



## Somatotype of Croatian Amateur Soccer Players – Positional Differences

### KEYWORDS

soccer, senior players, Heath-Carter somatotype, ANOVA

**Dr. sc. Marko Erceg**

Assistant professor, Faculty of Kinesiology, University of Split, Teslina 6, Croatia

**Dr. Sc. Zoran Grgantov**

Associate professor, Faculty of Kinesiology, University of Split, Teslina 6, Croatia

**Mirjana Milic, prof**

Assistant, Faculty of Kinesiology, University of Split, Teslina 6, Croatia

### ABSTRACT

With the aim of analysing positional differences in somatotype characteristics, the Heath-Carter method was used to calculate the somatotype of Croatian amateur senior soccer players (N=40). The goalkeepers (N=5) averagely fit the balanced endomorph category, the defenders (N=13) and the forwards (N=9) fit the endo-mesomorph category, whereas the midfielders (N=13) fit the central somatotype category. The subjects were classified into 11 out of the 13 possible somatotype categories. Dominance of the mesomorph somatotype component was noticed in 37% of the subjects, whereas the endomorph component dominated in 27% of the soccer players. By analysis of variance it was determined that the goalkeepers were taller than the midfielders and the forwards, the midfielders were significantly lighter than the defenders and the goalkeepers, and the defenders were more mesomorphic than the midfielders and the goalkeepers. In comparison to elite soccer players, amateur soccer players are less mesomorphic and more endomorphic.

### INTRODUCTION

Success in soccer depends, among other things, on anthropometric characteristics, i.e. body build and composition (Reilly et al., 2000; Rebelo et al., 2013). Body mass index is often used as a rough estimate of body composition, whereas calculation of somatotype components according to Heath-Carter (Carter and Heath, 1990) is one of the most frequently used methods for estimating body build in sport. In soccer, players are specialized for their specific position. Therefore, investigation of body build and composition must also take positional differences into consideration. Studies on junior and senior elite soccer players have found significant differences in body build and composition between individual player positions (Gill et al., 2007; Salgado et al., 2009; Hazir, 2011). It has also been established that more successful soccer players differ from less successful ones (Lago-Penas et al., 2011; Hazir, 2011).

Most of the studies mentioned have been conducted on a sample of quality junior and senior soccer players. Soccer players who participate in competitions of a lower rank have been investigated less (Rogan et al., 2011). Researchers in Croatia have also paid more attention to the analysis of body build and composition of first-league players at specific positions (Matković et al., 2003; Sporiš et al., 2009). Useful information about the importance of body build for success at different soccer positions can be obtained by comparing players who play at lower competitive levels to elite soccer players in each age group.

### METHOD

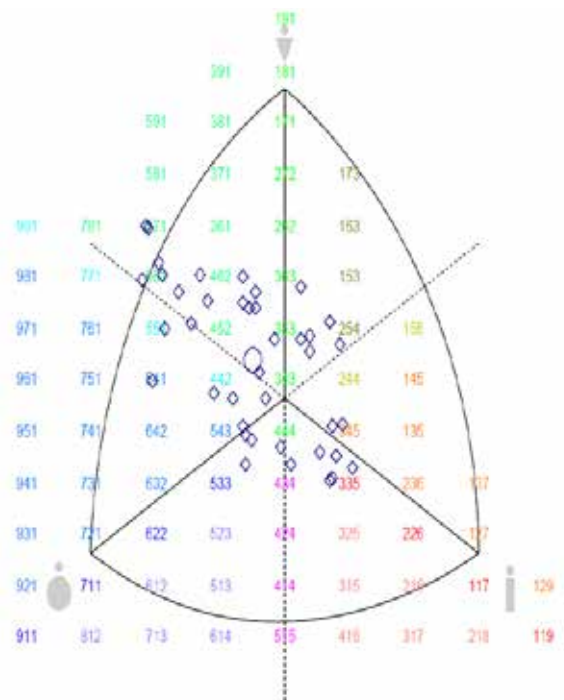
The main aim of this study was to analyse the differences in height, mass and somatotype of Croatian amateur soccer players according to player position.

In this cross-sectional study, 40 soccer players, members of 2 clubs competing in the fourth Croatian senior league, were measured using ten independent anthropometric measures. The variables were: Body height (cm) and Body mass (kg); Triceps, Subscapular, Supraspinale and Calf skinfolds (cm); Flexed arm and Calf girth (cm); Humerus and Femur breadth (cm). Player position (goalkeeper, defender, midfielder and forward) was the dependent variable in this study. Based on the anthropometric characteristics, body mass index was calculated as well as three somatotype components by using the Heath-Carter method. Two to three measurements were

taken at each site with the average value used in any further calculation if two measurements were taken, and the median value used if three measurements were taken. Significance of differences in the applied variables between soccer players playing at different positions was determined by univariate analysis of variance. Somatotype Ver. 1.2.5. and Statistica Ver 10.00 software packages were used to analyse the data.

### RESULTS AND DISCUSSION

Individual somatoplots of Croatian amateur soccer players as well as the mean somatoplot for all players are presented in Figure 1. Mean values and deviations from mean values in separate somatotype components are given below Figure 1.



**Figure 1** Somatoplot of soccer players (N=40): 3.34 – 3.60 – 2.38 ± 1.31 – 1.58 – 0.80

Croatian amateur soccer players, on average, fit the endomorph-mesomorph somatotype category. The most predominant somatotype of professional soccer players is within the mesomorph sector on the somatochart, with means close to 2.5 – 5 – 2.5 (Martirosov et al., 1987; Rienzi et al., 2000; Hazir, 2010; Orhan et al., 2013). Somewhat higher values of the endomorph component can be noticed in soccer players of somewhat lower quality (Bandyopadhyay, 2007; Rogan et al., 2011). In comparison to elite soccer players, lower-ranked Croatian soccer players are also more endomorphic and less mesomorphic. It is very likely that such body build diminishes the quality of their performance in competitions.

**Table 1 Frequency and percentage of each somatotype category among soccer players (N=40)**

Somatotype categories	N	%
Endomorph-ectomorph	1	2.50
Balanced endomorph	3	7.50
Mesomorphic endomorph	5	12.50
Balanced ectomorph	6	15.00
Central somatopip	4	10.00
Mesomorph-ectomorph	2	5.00
Balanced mesomorph	3	7.50
Endomorphic mesomorph	10	25.00
Endomorphic ectomorph	1	2.50
Ectomorphic mesomorph	2	5.00
Mesomorph-endomorph	3	7.50

Table legend: N – frequency of subjects, % – relative values

To gain a more detailed insight into individual characteristics of body build of individual soccer players, the number and the percentage of soccer players in each somatotype category are presented in Table 1. Forty soccer players were classified into 11 out of the 13 possible somatotype categories, which indicates the heterogeneity of their body build. The desirable body build which is dominated by the mesomorph somatotype component was observed in 37% of the subjects. However, the endomorph somatotype component was dominant in over one quarter of the soccer players. The aforementioned is probably the consequence of a less rigid selection among amateur soccer players, as opposed to elite players. Different tasks that are performed by players at different positions during play can also affect the specificities in body build of individual soccer players. Due to this, positional differences in height, mass, body mass index and separate somatotype components among Croatian amateur soccer players are analysed in Table 2.

**Table 2 Descriptive indicators of somatotype components and analysis of differences (ANOVA with Fischer LSD post-hoc test) between soccer players at different player positions**

Variables	Goalkeepers (N=5)		Defenders (N=13)		Midfielders (N=13)		Forwards (N=9)	
	M	SD	M	SD	M	SD	M	SD
Height	188.20¥	2.86	185.08	7.57	180.92	4.87	180.56	5.55
Mass	86.80	7.85	84.69	8.86	77.15 <sup>1</sup>	5.00	80.67	10.64
BMI	24.48	1.63	24.71	1.96	23.57	1.23	24.67	2.28
Endomorph	3.60	1.26	3.71	1.47	2.82	0.93	3.42	1.53

Mesomorph	2.84	1.20	4.30†	1.71	2.91	1.16	3.96	1.71
Ectomorph	2.56	0.61	2.33	0.95	2.61	0.75	2.10	0.84

Soccer players at different player positions in this study have the same body height as Belgian elite soccer players (Boone et al., 2012) and German amateurs (Rogan et al., 2011), but are somewhat heavier. They are also averagely taller and heavier in comparison to elite Turkish soccer players (Hazir, 2010; Orhan et al., 2013). In comparison to Croatian elite soccer players (Sporiš et al., 2009), the midfielders from the present study are averagely 11 cm taller, while the defenders are 8 cm taller. The midfielders are also 18 kg heavier, while the defenders are 11 kg heavier.

In terms of somatotype, the goalkeepers fit the balanced endomorph category, the defenders and the forwards fit the endo-mesomorph category, and the midfielders fit the central somatotype category. In comparison to elite players at the same positions, the goalkeepers and the forwards in this study are more endomorphic, whereas the mesomorphic component of the goalkeepers and the midfielders is not sufficiently developed (Ramadan and Byrd, 1987).

By analysis of variance it was determined that the goalkeepers are significantly taller than the midfielders and the forwards, the midfielders are significantly lighter than the defenders and the goalkeepers, and the defenders are more mesomorphic than midfielders and goalkeepers.

**CONCLUSIONS**

Based on the results of this study, the following conclusions can be made about Croatian amateur soccer players:

1. Generally, they fit the endomorph-mesomorph somatotype category and, in comparison to elite soccer players, they are more endomorphic, and less mesomorphic.
2. Their inter-positional differences in body composition are similar to those in elite soccer players (the goalkeepers are the tallest and the heaviest, the midfielders are the shortest and the lightest, whereas the defenders are most mesomorphic.)
3. In comparison to elite players at the same positions, the goalkeepers and forwards in this study are more endomorphic, whereas the mesomorphic component of the goalkeepers and the midfielders is not sufficiently developed.

Table legend: M – mean, SD – standard deviation, ¥ p<0.05 – the goalkeepers are significantly taller than the midfielders and the forwards, <sup>1</sup> – the midfielders are significantly lighter than the defenders and the goalkeepers, † p<0.05 – the defenders are significantly more mesomorphic than the midfielders and the goalkeepers.

## REFERENCE

1. Bandyopadhyay, A. (2007). Anthropometry and body composition in soccer and volleyball players in West Bengal, India. *J Physiol Anthropol* 26 (4): 501-505. | 2. Boone, J., Vaeyens, R., Steyaert, A., Vanden Bossche, L., & Bourgois, J. (2012). Physical fitness of elite Belgian soccer players by player position. *J Strength Cond Res* 26 (8): 2051–2057. | 3. Carter, J.E.L., & Heath, B.H. (1990). *Somatotyping: Development and Applications*. Cambridge University Press: New York. | 4. Gil, S.M., Gil, J., Ruiz, F., Irazusta, A., & Irazusta, J. (2007). Physiological and anthropometric characteristics of young soccer players according to their playing position: relevance for the selection process. *J Strength Cond Res* 21 (2): 438-445. | 5. Hazir, T. (2011). Physical Characteristics and Somatotype of Soccer Players according to Playing Level and Position. *J Human Kinetics* 26 (1): 83–95. | 6. Martirosov, E.G., Skomorokhov, E.V., Farmochi, I., & Varga, S. (1987). Somatotypes of the world's leading young football players. *Arkh Anat Gistol Embriol.* 93 (8): 29-33 | 7. Matkovic, B.R., Misigoj-Durakovic, M., Matkovic, B., Jankovic, S., Ruzic, L., Leko, G., Kondrić, M. (2003). Morphological differences of elite Croatian soccer players according to the team position. *Coll Antropol* 27 Suppl 1: 167-174. | 8. Ramadan, J., & Byrd, R. (1987). Physical characteristics of elite soccer players. *J Sports Med Phys Fitness* 27 (4): 424-428. | 9. Rebelo, A., Brito, J., Maia, J., Coelho-e-Silva, M.J., Figueiredo, A.J., Bangsbo, J., Malina, R.M., & Seabra A. (2013). Anthropometric characteristics, physical fitness and technical performance of under-19 soccer players by competitive level and field position. *Int J Sports Med.* 34 (4): 312-317. | 10. Reilly, T., Bangsbo, J., & Franks, A. (2000). Anthropometric and physiological predispositions for elite soccer. *J Sports Sci* 18: 669-683 | 11. Rienzi, E., Drust, B., Reilly, T., Carter, J. E., & Martin, A. (2000). Investigation of anthropometric and work-rate profiles of elite South American international soccer players. *J Sports Med Phys Fitness* 40: 162-169. | 12. Rogan, S., Hilfiker, R., Claiys, P., Clijsen, R., & Taeytnansa, J. (2011). Position-specific and Team-ranking-related Morphological characteristics in German Amateur Soccer Players—A Descriptive Study— Anthropometry in Amateur Soccer players. *Int J Appl Sports Sci* 23: 168-182. | 13. Orham, Ö., Sagir, M., & Zorba, E. (2013). Comparison of Somatotype Values of Football Players in Two Professional League Football Teams According to the Positions. *Coll. Antropol.* 37 (2): 401–405. | 14. Salgado, B., Vidal, S., Silva, S., Miranda, R., Deus, R., Garganta, R., Maia, J., Rebelo, A., & Seabra, A. (2009). Somatotype and body composition in Portuguese youth soccer players. *1st World Conference on Science and Soccer*; 141-146.