

BODY COMPOSITION OF PROFESSIONAL FOOTBALL PLAYERS IN RELATION TO PLAYING POSITION

Original scientific paper

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Abstract

One of the main components of sports science in the sport of football is the accurate measurement of body composition. It should be kept in mind that body composition is a good indicator of health, therefore every high-level football player who claims a more stable performance must have the optimal state of body composition under constant control. The purpose of this study was to determine differences in body composition in relation to playing position in professional football players. The research had a transversal, descriptive and comparative character. The sample of subjects consisted of football players who compete in the highest competition rank, the North Macedonian Super league. The total number of examinees in the study included 30 elite male football players (age 26.57±4.8 years, body height 183.4±6.54 cm., body mass 76.35±7.12 kg.). The results of this study showed that there are statistically significant differences in relation to playing position between football players in relation to body composition assessment, but only in the body height variable. Differences were evident between goalkeepers and midfielders. Other values for body composition assessment did not show differences between players based on playing position.

Keywords: *Body composition, football players, ANOVA, Playing position*

INTRODUCTION

Since there are certain specifics of certain sports and sports disciplines, which consist in the diversity of their competitive structure, there is a strong need for continuous research and in practice controlling the specifics of certain sports, including primarily genetic conditioning (limitations) of certain skills and anthropological characteristics, then the hierarchical value of athletes and teams, as well as their structure and development under the influence of certain training tools, methods and loads (Iseni, 2022).

Morphological features of the anthropological status of a person are more often understood as processes of human ontogenic growth and development. However, in order to determine the structure and development of anthropometric characteristics in morphological space, solutions were sought in mathematical-statistical factor procedures, which isolated anthropometric characteristics, and which are determined by a set of manifest variables (anthropometric measures that can be measured directly), as well as the latent morphological variables, which cannot be measured directly, because they are obtained by condensing (summarizing) the information obtained based on measured anthropometric measures (Ratames, 2012). One of the key components of sports science in the sport of football is the accurate measurement of body composition (Milsom et al. 2015). The most popular collective sports such as football, basketball, etc., are characterized by complex and dynamic activities, which are characterized by various cyclic and acyclic movements, which requires a detailed follow-up regarding the profile of each individual athlete (Bjelica et al., 2019). In all sports activities, and especially in the sport of football as the most popular sport in the world, this good result can only be achieved in well-programmed conditions of the training process and their morpho-functional transmission (Amani, Sadeghi & Afsharnezhad, 2018). Body composition is the assessment of the parts of the human body

that together make up the total body weight. Several attributes of the athlete's physique are considered to contribute to success in various

sports. The study and determination of physique from body composition variables are an important part of the integral evaluation of an athlete, as they can be used both for the discovery and selection of players, and to determine placement in a specific sport discipline or position (Zuniga & De Leon, 2007). In terms of performance and body composition, some studies have shown that the teams with the best position in the league table had a lower percentage of fat mass compared to the teams in the middle and low positions in the same division (Kalapotharakos et al. 2006). The state and change of body composition in professional football players also depends on the way of eating, or the nutritional aspect, which has a high correlation with body composition (Staskiewicz et al., 2022). It should also be borne in mind that body composition is a good indicator of health, therefore every high-level athlete and athlete who claims more stable performance must constantly monitor the optimal state of body composition (Garcia et al. 2009). As good predictors of success among young football players, the characteristics of body and physiological composition, physical fitness, maturity status and the influence of age during the selection of players have been shown (Le Gall et al., 2010). Through the assessment of body composition, it is possible to adapt training programs according to players, to identify differences between specific positions or categories and to have a more complete control of the physical condition and health of players, however, this does not justify success in sports practice, as the process of player development is always long-term and this performance variable is only one of many in the field of evaluation and research in sports sciences (Wong et al. 2009). Therefore, the purpose of this study was to determine differences in body composition in relation to playing position in professional football players.

METHODS

Participants

The sample of subjects consisted of male football players who compete in the top tier of the competition, the North Macedonian Super League. The total number of tested is 30 male soccer players (26.57±4.8 years, 183.4±6.54 body height, 76.35±7.12 body mass). The study was transversal in nature and the tests were carried out in the pre-competitive period. All subjects were first informed about the study and the purpose of the research was explained to them. Before testing, each player signed a consent form to participate in the study. For this study, consent was also obtained from the head coach and the president of the club. The research was approved by the Ethics Committee of the Faculty of Physical Education, University of Tetovo (February 20, 2021 with protocol number 0129/12), in accordance with the Declaration of Helsinki (World Medical Association, 2013).

Test procedures

The measurement instruments in this study included several body composition variables. The assessment of body composition was carried out in the early hours of the morning. The testing was done after a day off that the players had. The day before during the body composition examination, the examinees had to follow a

protocol, which included requirements not to consume food and drink after 10:00 p.m. Also, in the morning, before the test, the examinees did not consume food and drink. Assessment was performed indoors, at 21–23°C, using a multi-frequency bioelectrical impedance (InBody 770, Biospace Co. Ltd, Seoul, Korea). Participants were dressed only in shorts and stood barefoot on the metal scale and grasped hand electrodes as instructed. InBody 770 automatically measures total body weight, fat mass, muscle and bone mass.

Statistical analysis

Data were processed using the SPSS statistical package, version 26, IBM, U.S.A. In the first step, the basic descriptive parameters and the distribution of the variables were defined. Central and dispersive parameters were calculated for all tests and groups, such as arithmetic mean (mean) and standard deviation (St.Dev.). The normality of the distribution of the variables is derived through the asymmetry of the results (Skewness) and the homogeneity of the results (Kurtosis). To determine the differences between the groups in the researched variables, we used the univariate analysis of variance ANOVA, while to determine how the groups differ statistically from each other, we used the LSD-Post hoc test. The statistical significance of the differences was determined at the $p < 0.05$ level.

RESULTS AND DISCUSSION

Table 1. Descriptive parameters of the football players in relation to the

<i>Position</i>	<i>Variables</i>	<i>N</i>	<i>Mean</i>	<i>St. Dev.</i>	<i>Min.</i>	<i>Max.</i>	<i>Skew.</i>	<i>Kurt.</i>
Goalkeeper	Body height		188.50	1.29	187.00	190.00	.000	-1.200
	Body mass		81.05	5.72	75.60	87.50	.235	-4.189
	BMI	4	22.82	1.55	21.20	24.20	-.125	-5.245
	BF%		14.82	2.05	12.9	16.70	-.010	-5.847
	Muscle Mas		65.55	3.14	62.4	69.30	.355	-2.756
Defender	Body height		184.09	6.68	172.00	193.00	-.312	-.821
	Body mass		76.72	5.00	67.00	83.40	-.378	-.085
	BMI	11	22.83	1.12	2.80	25.00	.243	.808
	BF%		12.91	3.33	6.10	18.20	-.432	.554
	Muscle Mas		63.50	3.85	58.20	69.60	.147	-.976
Midfielder	Body height		179.90	5.33	170.00	190.00	.129	.835
	Body mass		74.92	8.01	64.20	88.00	.179	-1.023
	BMI	11	23.48	2.21	20.30	28.00	.714	.374
	BF%		14.23	3.88	7.40	19.60	-.490	-.881
	Muscle Mas		60.48	4.92	54.00	69.10	.781	-.397
Forward	Body height		186.00	8.83	174.00	194.00	-1.057	.448
	Body mass		74.55	10.98	60.00	85.10	-.896	.251
	BMI	4	21.40	1.19	19.80	22.60	-.884	.865
	BF%		12.45	2.83	8.90	15.60	-.370	-.083
	Muscle Mas		60.30	7.01	49.30	67.20	-1.232	1.160
Total	Body height		183.40	6.54	170.00	194.00	-.226	-.900
	Body mass		76.35	7.12	60.00	88.00	-.404	-.404
	BMI	30	24.21	7.74	19.80	28.00	.505	-.507
	BF%		13.35	3.32	6.10	19.60	-.351	-.413
	Muscle Mas		62.24	4.98	49.30	69.60	-.452	.018

In Table 1, we have reflected the basic statistical parameters of body composition variables based on playing positions among 30 elite players of the football club K.F. Skopje, a club that is the current champion in the North Macedonian super league. The values of the standard deviations are at a low level for all the investigated variables of the body composition, almost for the players of all positions of the game, which shows that the discriminability of the results is at a low

level and it is about homogeneous results, except for the forward players (forward), where the discriminability of body mass (BM) and body height (BH) variables are at a slightly higher level and it is a question of heterogeneous results. The values of the asymmetry of the curve or the Skunis indicator, almost all the variables based on the positions of the game are of low asymmetry, except for the variables body height (BH) and muscle mass (MM) in forward players, who are

more higher and negative asymmetries. The value of the roundness of the curve or the index called kurtosis, for almost all variables and all positions are below 2.75, which means that the results move to normal distribution values and these values are platykurtic, except for body

weight (BM) variables), body mass index (BMI) and body fat percentage (BF%) at the goalkeeper position, which have values greater than 4.00, and these values are leptokurtic in shape.

Table 2. Differences in the body composition of the football player - Anova, Post Hoc

Body composition	Position				TOTAL	Anova	
	GK	DF	MF	FW		F	p
Body height	188.50±1.29	184.09±6.68	179.90±5.33	186.00±8.83	183.40±6.54	2.41	.049
Body weight	81.05±5.72	76.72±5.00	74.92±8.05	74.55±10.98	76.35±7.12	.837	.486
BMI	22.82±1.55	22.83±1.12	23.48±2.21	21.40±1.19	24.21±7.74	.805	.502
BF%	14.82±2.05	12.91±3.33	14.23±3.88	12.45±2.83	13.39±3.32	.604	.618
Muscle mass	65.55±3.14	63.50±3.85	60.48±4.92	60.30±7.91	62.24±4.98	1.575	.219

Based on the obtained values of the results from the ANOVA analysis (table 2), it can be observed that we have significant statistical differences in only 1 of the 5 variables used in this research, where significant differences are only found in the body height variable, with reliability $p < .05$. Post Hoc LSD test determined that these differences were present between goalkeepers and midfielders.

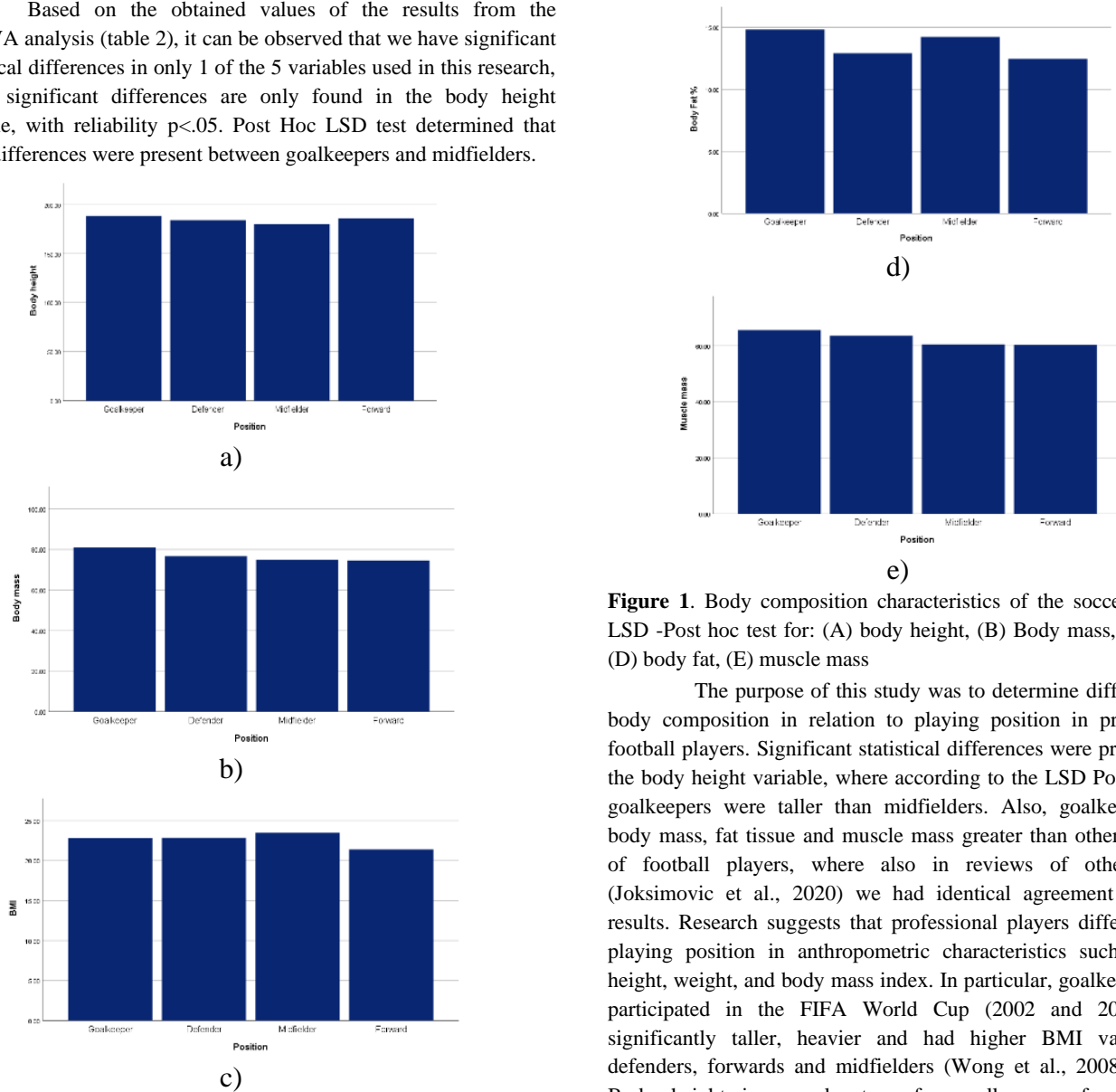


Figure 1. Body composition characteristics of the soccer players, LSD -Post hoc test for: (A) body height, (B) Body mass, (C) BMI, (D) body fat, (E) muscle mass

The purpose of this study was to determine differences in body composition in relation to playing position in professional football players. Significant statistical differences were presented in the body height variable, where according to the LSD Post hoc test goalkeepers were taller than midfielders. Also, goalkeepers had body mass, fat tissue and muscle mass greater than other positions of football players, where also in reviews of other studies (Joksimovic et al., 2020) we had identical agreement with our results. Research suggests that professional players differ by their playing position in anthropometric characteristics such as body height, weight, and body mass index. In particular, goalkeepers who participated in the FIFA World Cup (2002 and 2006) were significantly taller, heavier and had higher BMI values than defenders, forwards and midfielders (Wong et al., 2008, 2009). Body height is an advantage for goalkeepers, forwards and defenders who play mostly in wing and header play, while offensive

and defensive midfielders tend to have a lower height (Ostojic, 2015). The average body height for goalkeepers who participated in the last world championships was 188.9 ± 5.0 cm, and these values allow goalkeepers to stop shots below the crossbar (Pedersen et al., 2019). Offensive and defensive lines have previously been reported to be quite similar in body mass and slightly higher body fat (Kraemer et al., 2005). The study of (Dengel et al. 2013) is in agreement with previous reports (Kraemer et al., 2005) suggesting that offensive and defensive lines are somewhat similar. Forwards were significantly taller and heavier than defenders in the latest study. The greater body mass was caused by a greater fat mass in offensive players compared to defensive players, as both had similar lean mass. Mass distribution was also similar between the two positions with greater mass in the upper body than in the lower body. After comparing the groups according to the playing position (goalkeeper, defender, midfielder and forward), significant differences were found in age, height, weight, sum of adipose tissue, muscle mass and fat percentage (Sebastia-Rico et al., 2023). In another case, the defenders seem to be in the position with the highest total weight than the midfielders. This makes sense because, due to their role in the game, it is a very physical position in which they have to stop attackers by breaking up plays both on the ground and in the air and start attacking plays on many occasions. Midfielders are shorter and lighter, and show similar values to forwards. This body composition is justified to favor agility and speed during the game, especially in counter-attacking games, being the main roles of midfielders and forwards (although this role can change depending on the strategic alignment of the team, the style of the coach, etc. (Di Salvo et al., 2007) (Dolci et al., 2020). Morphological characteristics and body composition have a vital role in determining the success of football players (Gontarev et al., 2016) (Jagiello et al., 2017) and especially in the performance of motor tasks (Smajic, et al. 2016), where it is confirmed that research of body composition and morphological characteristics participates in specific motor skills with 42% of the variability, so that taller players have greater and better strength and accuracy in headers (Lilic, 2007). Based on all these facts, the coach's role is to pay attention to these characteristics when creating a team, because it is necessary to adjust the configuration of his team and the style of play for his players based on the position of the game (Joksic, 2009).

CONCLUSION

Football is a game in which body composition and morphological characteristics are important factors, especially when they change in relation to the competitive level and position in the game. The results of this study showed that there are statistically significant differences in relation to playing position between football players in relation to body composition assessment, but only in the body height variable. Differences were evident between goalkeepers and midfielders. Other values for body composition assessment did not show differences between players based on playing position. Football coaches can use the results of this study as a tool to better understand and interpret body composition and morphological characteristics and their importance in relation to playing position. Knowing the differences observed can improve the training process and make the right selection at an early age.

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