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Body Composition of Elite Soccer Players from Montenegro and Kosovo

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Abstract

This research aimed to determine the differences among the top soccer players of a club in Montenegro, FC Buducnost, and the top soccer players of a club in Kosovo, FC Trepca '89, the champions in their countries, in the anthropometric characteristics and body composition. A sample of 45 subjects was divided into two sub-samples. The first sub-sample of the subjects consisted of 30 soccer players of FC Buducnost of the average age 22.73±4.33, the winners of the Montenegro Championship in the 2016/17 season, while the other sub-sample consisted of 15 soccer players of FC Trepca '89 of the average age 21.80±3.57, the winners of the Kosovo Championship in the 2016/17 season. Soccer players were tested immediately after the end of the 2016/17 competition season. Anthropometric characteristics were evaluated using a battery of seven variables: body height, body weight, waist circumference, triceps skinfold, biceps skinfold, skinfold of the back, abdominal skinfold. The body composition was evaluated using a battery of three variables: body mass index, fat percentage and muscle mass. The standard central and dispersion parameters of all variables were calculated. The significance of the differences between the players of the top two soccer clubs in the anthropometric characteristics and variables for assessing body composition was determined using a t-test for independent samples. It was found that the soccer players of the two mentioned clubs do not have statistically significant differences according to the variables.

Key words: *football, morphological characteristics, football players, fat percentage, muscle mass*

Introduction

A soccer game is said to be the most important "secondary thing" in the world; it gathers huge masses at stadiums and in front of TVs (Gardasevic, Bjelica, & Vasiljevic, 2019). It is a highly dynamic and fast team game that, with its richness of movement, falls under the category of polystructural sports games (Gardasevic, Bjelica, & Corluka, 2018; Bjelica, Popovic, Gardasevic, & Krivokapic, 2016). Soccer is a sport that is characterized by numerous and various complex and dynamic kinesiological activities, which are then characterized by either cyclical (Sermaxhaj, Popovic, Bjelica, Gardasevic, & Arifi, 2017; Gusic, Popovic, Molnar, Masanovic, & Radakovic, 2017; Gardasevic, Bjelica, & Vasiljevic, 2017) or acyclical movement (Masanovic, 2019; Masanovic, T. Bavcevic, & I. Bavcevic, 2019; Gardasevic, Bjelica i Vasiljevic, 2016; Gardasevic, Bjelica, Milasinovic i Vasiljevic, 2016; Gardasevic, Popovic, & Bjelica, 2016). In sport, top scores can be achieved only under conditions of well-programmed training process (Gardasevic, Akpinar, Popovic, & Bjelica, 2019; Gardasevic & Bjelica, 2019; Bjelica, Popovic, Tanase, & Gardasevic, 2017; Bojanic, Petkovic, Gardasevic, Muratovic, & Vasiljevic, 2015). High quality management of the training process depends on knowing the structure of specific anthropological capabilities and players' characteristics, as well as their development (Arifi, Bjelica, & Masanovic, 2019; Masanovic, 2018; Bjelica & Gardasevic, 2018; Bjelica, Popovic, & Gardasevic, 2016a; Bjelica, Popovic, & Gardasevic, 2016b). Various research studies have been conducted to

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establish certain principles and norms for the transformational processes of the anthropological characteristics important for soccer; with anthropometric characteristics and body composition among them as expected. Findings regarding anthropometric characteristics and body composition are of crucial importance for complex sports such as soccer. Body composition also depends on proper nutrition (Vasiljevic, Bjelica, & Gardasevic, 2018; Corluka, Bjelica, & Gardasevic, 2018; Vasiljevic, Bjelica, Popovic, & Gardasevic, 2015; Gardasevic, Vasiljevic, Bjelica, & Popovic, 2015). The anthropometric space is defined by the longitudinal dimension of the skeleton, the transversal dimensionality of the skeleton, and the mass and volume of the body. The purpose of knowing anthropometric characteristics is to improve skills in many sports. The anthropometric status of top-level athletes is relatively homogeneous, depending on the sport, and it can be defined as a model of athletic achievement. Research on anthropometric characteristics and body composition among athletes of different sports indicates that the athletes have specific characteristics. Muscle mass improves performance in activities that require muscular strength and endurance, but also in those that require significant aerobic ability (Green, 1992).

Today, soccer is undoubtedly the most popular sport in the world (Gardasevic, Georgiev & Bjelica, 2012), and the same applies to Montenegro and Kosovo (Bjelica, Gardasevic, Vasiljevic, Arifi, & Sermaxhaj, 2019). In the 2016/17 competitive season, the club at the top of the First Montenegrin Telecom League, FC Buducnost, and at the top of the Super League of Kosovo, FC Trepca '89, both achieved a staggering success. Based on the two championship trophies that they won at the end of the competition season, both clubs have acquired the right to play on the international soccer scene within the framework of UEFA's Champions League qualification. It became interesting for researchers to determine the models of anthropometric characteristics and body composition of the players who play for these clubs to assess the differences among them.

This research aimed to determine the anthropometric characteristics and body composition of elite soccer players, players of FC Buducnost, who compete in the First Montenegrin Telecom League and soccer players of FC Trepca '89, who compete in the Super League of Kosovo. Afterwhich, a comparison of the variables between these soccer players and a determination of the possible differences between them were made.

Method

The data obtained in the study of anthropometric characteristics and body composition are checked and prepared for processing according to the set goal. Databases are arranged according to the features and prepared for planned statistical processing. The results obtained by statistical analysis are presented in the tables and analysed according to the corresponding logical units. In general, the results of the research, through gradualness in the explanation of individual relationships, allow determining differences in the observed anthropometric measures and body composition in accordance with the aim of the databases; specifically, they contribute to a more precise application of the obtained results in practice.

In terms of time constraint, the research is of transversal character and consists of a one-off measurement of the corresponding anthropometric characteristics and body composition of top-level senior soccer players.

Sample of subjects

A sample of the subjects consists of a total of 45 top-level senior soccer players who performed in the First Montenegrin Telecom League and the Super League of Kosovo, divided into two sub-samples. The first one consists of 30 soccer players of FC Buducnost, the average age of 22.73±4.33, the champions of the Montenegro Championship in the season 2016/17, and the second one that consists of 15 soccer players of FC Trepca '89 of the average age 21.80±3.57, the champions of the Kosovo Championship in the 2016/17 season. The soccer players were tested immediately after the 2016/17 season ended.

Sample of measures

Anthropometric research has been carried out concerning the basic rules and principles related to the selection of measuring instruments and measurement techniques standardized in accordance with the International Biological Program guidelines. For the purpose of this study, seven anthropometric measures have been taken: body height, body weight, waist circumference, triceps skinfold, biceps skinfold, skinfold of the back and abdominal skinfold; accompanied by three body composition assessment variables: body mass index, fat percentage, and muscle mass. An anthropometer, calliper, and measuring tape were used for anthropometric measurements. To evaluate the body composition, a Tanita body fat scale (model BC-418MA) was used. The principle of this scale is based on the indirect measurement of the body composition; a safe electrical signal is transmitted through the body via electrodes located in the standalone unit. The Tanita Scale, with its athletics mode, enables athletes to closely monitor their body weight, health condition, and form with all relevant parameters.

Method of data processing

The data obtained through the research are processed by descriptive and comparative statistical procedures. For each variable, central and dispersion parameters, as well as asymmetry and flattening measures are processed. Differences in anthropometric characteristics and the composition of the body of the soccer players of these two clubs were determined by using a discriminatory parametric procedure with a t-test for small independent samples, with statistical significance of $p < 0.05$.

Results

In Tables 1 and 2, basic descriptive statistical parameters of anthropometric variables and body composition of the soccer players of the two clubs, where the values of central measurements and dispersion tendencies are calculated, are shown: Arithmetic mean (Mean), Standard deviation (S.D.), Variance (Variance), Minimal (Min) and Maximal (Max) values, coefficient of Curvature (Skewness) and Elongation (Kurtosis). First, the central and dispersion parameters of the variables were analysed to evaluate the anthropometric characteristics and body composition of the soccer players of FC Buducnost (Table 1).

Table 1. Central and dispersion parameters of variables for assessment of anthropometric characteristics and body composition of soccer players of FC Buducnost (N=30)

Variables	Min	Max	Mean±S.D.	Variance	Skewness	Kurtosis
body height	171.1	196.0	181.96±5.89	34.748	.339	-.260
body weight	64.7	96.9	78.03±8.52	72.627	.730	-.308
waist circumference	74.0	95.0	83.43±5.23	27.357	.454	-.260
triceps skinfold	4.0	13.6	7.79±2.45	6.008	.481	-.274
biceps skinfold	3.2	8.2	5.28±1.29	1.687	.540	-.556
skinfold of the back	3.6	18.6	9.81±2.89	8.395	.827	2.138
abdominal skinfold	6.4	18.2	10.22±2.90	8.431	1.040	.941
body mass index	21.1	27.1	23.49±1.45	2.113	.872	.762
fat percentage	5.2	16.0	9.98±2.76	7.632	.160	-.470
muscle mass	34.7	46.9	39.54±3.69	13.632	.412	-1.133

Based on the central and dispersion parameters, the values of the skewness and the kurtosis, it can be noted that all the variables are placed within the normal distribution boundaries. It can be stated that the soccer players of FC Buducnost are younger on average, and that their body height is similar to the average adult body height in Montenegro (Milasinovic, Gardasevic, & Bjelica, 2017; Gardasevic, Rasidagic, Krivokapic, Corluka, & Bjelica, 2017). Generally, according to all statistical parameters, it can be concluded that there is a normal distribution in all variables among these top soccer players and that the results that prevail are superior to the arithmetic mean, which is not statistically significant because it is to be expected that regarding soccer players of a professional soccer club. Furthermore, there is no overly large a span between the results of analysed variables. Table 2 shows the central and dispersion parameters of the variables analysed to evaluate the anthropometric characteristics and body composition of the soccer players of FC Trepca '89.

Table 2. Central and dispersion parameters of variables for the assessment of anthropometric characteristics and body composition of soccer players of FC Trepca '89 (N=15)

Variables	Min	Max	Mean±S.D.	Variance	Skewness	Kurtosis
body height	174.3	188.0	181.95±4.41	19.424	-.502	-.941
body weight	66.3	86.1	76.61±6.75	45.576	-.066	-1.565
waist circumference	79.0	91.0	84.20±3.76	14.171	.182	-.619
triceps skinfold	3.6	10.5	7.11±1.86	3.454	-.114	.094
biceps skinfold	2.6	8.2	4.57±1.49	2.209	1.015	.957
skinfold of the back	6.8	13.4	9.04±2.07	4.303	1.192	.333
abdominal skinfold	4.6	16.8	8.33±3.84	14.746	1.391	.702
body mass index	20.0	25.5	23.00±1.65	2.729	-.252	-.762
fat percentage	3.8	14.4	9.81±2.96	8.752	-.426	-.121
muscle mass	34.9	43.0	39.02±2.53	6.389	-.276	-1.124

Based on the central and dispersion parameters, the values of skewness and kurtosis of the soccer players of FC Trepca '89, it can be stated that all the variables are within the normal distribution boundaries and that the values are very similar to those of the soccer players of FC Buducnost. It can also be stated that the soccer players of FC Trepca '89 are younger on average and that their body height is similar to the average adult body height in Kosovo (Gardasevic, 2019 ; Masanovic, Bavcevic, & Prskalo, 2019; Gardasevic, 2018; Gardasevic, Masanovic, & Arifi, 2018; Masanovic, Gardasevic, & Arifi, 2018a; Masanovic, Gardasevic, & Arifi, 2018b; Arifi, Sermaxhaj, Gardasevic, Alaj, & Metaj, 2018; Arifi, Gardasevic, & Masanovic, 2018; Arifi et al., 2017). It can also be concluded that almost all variables of quantitative value are better with soccer players of FC Trepca '89. However, a comparative statistical procedure, a t-test (Table 3), will show whether it is statistically significant. By the value of the skewness, it can be observed that in the variables of the biceps skinfold, skinfold of the back, and abdominal skinfold, there was a slight inclination on the side of the lower results, which is good because subcutaneous fat is a disrupting factor for professional athletes. To determine whether there are statistically significant differences in the analysed variables in the top soccer players of these two clubs, the statistical procedure t-test (Table 3) was applied.

Table 3. T-test values between the arithmetic mean of variables for the evaluation of anthropometric characteristics and body composition of soccer players of FC Buducnost (N=30) and FC Trepca '89 (N=15)

Variables	Club	Mean±S.D.	Mean Difference	t-test	Sig.
body height	FC Buducnost	181.96±5.89	0.006	.004	.997
	FC Trepca '89	181.95±4.41			
body weight	FC Buducnost	78.03±8.52	1.4200	.562	.577
	FC Trepca '89	76.61±6.75			

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Variables	Club	Mean±S.D.	Mean Difference	t-test	Sig.
waist circumference	FC Buducnost	83.43±5.23	-0.7666	-.505	.616
	FC Trepca '89	84.20±3.76			
triceps skinfold	FC Buducnost	7.79±2.45	0.67333	.936	.355
	FC Trepca '89	7.11±1.86			
biceps skinfold	FC Buducnost	5.28±1.29	0.7066	1.640	.108
	FC Trepca '89	4.57±1.49			
skinfold of the back	FC Buducnost	9.81±2.89	0.7666	.912	.367
	FC Trepca '89	9.04±2.07			
abdominal skinfold	FC Buducnost	10.22±2.90	1.8933	1.849	.071
	FC Trepca '89	8.33±3.84			
body mass index	FC Buducnost	23.49±1.45	0.4800	.998	.324
	FC Trepca '89	23.00±1.65			
fat percentage	FC Buducnost	9.98±2.76	0.1766	.198	.844
	FC Trepca '89	9.81±2.96			
muscle mass	FC Buducnost	39.54±3.69	0.5233	.493	.625
	FC Trepca '89	39.02±2.53			

Based on the obtained values of t-test results, it was found that the soccer players of the two clubs do not have statistically significant differences according to the variables. In all variables, the differences are negligible and not statistically significant.

Discussion

This study aimed to determine the difference in the anthropometric characteristics and body composition of the top soccer players of the club in Montenegro FC Buducnost and the top soccer players of the club in Kosovo FC Trepca '89, the champions in their respective countries in the 2016/17 season. A sample of 45 respondents was divided into two sub-samples. The first sub-sample consisted of the 30 soccer players of FC Buducnost of 22.73±4.33 age on average, who were older than the 15 soccer players of FC Trepca '89, who comprised the second sub-sample of 21.80±3.57 age on average. The results were obtained by using a battery of seven tests in the area of anthropometric characteristics and three tests in the area of body composition. By examining the basic descriptive statistical parameters, it can be concluded that we have indeed examined professional athletes. It can be observed that the soccer players of both clubs are of the approximately similar mean values of the variables analysed, which is not surprising because these are the top two soccer clubs in Montenegro and Kosovo, states in which there are significant concentrations of good soccer players. The t-test results showed that the soccer players of the two mentioned clubs have no statistically significant differences according to the variables. Very similar anthropometric characteristics of soccer players were obtained, which shows that soccer players have similar the characteristics and body composition throughout the region (Gardasevic, Bjelica, Popovic, Vasiljevic, & Milosevic, 2018; Corluka & Vasiljevic, 2018).

For other variables, some values are better for soccer players of FC Buducnost and some for soccer players of FC Trepca '89, although these are statistically insignificant, which indicates that these soccer players have very similar anthropometric parameters and body composition, which is again, not surprising, considering that these two soccer clubs were the best in their countries in the 2016/17 competitive season. The values obtained in this research can be useful for coaches of these soccer clubs for making a comparison of their soccer players with others and for formulating their work in a way that enables reduction of those parameters that are not good and raises those that are good to a higher level. That will surely make their soccer players even better and more successful. Also, both clubs should turn to other research studies and check the functional-motoric status, psychological preparation as well as tactical training of their soccer players and analyse whether there is room for their improvement. The results obtained in this research can serve as model parameters for the estimated variables for soccer players of all other soccer clubs in Montenegro and Kosovo, because the soccer players that have been analysed were among the best and the most successful soccer players in those two countries at the end of the 2016/17 competitive season.

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