ORIGINAL SCIENTIFIC PAPER

Elite Football Players of Bosnia and Herzegovinian and Kosovian Clubs and Differences in the Morphological Characteristics and Body Composition among them

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Abstract

The goal of this research was to determine the differences in the morphological characteristics and body composition among the top football players of the two clubs, Bosnia and Herzegovinian football club Zrinjski Mostar and Kosovian football club Besa Peje. A sample of 46 subjects was divided into two sub-samples. The first sub-sample of the subjects consisted of 28 players of CSC Zrinjski Mostar of the average age 24.36±4.14, the champion of the Bosnia and Herzegovina in the season 2016/17, while the other sub-sample consisted of 18 players of FC Besa Peje of the average age of 21.83±3.17, the winner of Kosovo Cup in the season 2016/17. Football players were tested immediately after the end of the competition season 2016/17. Morphological characteristics in the body composition were evaluated by a battery of 11 variables: body height, body weight, waist circumference, triceps skinfold, biceps skinfold, back skinfold, abdominal skinfold, body mass index, fat percentage and muscle mass. The differences between the players of the top two football clubs in the morphological characteristics and variables for assessing body composition was determined by a t-test for independent samples. It was found that the football players of CSC Zrinjski and FC Besa Peje have statistically significant differences by the three variables that estimate the body weight, waist circumference and muscle mass.

Keywords: Football Players, Morphological Characteristics, Body Composition

Introduction

A football game is said to be the most important secondary thing in the world, it gathers huge masses at stadiums and in front of TVs (Bjelica, Popovic, Gardasevic, & Krivokapic, 2016; Sermaxhaj, Popovic, Bjelica, Gardasevic, & Arifi, 2017). It is a highly dynamic and fast team game which, with its richness of movement, falls under category of polystructural sports games (Gardasevic, Georgiev, & Bjelica, 2012; Gardasevic, Bjelica, Milasinovic, & Vasiljevic, 2016). Football is a sport that is characterized by numerous and various complex and dynamic kinesiological activities which are then characterized by either cyclical (Gardasevic,

Popovic, & Bjelica, 2016; Gusic, Popovic, Molnar, Masanovic, & Radakovic, 2017) or acyclical movement (Gardasevic, & Vasiljevic, 2017). In football, top score can be achieved only under conditions of well-programmed training process (Gardasevic, Bjelica, & Corluka, 2018). High quality management of the training process depends on the knowing of the structure of certain anthropological capabilities and player's characteristics, as well as their development (Masanovic, 2018; Gardasevic, & Bjelica, 2018; Arifi, Bjelica, & Masanovic, 2019). Various researches are to be done in order to establish certain principles and norms for the transformational processes of the anthropological characteristics

important for football (Gardasevic, Bjelica, & Vasiljevic, 2020; Gardasevic, & Bjelica, 2019) with morphological characteristics and body composition among them as expected. Findings regarding morphological characteristics and body composition are of crucial importance for complex sports games such as football (Masanovic, T. Bavcevic, & I. Bavcevic, 2019). The morphological space is defined by the longitudinal dimension of the skeleton, the transversal dimensionality of the skeleton, the mass and volume of the body (Gardasevic, Bjelica, & Vasiljevic, 2017). The purpose of knowing morphological characteristics is to improve skills in many sports (Bjelica, Masanovic, & Krivokapic, 2020). The morphological 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 morphological characteristics and body composition among athletes of different sports indicates that athletes of different sports have their own specific characteristics. Muscle mass improves performance in activities that require muscular strength and endurance, but also in those that require enviable aerobic ability.

Today, football is certainly the number one sport in the world for its view and popularity (Masanovic, Corluka, & Milosevic, 2018; Masanovic, 2019), and the same applies to Bosnia and Herzegovina and Kosovo, countries of the Southern Balkans, states ex Yugoslavia. The first club that is at the top of the Bosnia and Herzegovina Premier League and is fighting for trophies almost every year is CSC Zrinjski Mostar. The second club is FC Bresa Peje who is successful in the Kosovo Super League. In the 2016/17 competitive season, they both have achieved a staggering success, CSC Zrinjski Mostar was the champion of Bosnia and Herzegovina and FC Besa Peje was the winner of the Kosovo Cup. Based on these two trophies that they have won at the end of the competition season in their countries, both clubs have acquired the right to play on the international football scene within the framework of UEFA's competitions. It became as interesting for researchers to determine the models of anthropometric characteristics and body composition of the players who play for these clubs as to determine the differences among them.

The goal of this research was to analyze the differences in some morphological characteristics and body composition among football players of CSC Zrinjski Mostar and FC Besa Peje.

Method

Sample of subjects

A sample of the subjects consists of a total of 46 elite-level players who performed in the Bosnia and Herzegovina Premier League and Kosovo Super League. The first one consists of 28 players of CSC Zrinjski Mostar, the average age of 24.36±4.14, champion Bosnia and Herzegovina in season 2016/17, and the second one that consists of 18 players FC Besa Peje, the average age of 21.83±3.17, the winner of Kosovo Cup for that season. The football players were tested immediately after the 2016/17 season ended.

Sample of measures

Anthropometric research has been carried in accordance with the International Biological Program. For the purpose of this study, 7 morphological measures have been taken: body height, body weight, waist circumference, triceps skinfold, biceps skinfold, back skinfold, abdominal skinfold, and 3 variables for assessment body composition: body mass index, fat percentage, muscle mass. Anthropometer, caliper, and measuring tape were used for morphological measurements. To evaluate the body composition, Tanita body fat scale - model BC-418MA, was used.

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 morphological characteristics and the composition of the body of the players of these two clubs were determined by using a discriminatory parametric procedure with t-test for small independent samples, with statistical significance of p<0.05.

Results

In tables 1 and 2, basic descriptive statistical parameters of morphological characteristics and body composition of the players of the two clubs, where the values of central measurements and dispersion tendencies are calculated, are shown: Arithmetic mean, Standard deviation, Variance, Minimal i Maximal values, coefficient of Curvature and Elongation. First were analyzed the players of CSC Zrinjski Mostar (Table 1).

Table 1. Central and dispersion parameters of variables for assessment of morphological characteristics and body composition of players of CSC Zrinjski Mostar (N=28)

Variables	Min	Max	Mean	S.D.	Variance	Skewness	Kurtosis
body height	170.8	193.0	182.59	4.82	23.27	-.07	.25
body weight	70.0	90.5	78.85	5.80	33.68	.13	-.92
waist circumference	77.0	98.0	86.39	4.35	18.91	.34	.95
triceps skinfold	4.6	13.0	7.59	2.09	4.39	.88	.63
biceps skinfold	3.3	6.2	4.33	.74	.55	1.07	.59
back skinfold	3.7	13.8	9.23	2.18	4.74	.31	.92
abdominal skinfold	4.0	15.0	8.02	2.77	7.66	.89	.36
body mass index	21.4	26.1	23.63	1.14	1.30	.16	-.47
fat percentage	3.9	14.6	8.79	3.18	10.14	-.05	-.88
muscle mass	35.5	46.9	40.67	2.67	7.12	.05	-.03

Legend: Min - Minimal value; Max - Maximal value; Mean - Arithmetic mean; S.D. - Standard deviation; Skewness - coefficient of Curvature; Kurtosis - Elongation

Table 2. shows the analyzed parameters in football players of FC Besa Peje (N=18)

Based on the central and dispersion parameters, the values of the skewness and the kurtosis of all players in two tables, it can be noted that all the variables are placed within the normal distribution boundaries. It can be seen based on the value of skewness as well, that the one variable biceps skinfold of players of both clubs hase mild asymmetry, and though not statistically significant on behalf of better

results, it is a positive sign, since it is essential for football players to have lower values of subcutaneous fat tissue and bone mass value. By the value of the kurtosis, it can be seen that the two variables of players of FC Besa Peje - biceps skinfold and abdominal skinfold have a mild leptokurticity, not statistically significant, and two variables body weight and waist circumference have sigificant leptokurticity, which indicates that a greater number of results in this variables are arranged around the arithmetic mean. Generally, according to all sta-

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Table 2 Central and dispersion parameters of variables for assessment of morphological characteristics and body composition of players of FC Besa Peje (N=18)

Variables	Min	Max	Mean	S.D.	Variance	Skewness	Kurtosis
body height	169.0	193.0	179.57	6.73	45.36	.40	-.19
body weight	57.9	92.3	73.73	7.11	50.57	.38	2.65
waist circumference	75.0	89.0	80.72	4.35	18.92	.61	-.52
triceps skinfold	4.2	13.0	7.48	2.35	5.52	.72	.14
biceps skinfold	2.8	9.6	4.79	1.88	3.54	1.28	1.04
back skinfold	4.6	10.6	8.36	1.58	2.50	-.97	.64
abdominal skinfold	4.4	18.6	9.35	3.60	12.98	.94	1.14
body mass index	20.0	26.1	22.86	1.54	2.39	.21	.18
fat percentage	4.1	12.6	9.20	2.56	6.55	-.81	-.26
muscle mass	30.4	47.1	37.86	3.33	11.09	.62	3.67

tistical parameters, it can be concluded that here we have some top football players and that the results that prevail are superior to the arithmetic mean, which is not statistically significant for most variables because it is to be expected that regarding players of a professional football club, there is no too large a span between the results of analyzed variables. It can also be stated that the players of FC Besa Peje are significant younger on average, have less body weight than the players of FC Besa Peje, and have a higher fat percentage, though insignificantly. However, a comparative statistical procedure, t-test (Table 3), will show whether it is statistically significant.

Based on the obtained values of t-test results, it can be noted that there are statistically significant differences in three variables at p≤0.01. It is two morphological measures of the body weight and the waist circumference, and it is one of the variables that

Table 3. T-test values between the arithmetic means of variables of players of CSC Zrinjski Mostar (N=28) and FC Besa Peje (N=18)

Variables	Football clubs	Mean±SD	Mean Difference	t-test	Sig.
body height	CSC Zrinjski	182.59±4.82	3.02	1.77	.083
	FC Besa Peje	179.57±6.73			
body weight	CSC Zrinjski	78.85±5.80	5.12	2.674	.010*
	FC Besa Peje	73.73±7.11			
waist circumference	CSC Zrinjski	86.39±4.35	5.67	4.316	.000*
	FC Besa Peje	80.72±4.35			
triceps skinfold	CSC Zrinjski	7.59±2.09	.11	.168	.867
	FC Besa Peje	7.48±2.35			
biceps skinfold	CSC Zrinjski	4.33±.74	-.46	-1.181	.244
	FC Besa Peje	4.79±1.88			
back skinfold	CSC Zrinjski	9.23±2.18	.87	1.465	.150
	FC Besa Peje	8.36±1.58			
abdominal skinfold	CSC Zrinjski	8.02±2.77	-1.33	-1.414	.164
	FC Besa Peje	9.35±3.60			
body mass index	CSC Zrinjski	23.63±1.14	.77	1.932	.060
	FC Besa Peje	22.86±1.54			
fat percentage	CSC Zrinjski	8.79±3.18	-.41	-.463	.645
	FC Besa Peje	9.20±2.56			
muscle mass	CSC Zrinjski	40.67±3.33	2.81	3.164	.003*
	FC Besa Peje	37.86±2.67			

Legend: Mean - Arithmetic mean; S.D. - Standard deviation; Sig – significant difference; * - p≤.001

evaluate the body composition, muscle mass. It can be stated that the football players of CSC Zrinjski Mostar have statistically significantly higher value for all three variables than the players of FC Besa Peje. In all other variables the differences are negligible and not statistically significant.

The significant differences of body weight, waist circumference and muscle mass among the football players of these two clubs are shown in Figure 1.
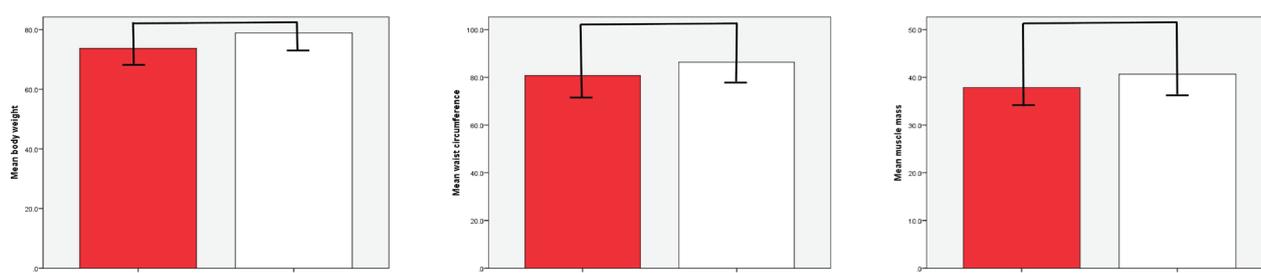

FIGURE 1. The significant differences for three variables among the football players of CSC Zrinjski and FC Besa Peje

Discussion

The goal of this study was to determine the difference in the morphological characteristics and body composition of the top players of the two football clubs, CSC Zrinjski Mostar winner of the Championship Bosnia and Herzegovina and FC Besa Peje, winner of the Kosovo Cup in the 2016/17 season. The results were obtained by using a battery of 11 tests in the area of morphological characteristics and body composition. By looking into the basic descriptive statistical parameters, it can be concluded that we have examined professional sportsmen indeed. It can be noticed that the players of both clubs are of the approximately similar mean values for most variables analyzed, which is not surprising because these are the top two clubs in Bosnia and Herzegovina and Kosovo, and theay have also a similar concentration of good players. The t-test results showed a statistically significant difference in three variables. The first one is one of those that are important for body composition is muscle mass of football players, which has shown that the players of CSC Zrinjski Mostar have significantly higher values than the players of FC Besa Peje. The second variable in which a statistically significant difference has been found is a variable that estimates body weight, where the players of CSC Zrinjski Mostar also have a statistically higher value than the players of FC Besa Peje. Also, at the variable of waist circumference, players of CSC Zrinjski Mostar have shown statistically higher value than the players of FC Besa Peje.

Similar results have been obtained in a recent researches for football players of Montenegrin clubs (Gardasevic, Bjelica, & Vasiljevic, 2019; Bjelica, Gardasevic, & Vasiljevic, 2018; Gardasevic, Bjelica, Popovic, Vasiljevic, & Milosevic, 2018) for football players of other Bosnia and Herzegovinian clubs (Bjelica, Gardasevic, Vasiljevic, Jeleskovic, & Covic, 2019) for football players of other Kosovian clubs (Bjelica, Gardasevic, Masanovic, & Vasiljevic, 2020; Gardasevic, & Bjelica, 2020; Gardasevic, Bjelica, Vasiljevic, Sermaxhaj, & Arifi, 2018). Also, researchers who compared football players of clubs from different countries in the southern Balkans, Montenegrin and Kosovian clubs (Gardasevic, Bjelica, Vasiljevic, & Corluka, 2020; Bjelica, Gardasevic, Vasiljevic, Arifi, & Sermaxhaj, 2019; Gardasevic, Bjelica, Vasiljevic, Arifi, & Sermaxhaj, 2019a; Gardasevic, Bjelica, Vasiljevic, Arifi, & Sermaxhaj, 2019b), Bosnia and Herzegovinian and Montenegrin clubs (Gardasevic, Bjelica, Vasiljevic, & Corluka, 2019; Corluka, Bjelica, Gardasevic, & Vasiljevic, 2019), Bosnia and Herzegovinian and Kosovian clubs (Gardasevic et al., 2020), obtained similar results.

For other variables, some values are better for players of CSC Zrinjski Mostar and some for players of FC Besa Peje, although, insignificantly for statistics, which indicates that these players have very similar morphological characteristics and body composition, which is again, not surprising, considering that these two clubs shared the two trophies in the 2016/17 competitive season in their countries. These results show that ex Yugoslavia had a unique football school, had a football player of similar quality, and that this situation has not changed today in these countries after the breakup of the great Yugoslavia. The values obtained in this research can be useful for coaches of these clubs for making a comparison of their players with others and formulate their work in a way that enables reduction of those parameters that are not good, and raise those that are good to a higher level. That will surely make their football players even better and more successful. Also, both clubs should turn to other researches and check the functional-motoric status, psychological preparation as well as tactical training of their players and analyze whether there is room for their improvement. The results obtained in this research can serve as model parameters for the estimated variables for players of all other football clubs in Bosnia and Herzegovina and Kosovo, because the players that have been analyzed here, were among the best and the most successful football players in Bosnia and Herzegovina and Kosovo at the end of the competitive season in their countries 2016 / 17.

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