THE DIFFERENCES IN SOME ANTHROPOMETRIC CHARACTERISTICS BETWEEN TOP FOOTBALL PLAYERS AND RECREATIONAL PLAYERS

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Abstract
This research was aimed at gaining relevant knowledge about important differences with respect to some anthropometric characteristics of the best football players and their peers who play football on a recreational basis. The sample included 56 respondents, aged 28 (±1 year) divided into two subsample groups. The first subsample group was comprised of 26 respondents who practice football at a Football Club "Vojvodina" from Novi Sad, while the other subsample included 30 respondents who play football recreationally. The sample of variables contained 20 anthropometric measures that defined longitudinal and transversal dimensionality of the skeleton, then the body mass and body volume as well as the subcutaneous adipose tissue. The results of the measuring were analyzed by means of a statistical procedure labeled a significance test of two arithmetic means conducted on independent samples or popularly known a t-test. Based on the results it was concluded that significant differences occur in the case of all the variables used to assess the subcutaneous adipose tissue, as well as in the case of most variables for assessing the body mass and body volume at a significance level of p=.05.

Key words: anthropometric characteristics, top football players, recreational players.

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INTRODUCTION

Physical culture is certainly not merely a top sport, even though according to the attention the sport gets in everyday life it is precisely what we might say about it. In its essence, physical culture is represented with another two parts, far more important as far as health is concerned: physical education and recreation. Just as the top sport is the most popular part of the physical culture, sports medicine is solely associated with the top players. It is, however, equally important for both the children engaged into physical education (but also into sport) and recreational players, i.e. for the population doing physical activities for fun or medical reasons. Top players should constantly be monitored by the teams of doctors of different specialties, as in the training or during the contests the players are exposed to physical pressure that may increase to very great extents. Recreational players represent a varied group of people doing physical exercise independently as much as they would do it within different recreational programs. In our country sports medicine does cover sufficiently recreational players, unlike in other countries where physical culture and culture of health are much more developed. Before every recreational exercise it is important to do a preventive medical check-up, where monitoring the heart under pressure represents the most important segment.

The aim of the research was to determine whether there were any differences and how prominent those differences were between anthropometric characteristics of the top sports people, i.e. the best football players and respondents of the same age who play sports on a recreational basis. Since anthropometrics, as a part of the science of man, deals with measuring of the human body, the goal of the research was to measure and describe as precisely and in as much detail as possible the morphological characteristics of respondents.

Researches in the morphological field are numerous, but most closely related to the topic of this research were the researches conducted by Molnar (1998), who compared morphological characteristics of football players and the boys who did not play sports all of them making up a sample of 240 boys, and Hamidović (2007) who compared anthropometric characteristics of football players and recreational players from Novi Pazar on a sample of 110 respondents.

METHOD

Participants

The sample included 56 male respondents aged 28 (± 1 year) divided into two subsamples. The first subsample included 25 respondents who were actively engaged at a Football Club "Vojvodina" from Novi Sad, competing in the Super League of Serbia, while the other subsample included 30 respondents who played sports recreationally in a place where they lived. The criteria for selecting footballers for the sample were as follows: being a member of the first team in the club for a year at least and having a good health condition, while for the other subsample the only criterion was not playing sports actively.

Instruments

For the data collecting the technique of anthropometric investigation was used. 20 anthropometric measures were taken altogether that defined longitudinal and transversal dimensionality of the skeleton, the body mass and the body volume, as well as the subcutaneous adipose tissue: body height (BODHEI), body mass (BODMAS), elbow diameter (ELBDIA), wrist diameter (WRIDIA), knee diameter (KNEDIA), ankle diameter (ANKDIA), minimum upper arm diameter (MINUAD), maximum upper arm diameter (MAXUAD), minimum forearm diameter (MINFAD), maximum forearm diameter (MAXFAD), minimum thigh diameter (MINTHD), maximum thigh diameter (MAXTHD), minimum calf diameter (MINCAD), maximum calf diameter (MAXCAD), triceps skinfold thickness (TRSKTH), forearm skinfold thickness (FASKTH), thigh skinfold thickness (THSKTH), calf skinfold thickness (CASKTH), chest skinfold thickness (CHSKTH) and abdominal skinfold thickness (ABSKTH). Anthropometric research was conducted according to the IBP standards respecting the basic rules and principles related to the parameter choice, standard conditions and measurement techniques, as well as the standard measuring instruments adjusted before measurement was carried out.

Procedure

The data obtained in the research were processed using the application statistics program SPSS 10.0 adjusted for the use on personal computers. Arithmetic means, standard deviation and standard errors of arithmetic means were first calculated, and then it was determined whether there was significance with respect to the difference between the arithmetic means in respondents actively playing football and the respondents playing sports recreationally, which was done testing the difference between the arithmetic means of independent samples, using the popularly known, t-test. The analysis provided the answers to the question of whether there was and how prominent was the difference between anthropometric characteristics in the top sports people, i.e. footballers and the respondents of the same age but engaging in sports on a recreational basis.

RESULTS AND DISCUSSION

This section offers the results of the central and dispersion parameters, as well as the results of discriminative analysis classified into two tables. The first table, in the first two columns contains the data on basic discriminative parameters for the analyzed variables (Variables) and entity group (Group). The third columns shows the number of respondents in both samples (N), and then the arithmetic means of both samples (M), the standard deviation (SD) in both samples (SD) and the standard errors of arithmetic means (SEM). The other table contains all the data related to the procedure of a t-test for independent samples. For each variable the results of Levene's test for equality of variances are given: its value (F), and significance (p). The remaining columns show the test results of equality of arithmetic means divide into two groups: t-test value (t), degrees of freedom (df), the significance level of two-way testing of the equality of arithmetic means (p), the difference between the arithmetic means (MD), the standard error of the difference (SED), the low interval limit (Min) and upper interval limit (Max) of the differences of p=.05.

Table 1: Group Statistics

Variables	Group	N	M	SD	SEM
BODHEI	footballers	26	182.112	6.732	1.320
	recreational players	30	183.620	7.709	1.408
BODMAS	footballers	26	80.10	7.13	1.40
	recreational players	30	86.90	14.78	2.70
ELBDIA	footballers	26	72.712	3.380	.663
	recreational players	30	71.370	3.484	.636
WRIDIA	footballers	26	58.096	3.434	.673
	recreational players	30	57.420	3.075	.561
KNEDIA	footballers	26	99.331	3.770	.739
	recreational players	30	101.350	5.474	.999
ANKDIA	footballers	26	75.72	3.22	.63
	recreational players	30	76.15	4.29	.78
MINUAD	footballers	26	30.31	2.46	.48
	recreational players	30	32.88	2.71	.50
MAXUAD	footballers	26	32.15	1.97	.39
	recreational players	30	34.73	2.59	.47
MINFAD	footballers	26	16.92	.89	.17
	recreational players	30	17.33	1.09	.20
MAXFAD	footballers	26	26.42	2.55	.50
	Recreational players	30	28.08	1.48	.27
MINTHD	footballers	26	41.27	2.63	.52
	recreational players	30	41.05	3.96	.72
MAXTHD	footballers	26	56.42	2.66	.52
	recreational players	30	59.53	6.07	1.11
MINCAD	footballers	26	24.35	1.20	.23
	recreational players	30	23.18	1.85	.34
MAXCAD	footballers	26	37.85	1.93	.38
	recreational players	30	38.72	3.40	.62
TRSKTH	footballers	26	4.208	1.155	.227
	recreational players	30	7.510	3.276	.598
FASKTH	footballers	26	4.835	.624	.122
	recreational players	30	7.767	3.462	.632
THSKTH	footballers	26	7.331	2.065	.405
	recreational players	30	15.027	5.829	1.064
CASKTH	footballers	26	6.142	1.530	.300
	recreational players	30	10.307	4.144	.757
CHSKTH	footballers	26	6.465	1.349	.265
	recreational players	30	16.543	7.011	1.280
ABSKTH	footballers	26	6.342	1.379	.270
	recreational players	30	15.347	7.954	1.452

Table 2: Independent Samples Test

Variables	F	p	t	df	p	MD	SED	Min	Max
BODHEI	.913	.343	-.774	54	.442	-1.508	1.949	-5.416	2.399
BODMAS	6.836	.012	-2.239	43.067	**.03***	-6.8	3.04	-12.93	-.68
ELBDIA	.032	.859	1.457	54	.151	1.342	.921	-.504	3.187
WRIDIA	.084	.774	0.777	54	.44	.676	.87	-1.068	2.42
KNEDIA	4.102	.048	-1.624	51.527	.11	-2.019	1.243	-4.514	.476
ANKDIA	4.821	.032	-.428	53.009	.67	-.43	1.01	-2.45	1.59
MINUAD	0.938	.337	-3.698	54	**.001***	-2.58	.7	-3.97	-1.18
MAXUAD	1.409	.24	-4.138	54	**.000***	-2.58	.62	-3.83	-1.33
MINFAD	1.509	.225	-1.524	54	.133	-.41	.27	-.95	.13
MAXFAD	.671	.416	-3.03	54	**.004**	-1.66	.55	-2.76	-.56
MINTHD	4.45	.04	0.247	50.789	.806	.22	.89	-1.56	2
MAXTHD	14.148	.000	-2.541	40.922	**.015***	-3.11	1.22	-5.58	-.64
MINCAD	2.556	.116	2.738	54	**.008***	1.16	.42	.31	2.01

MAXCAD	5.437	.023	-1.198	47.1	.237	-.87	.73	-2.33	.59
TRSKTH	22.887	.000	-5.164	37.04	**.000***	-3.302	.64	-4.598	-2.007
FASKTH	21.311	.000	-4.555	31.161	**.000***	-2.932	.644	-4.245	-1.619
THSKTH	15.546	.000	-6.759	37.103	**.000***	-7.696	1.139	-10.003	-5.389
CASKTH	14.757	.000	-5.116	37.755	**.000***	-4.164	.814	-5.813	-2.516
CHSKTH	68.877	.000	-7.71	31.465	**.000***	-10.078	1.307	-12.742	-7.414
ABSKTH	37.152	.000	-6.096	31.004	**.000***	-9.004	1.477	-12.017	-5.992

Examining the first table it is possible to spot the differences in central and dispersion parameters between the footballers and the respondents who play sports recreationally with respect to the accumulation of subcutaneous adipose tissue, while in the case of parameters regarding longitudinal and transversal dimensionality of the skeleton, the body mass and body volume these differences are not prominent as in the case of the parameters used for assessing subcutaneous adipose tissue. Based on the observed results it is obvious that the footballers manifest higher values regarding an elbow diameter and wrist diameter, as well as in the case of a minimal thigh circumference and minimal calf circumference. On the other hand, the respondents who play sports recreationally manifest higher values in the case of body height, body mass, knee diameter, ankle diameter, minimal and maximum upper arm circumference, minimal and maximum forearm circumference and maximum calf circumference.

The discriminative analysis procedure enabled determining significant differences between the footballers and the respondents playing sports recreationally (table 2). Based on the obtained results it was determined that the results of the subsamples differ to a considerable extent with respect to twelve anthropometric characteristics (body mass, minimal and maximum upper arm circumference, maximum forearm circumference, maximum thigh circumference, minimum calf circumference, triceps skinfold thickness, forearm skinfold thickness, thigh skinfold thickness, calf skinfold thickness, chest skinfold thickness and abdominal skinfold thickness).

By means of a discriminative analysis it was determined that anthropometric characteristics were more in favor of a group of respondent who actively played football in most cases, especially when it was the case of the parameters for assessing subcutaneous adipose tissue, also confirmed in some earlier researches (Bala, 1981; Sekereš, 1985; Siozios, 1985;

Molnar, 1998; Molnar, Radosav and Smajić, 1999). Furthermore, it was also observed that skinfolds are considerably thicker in the respondents who played sports recreationally, and the difference was 3.302 mm in the case of upper arm skinfold thickness and 2.932 mm in the case of forearm skinfold thickness, 7.696 mm with respect to thigh skinfold thickness, 4.164 mm with respect to calf skinfold thickness, 10.078 mm with respect to chest skinfold thickness, 9.004 mm with respect to abdominal skinfold thickness, which confirms the fact that physical education has a positive effect on the reduction of subcutaneous adipose tissue. Moreover, in some earlier researches carried out in different time period certain differences were observed with respect to subcutaneous adipose tissue both in the respondents who played sports actively and those who played sports recreationally (Sekereš, 1985; Siozios, 1985; Molnar, 1998). These researches also confirmed that the older the respondents are, the bigger the difference, and therefore the difference with respect to subcutaneous adipose tissue is smaller in the case of younger respondents, and on the other hand it gets bigger with age (Molnar, 1998). In addition to this, it was also determined that the respondents who play sports recreationally manifest considerably higher body mass values where a difference of 6.8 cm was observed, then a difference of 2.58 cm in the case of a minimum upper arm circumference and finally the identical difference in the case of a maximum upper arm circumference. In the case of maximum upper arm circumference the difference is 1.66 cm, while in the case of a maximum thigh circumference the difference was 3.11 cm in favor of the respondents who play sports recreationally. The only characteristic that was more prominent in the footballers was the minimum calf circumference and the difference was 1.16 cm. However, these differences were not observed in the previous researches and it could be considered that differences in these characteristics individual in character and cannot be uniform for the whole population.

CONCLUSION

In general, the obtained results show that active engagement in sports results in a decrease of subcutaneous adipose tissue. This is particularly indicated by a considerable difference in the case of all types of skinfold thickness among the subsamples. In most cases, a remarkably bigger difference is observed with respect to measures of circumference dimensions in favor of the respondents who play sports recreationally, and thus it can be concluded that considerably increased skinfolds have an impact on considerably increased volume. No significant differences were observed in the case of longitudinal and transversal dimensionality of the skeleton. The results also point out the necessity of further monitoring in changes of anthropometric characteristics in children in order to draw much more certain conclusions in the future.

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RAZLIKE U NEKIM ANTROPOMETRIJSKIM KARAKTERISTIKAMA VRHUNSKIH FUDBALERA I REKREATIVACA

Originalni naučni rad

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Sažetak
Cilj ovog istraživanja je dobijanje relevatnih znanja o značajnim razlikama u nekih antropometrijskim karakteristikama vrhunskih fudbalera i njihovih vršnjaka koji se bave sportom rekreativno. Uzorak ispitanika je obuhvatio 56 ispitanika muškog pola, uzrasta 28 godina (±1 godina) podeljenih na dva subuzorka. Prvi subuzorak je obuhvatio 26 ispitanika koji treniraju u Fudbalskom klubu "Vojvodina" iz Novog Sada dok je drugi subuzorak obuhvatio 30 ispitanika koji se bave sportom rekreativno. Uzorak varijabli je sadržao 20 antropometrijskih mera koje su definisale longitudinalnu i transverzalnu dimenzionalnost skeleta, zatim volumen i masu tela, kao i potkožno masno tkivo. Rezultati merenja su analizirani statističkom procedurom označenom kao testiranje značajnosti dve aritmetičke sredine na nezavisnim uzorcima ili popularno, t-testom. Na osnovu dobijenih rezultata

zaključeno je da se značajne razlike pojavljuju kod svih varijabli za procenu potkožnog masnog tkiva, kao i kod većine varijabli za procenu volumena i mase tela na nivou značajnosti p=.05.

Ključne reči: *antropometrijske karakteristike, vrhunski fudbaleri, rekreativci*

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