GB	4.00	2.33 - 4.13 - 2.10	0.94 - 0.66 - 0.28
ANOVA	F = 1.41	P = 0.28	

Table 7. The data of age, height and weight of the footballers taking part in various studies, and a comparison of the data.

Studies	Age	Height (cm)	Weight (kg)
AKKURT (1994)	23.6	178.0	73.0
JANKOVİC (1991)	21.6	176.5	76.01
HELLER (1991)	23.5	183.0	75.6
TİRYAKİ (1994)	23.0	178.0	74.8
GÖKBEL (1990)	24.83	175.0	72.83
GB (2007)	25.12	179.08	76.6
GBO (2007)	23.29	180.28	76.86

2 footballers playing in the second czhech League as 23.5, the average height as 1.83 cm, and weight as 75.6 kg (Heller et al., 1991) (Tables 7-8).

Tiryaki and his colleagues calculated the height of Ankaragücü football players playing in the first Turkish League as 178 ± 3.8 cm and weight as 74.8 ± 6.6 kg on the average (Tiryaki et al., 1994). According to Gökbel, the average age of the footballers playing in the 18th professional second league was 24.83, the average weight was 72.83 kg, and the average height was 175.06 cm (Gokbel, 1990). Reilly et al. (2000) found the average height of the footballers of nine professional teams as 1.77±1.6 m and their average weight as 74.0 ± 1.6 kg.

In our study, Gençlerbirliği players' average age was 25.12, height was 179.08 cm, and weight was 76.6 kg whereas Gençlerbirliği Oftaş players' average age was 23.29 years, height 180.28 cm, and weight 76.86 kg. On comparing the research results with the relevant literature, similar results were found.

Anthropometric studies in soccer players have shown that height and body weight are important factors in the

Table 8. The footballers' somatotype values.

Research	Somatotype values
Turkish sport foundation (1978)	Balanced mesomorph
Gürses et al. (1984)	Balanced mesomorph
Işleğen et al. (1986)	Balanced mesomorph
Kalyon (1980)	Endo-Mesomorphic
Martirasov (1987)	Balanced mesomorph, ecto- mesomorpic
Açikada (1998)	Mesoendomorfic
Ziyagil (1997)	Ectomorfic
Rienzi (2000)	Balanced mesomorph
Vivani (1993)	Endo-mesomorphic
Toriola (1985)	Endo-mesomorphic, ectomorphic
Casajus (2001)	Mesomorhic
GB (2007)	Balanced mesomorph
GBO (2007)	Balanced mesomorph

performance of the athletes (Reilly and Bangsbo, 2000; Reilly, 1996). When all of the GB (Gençlerbirliği) and GBO (Gençlerbirliği Oftaş) footballers were evaluated, their somatoypes were seen to be balanced mesomorph. The average values of the professional footballers were found in mesomorphs in a study performed by Turkish Sport Foundation in 1976 concerning the footballers participating in Montreal Olympics, in another study done in 1979 concerning the player taking part in Mediterranean Games, and in the research done by İşleğen et al concerning the players in the first Turkish professional football league (Gurses and Olgun, 1979; Islegen and Ergen, 1986; Gurse and Olgun, 1986). In the research conducted by Kalyoncu, endo-mesomorphicaverage value was given as the ideal footballer type (Kalyon, 1980).

The research done by Martirasov et al. (1987) on the young team players coming from 10 different countries in the youth football tournament that was held in Moscow and Tashkent found the footballers' somatotype values as balanced mesomorph and average ecto-mesomorrphic.

The somatotype values of the footballers were found as mesoendomorphic by Açikada et al. (1998) in a study which was conducted on the football teams in the second league. And in a somatoypic study performed by Ziyagil et al. (1997) on the footballers of different age groups of Trabzon Spor, the somatotype values were seen to be ectomorphic. The endomorphy and mesomorphy values were low. In their work, Rienzi et al. (Rienzi et al., 2000) found South American football players' somatotype values as balanced mesomorph.

In a study done by Vivani et al. (1993) on the 19 footballers of professional Cuban teams, values were found as 2.1 (endomorphy), 5.2 (mesomorph), and 2.4 (ecdomorph). The same study found 29 Brazilian professional footballers' somatotype values as 2.8 (endomorphy), 4.2 (mesomorphy), and 2.1 (ectomorph). In their work concerning the 15 elite Nigerian footballers conducted by Toriola et al. (2001) values were found as 2.5 (endomorphy), 4.6 (mesomorphy), and 2.8 (ectomorphy). Jacajus found the somatotype values of 15 Spanish professional footballers as mesomorph. In our research, the footballers of the two teams (GBO-GB) displayed a balanced mesomorphic structure. On examining the relevant literature, similarities were found between the values found here and the ones in literature.

Owing to the fact that football is played in a large area and that the duties assigned to the players are different, physical and physiological requirements make it obligatory to make positional evaluations (Maranci and Müniroğlu, 2001). Upon examining the GB and GBO footballers' somatotype values according to their playing positions, it was found that GBO goalkeepers' somatotype values were ectomorphic-mesomorph in general sense, GB goalkeepers' values were balanced mesomorph but also displayed slightly endomorphic characteristics. Yet the ANOVA test, that was done to determine the significance of the differences between the players of both teams, displayed no significant differences. GBO and GB defenders' somatotypes were balanced mesomorph in general sense but GBO mid-fielders displayed ectomorphic characteristics. ANOVA test results showed no significant differences between the players of the two teams. The somatotypes of the GBO and GB forwarders were balanced mesomorph in general sense. On comparing both teams' players, no significant differences were found.

Doğan, in a study on footballers, found ectomorphy value dominant in all the playing positions. Midfielders were found to be endomorphic-ectomorph, and forwarders found to be mesomorphic-ectomorphic in Doğan's study. Amateurish goalkeepers are endomorphic-ectomorph whereas professional goal-keepers are balanced ectomorph. Amateurish defenders are ectomorphic-mesomorph while the professional ones

Table 9. The footballers' somatotype values according to their playing positions.

Research	Goalkeepers	Defenders	Mid-fielders	Forwarders
Ramadan et al. (1987)	Endomorphic mezomorph	Balanced mesomorph	Ectomorphic-mesomorph	Endomorphic mesomorph
Doğan (2005)	**Amateurish:** Endomorphic-ectomorph **Professional:** Balanced ectomorph	**Amateurish:** Ectomorphic mesomorph **Professional:** Mesomorphic ectomorph	Endomorphic-ectomorph	Mesomorphic-ekcomorphic
GB (2007)	Endomorphic mesomorph	Balanced mesomorph	Ectomorph	Balanced mesomorph
GBO (2007)	Balanced mesomorph	Balanced mesomorph	Ectomorph	Balanced mesomorph

are mesomorphic- ectomorph (Dogan, 2005). (Table 9).

Ramadan et al. (1987) in their research on Kuwait national team, who joined the 1982 World Cup, concluded that the defenders' average somatotype values were balanced mesomorph, the midfielders' values were ecto-mesomorph, the forwarders' and goalkeepers values were endomorphic- mesomorph; and all players' average somatotype values were mesomorph.

The research on 30 professional footballers that was conducted by Casajus (2001) found that seasonal changes did not affect somatotype and that footballers displayed a mesomorphic structure.

Literature review showed that there were some differences as well as similarities between relevant literature and this research. Due to such factors as countries, races, played leagues, and individual peculiarities, there can be differences.

Stepnicka (1972; 1976), having researched on the relationships between somatotype and sports performance, showed that 25 - 60% of the changes of physical abilities in successful athletes could be accounted for with somatotype (Zorba, 2005).

In the research conducted by Gürses and Olgun (1979) concerning Turkish athletes, mesomorhy scores representing muscle power was significantly higher in football, wrestling, judo and gymnastics than in basketball, volleyball and handball (Gurses and Olgun, 1979).

The research on two hundred and thirty-four male athletes (aged 24.7 ± 4.4 years) and 244 female athletes (aged 23.1 ± 4.4 years) from the Italian A1 and A2 volleyball leagues underwent anthropometric measure-ments during the 1992 - 1993 and 1993 - 1994 seasons contacted by Gualdi-Russo et al. (2001). The physique of athletes in the A1 league is characterized by higher ectomorphy and lower endomorphy and mesomorphy. There is also a slight tendency of male players to a greater homogeneity in somatotype within the group at the maximum level of performance.

The aim of Viviani's observational study was to determine the somatotype of average basketball players (BP) and to compare them with the values found in relevant literature. Since his group was on average, made up of mesomorphic-ectomorphs (2.2 - 3.2 - 3.8), it appeared to be quite well suited to the sporting activity undertaken (Viviani, 1994).

Casagrende, in a study on rugby players, found on average the RP group resulted as being endomorphic mesomorphs (3.1 ± 1.1 - 5.6 ± 1.3 - 1.4 ± 1.1), a result that is congruent with international data. They differed significantly from the balanced mesomorph CG (2.3 ± 1.0 - 4.5 ± 1.2 - 2.5 ± 1.4) for all the measurements taken, apart from bi-epycondylar width (Casagrande and Viviani, 1993).

In other research, 50 sedentary males and 128 sports persons (volleyball = 82, soccer = 46) of 20 - 24 years were selected from West Bengal, India, to evaluate and compare their anthropometry and body composition. Mesomorphy were significantly ($p < 0.001$) higher among the sports persons. Soccer and volleyball players were found to be ectomorphic mesomorph, whereas sedentary subjects were endomorphic mesomorph (Bandyopadhyay, 2007).

In this study a morphologic and an anthropometric characterization of Dutch korfball players (N = 36) was performed. Male korfball players presented a somatotype (1.9 - 4.4 - 3.4) similar to endurance athletes and an endomorphic value lower than or similar to the other athletes (Gurses and Olgun, 1984). The only apparent similarity between female korfball somatotype (3.2 - 4.0 – 2.8) and other athletes' somatotypes is the dominance of mesomorphy (Godinho et al., 1996).

The findings indicated that none of the athletes (3.5) were significantly more endomorphic (P less than 0.05) than the soccer players (2.5) and sprinters (2.4). The sprinters (3.6) and basketball players (3.7) had markedly higher ectomorphic ratings (P less than 0.05) as compared with the hockey players (2.0). The mesomorphic component did not differentiate the groups. The differences observed among the groups which could be attributed to genetic and environmental influences reflect the variability in the morphological characteristics of athletes and nonathletes (Toriola et al., 1985).

In this research it was found out that the players of both teams had balanced mesomorph. This result shows that there are no very special structures between playing positions in football. The trend in football today is to improve the responsibilities of players playing in every position. To put it differently, neither a defender can defend for long on his own, nor can a forwarder be in attack for a long time by himself (Kahraman, 1995). Each player takes on differing and very important roles in the flow of the game, which makes it necessary for each player to reach a certain level.

For both young and elite level footballers, the roles that they take on according to their positions are related with their physical performance. Somatotype is method which is employed in the evaluation of physical profile. However, anthropometric and physiological factors must be evaluated with genetics factors and with the influence of training. One single method is not sufficient to determine the physical profile (Reilly et al., 2000).

Ability selection and orientation is necessary for sport conception directed to high performance. Therefore, objective criteria should be used in ability selection, and orientation should be done by fully evaluating the anthropometric and physiological tests (Muratli, 2003; Reilly et al., 2000). Correct orientation by observing the individual differences and improvement should be one of the major objectives (Koca et al., 2003).

In this research, in consequence of the somatotypical evaluations, it was found that there were no special structures between playing positions in football. It is believed that, beside somatotypical research, some other physiological performance tests should also be carried out to facilitate the entrance of new abilities into football, one of the most popular branches of sport in the world.

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