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Changes in the Morphological Characteristics and Body Composition of Elite Montenegrin Football Players during the Competition Period

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Abstract

The goal of this research was to assess the quantitative and qualitative changes imposed by training and competition with help of selected variables of morphological characteristics and body composition which were measured in elite football players of First Montenegrin Telecom League at two different time points during the competition period. In this study 28 male football players (22.5±5.87 yrs.) of OFK Titograd from Podgorica who compete in the First Montenegrin Telecom League were enrolled. The measurements were carried out in January and then again, after 30 days, in February. 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 in morphological characteristics and the composition of the body in two periods during the competition period were determined by using a discriminatory parametric procedure with t-test for small independent samples. It was found that in football players of OFK Titograd in 30 days significant changes are observed for 3 variables, for upper arm skinfolf - triceps, back skinfold and abdomen skinfold.

Keywords: *Soccer Players, Anthropometrics Characteristics, Body Composition*

Introduction

It a known fact that various athletic events require differing body types to achieve maximum performance (Gusic, Popovic, Molnar, Masanovic, & Radakovic, 2017; Sermaxhaj, Popovic, Bjelica, Gardasevic, & Arifi, 2017; Masanovic, Milosevic, & Bjelica, 2019). In other words, every athlete should have specific morphological characteristics and body composition convenient for his own sports discipline (Bjelica, Gardasevic, & Vasiljevic, 2018; Arifi, Bjelica, & Masanovic, 2019; Bjelica, Gardasevic, Vasiljevic, Arifi, & Sermaxhaj, 2019). When it comes to body height, it is extremely important for some playing positions (goalkeeper, central defender), while for other playing positions it is less important (Bjelica, Gardasevic, Vasiljevic, Jeleskovic, & Covic, 2019). Therefore, in the talent identification process for some playing positions it is necessary to choose athletes who have a pronounced body height, while for others it is necessary to pay attention to certain morphological, motor and functional characteristics that the athlete must have in order to fulfill all the tasks assigned to him (Krespi, Sporis, & Popovic, 2019; Gardasevic, Bjelica, & Popovic, 2015). On the other hand, there are also several reasons why understanding body composition is extremely important. Excessive fat mass encumbers athletes with useless weight, thus decreases performance in terms of power and acceleration and compromises the physical performance (Masanovic, 2019). Energy expenditure during a match are also higher (Cossio-Bolanos, Portella, Hespanhol, Fraser, & De Arruda, 2012). On the contrary, muscle mass contributes to the energy production during high-intensity activities and provides absolute strength to athletes (Aslan, Sal-

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ci, Guvenc, 2019), and therefore is an indicator of sports performance (Trajkovic et al, 2018; Bjelica, Gardasevic, Masanovic, & Vasiljevic, 2020; Bjelica, Masanovic, & Krivokapic, 2020).

It is known, on body height cannot be much affected, because it is highly genetically conditioned dimension (Popovic, Akpinar, Jaksic, Matic, & Bjelica, 2013; Popovic, Bjelica, Jaksic, & Hadzic, 2014; Gardasevic, Akpinar, Popovic, & Bjelica, 2019). On the other hand, body weight, the percentage of fat and muscle It can be changed a lot, and this fact should be used. If striving towards the high-level attainment a professional player should keep his body composition close to an "ideal" value all season (Bunc, Hrasky, & Skalska, 2015).

However, since the correct periodization of training implies its wavines, i.e. the variability of its intensity and duration, and the variability of its objectives and focus, it is expected that the body composition also oscillates, and its changes are expected at certain periods. Body fat is a direct reflection of the intensity of training, so it is expected its decline in the period when the activities are most intense. Players with the lowest percentage of body fat often have a better performance, and that is what they need most during the most important competitions. The fact is that professional soccer players undergo changes in their body composition across the season with some regional variations, irrespective of the playing position (Bunc, Hrasky, & Marie Skalska, 2015). Changes are mostly positive at mid-season, possibly due to difference in training between the first and second phase of the season (Sutton, Scott, Wallace, & Reilly, 2009; Silvestre et al., 2006)

The most of the descriptive data concerning changes in the body composition of footballers in different parts of the season come from Western Europe. Because there is a lack of data from Eastern Europe it is necessaryi insight into the changes during the season in order to understand the complexity of competitive requirements of footbal in elite Montenegrin league compared to Wester European. Hence, the purpose of this research was to assess the quantitative and qualitative changes imposed by training and competition with help of selected variables of morphological characteristics and body composition which were measured in elite football players of First Montenegrin Telecom League at two different time points during the competition period.

Method

In this study 28 male's football players (22.5±5.87 yrs.) of OFK Titograd from Podgorica who compete in the First Montenegrin Telecom League were enrolled. The measurements were carried out in January and then again, after 30 days, in February.

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 mass, 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.

Statistical analysis: The data obtained in the research were processed using the SPSS 20.0 software (Chicago, IL, USA). The descriptive statistics were expressed as a mean (SD) for each variable. Differences in morphological characteristics and the composition of the body in two periods during the competition period were determined by using a discriminatory parametric procedure with t-test for small independent samples, with statistical significance of $p<0.05$.

Results

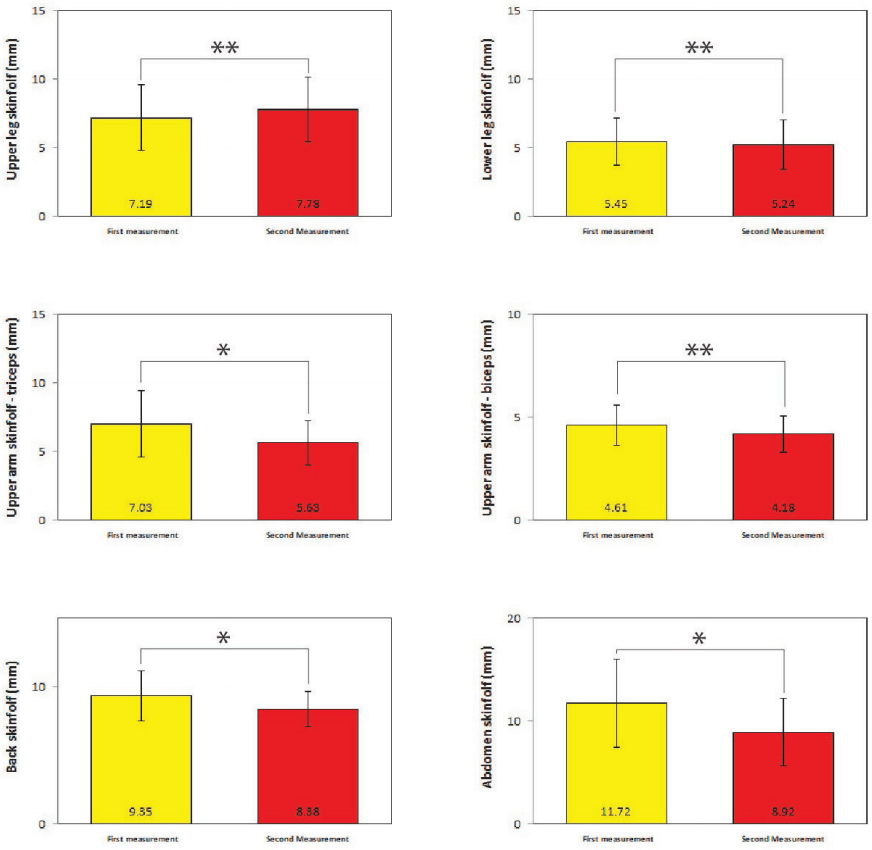
The anthropometric characteristics of footbollers at two different time points during the competition period are shown in Table 1. There was no significant difference in body height, body mass, upper leg skinfolf, lower leg skinfold, upper arm skibfold - biceps, fat mass, muscle mass and body mass index between two time points, while a significant difference was found for upper arm skinfolf - triceps (F=2.55), back skinfold (F=2.31) and abdomen skinfold (F=2.76) between two time points.

Table 1. Descriptive data and t-test of 28 male footboll players enrolled in the study

Variables	OFK Titograd	Maen±SD	t	Sig.
Body height (cm)	First measurement	181.6±6.26	.00	1
	Second Measurement	181.6±6.26		
Body mass (kg)	First measurement	76.18±7.63	.08	.939
	Second Measurement	76.02±7.65		
Upper leg skinfolf (mm)	First measurement	7.19±2.4	-.93	.356
	Second Measurement	7.78±2.34		
Lower leg skinfold (mm)	First measurement	5.45±1.71	.44	.662
	Second Measurement	5.24±1.81		
Upper arm skinfolf - triceps (mm)	First measurement	7.03±2.43	2.55	.014
	Second Measurement	5.63±1.6		
Upper arm skinfolf - biceps (mm)	First measurement	4.61±0.99	1.74	.087
	Second Measurement	4.18±0.89		
Back skinfold (mm)	First measurement	9.35±1.81	2.31	.025
	Second Measurement	8.38±1.3		
Abdomen skinfold (mm)	First measurement	11.72±4.25	2.76	.008
	Second Measurement	8.92±3.27		
Fat mass (%)	First measurement	11.41±3.13	-.47	.643
	Second Measurement	11.79±2.95		
Muscle mass (%)	First measurement	38.23±3.99	.26	.800
	Second Measurement	37.95±3.97		
Body mass index (kg/m^2)	First measurement	23.05±1.34	.11	.914
	Second Measurement	23.01±1.47		

Note: Mean - Arithmetic mean; SD - Standard deviation; ^ - non-significant; * - significant difference between groups.

The differences in skinfolds thickness of the football players between two different time points during the competition period are shown in Figure 1.



Note: * - significant difference; ** - non-significant difference between groups

FIGURE 1. The differences in skinfolds thicknes of the football players of OFK Titograd between two different time points during the competition period

Discussion

The goal of this study was to assess the quantitative and qualitative changes imposed by training and competition with help of selected variables of morphological characteristics and body composition which were measured in elite football players of First Montenegrin Telecom League at two different time points during the competition period. The results were obtained by using a battery of 11 tests in the area of morphological characteristics and body composition. The results highlight changes in body composition in elite football players associated with one month of intense training and playing during the competition period. The mean value for 3 from 6 skinfolds (upper arm skinfolf - triceps, back skinfold and abdomen skinfold) showed significant changes during the 30 days of the competition season. Also, a slight decrease in mean values is observed for two more skin folds. The direction ofchanges was generally consistent with expectations and they is in line with the results of numerous previous studies (Harley, Hind, & O'Hara, 2011; Siders, Bolonchuk, & Lukaski, 1991; Morris & Payne, 1996) which emphasize that the decline in adipose tissue during the competition phase and during the preparatory phases a direct reflection of activity intensity (Ostojic, 2002). Which again indicates highly competitive requirements in the elite Montenegrin league. Finally, when we look at parameters of body composition and body mass index, they also show a slight decrease. This is also consistent with expectations and in line with the results of previous studies (Bosch, Raymond-Pope, & Dengel, 2018 Cichy et al., 2020).

Studies of changes in body composition associated with systematic training and compeating have a relativelylong history, but there are very few who examine the variations in relation to the positions of the players in the team, so it is certainly a limitation of this study as well. Requirements to implement the game plan of specific playing positions in football contribute to variation in body composition andregional variation in body composition among players by position (Garcia et al., 2014). Therefore, it is expected that players in some playing positions will experience more changes due to higher demands. Therefore, the following studies should focus on determining variations in body composition during the competition season in relation to playing positions. The next limitation is the short period studied by this study, so the next should cover a longer period of time with multiple repeated measurements. But this does not diminish the contribution of this preliminary study, because it also contains data that can help football experts to gain insight into the demands of the elite Montenegrin competition, and changes observed during the one mesocycle in the competition period.

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Conflict of Interest
The authors declare that there are no conflicts of interest.

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