

Efficient Means of Development of Speed Abilities Based on Analysis between Morphofunctional Indicators with Speed Qualities for Footballers on the Stage of Advanced Specialization

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Abstract

The article revised analyzes of indicators of morphofunctional parameters in the interconnections between speed indicators of football players at the stage of in-depth specialization. The experiment was conducted during the competitive period, using the method of Bioimpedansometry and the computer mathematical-statistical program SPSS for parametric non-parametric correlation.

Keywords: *Pearson-Brave correlation, Kendal and Spearman correlation, SPSS computer program, Bioimpedancemetry method, standard “8” (“eight”), physique, metabolic rate, bone mass density index.*

Introduction

Optimal change of the functional state of players by the intensity of the game is a requirement of modern football². The increased functional state of football players over 15 km per match is evidenced by the rate of qualitative growth of players physical endurance in overcoming long distances during a single game, as well as the players performance of technical tricks at high speed and for a long time¹.

Relevance: The research of dependencies by method of mathematical statistics and the theory of probability, in particular by correlation analysis, helps researchers establish regularities that previously unknown to them³. Obtaining accurate and operational information in the analysis of sports parameters that are complex and difficult⁴. At the same time, for optimal planning of training loads, it is necessary to process the measured data during the training sessions, to assess the state of a football player after stress training is an invaluable tool in the researcher’s arsenal, and especially at the stage of in-depth specialization.⁵.

Object and Subject of Research

Eight football students of the RSHIOR (The Republican Olympic Reserve Boarding School) at

the aged of 14 to 15 years were selected as **the object** of research. **The subject** of the research is to study of the correlation between morphofunctional and speed qualities, such as the percentage of total fat, the percentage of water in body weight, muscle mass in kg., physique, metabolic rate, bone mass density index, high start running at 10 and 30 meters, shuttle run 5 * 30m and the test “eight”.

The Purpose of the Research: The purpose of this work was to research the interconnections of four speed characteristics such as the run of footballers at 10 m, 30 m, shuttle running 5*30 m and the test “eight” with physiological indicators and as a result to obtain quantitative measures of these interconnections in the form of coefficients of paired correlations to reveal effective means of developing speed qualities⁶.

Method of Research

The SPSS package of computer programs for mathematical statistics, including a software procedure that implements parametric and nonparametric method of correlation analysis were used to achieve this purpose.

The physiological indicators of athletes were eight signs: body length, body weight, percent of total fat and water in the body, muscle mass, physique, metabolic

rate and bone density index. The indicators were taken using Tanita MC-980 equipment (Japanese - made) and the Bioimpedansometry method (Fig. 1).



Fig. 1. Tanita Bioimpedance Meter MS-980.

Bioimpedansometry method. The study of the component composition of the body by the method.

Assessment of body composition of athletes using bioimpedansometry method. Bioimpedansometry (BIR) or bioimpedance analysis of the diagnostics of an athlete's body composition by measuring impedance - the electrical resistance of body parts. An apparatus designed for bioimpedance measurement is called a bioimpedance meter (Tanita company, Japan). The method is based on measuring the resistance of the bioelectric resistance of body tissues (in particular, the following parameters were recorded: body length (cm), body weight (kg), relative fat mass (%), relative water mass (%), TBW (%), type of addition, level of metabolism, bone density index. (Fig. 2.2.3.)



Fig. 2.2.3. Tanita Bioimpedance Meter MS-980.

Information on the effect of physical exercises on length of body weight in young athletes is scarce. This is due to the difficulty of organizing lengthy experiments with subjects who regularly engage in physical exercises for several years. In addition, it is extremely difficult to take into account the effects of changing factors such as diet and heredity that significantly affect body size in a long study on a young man.

There is a bioimpedance method for determining body weight and percentage of fat in an athlete's body. With regular measurement of body weight and the percentage of body fat, one can accurately determine how the structural composition of the body is measured in favor of active muscle tissue. The normal fat content in young men for 18 year olds is 14-20%.

It is important to note that the composition of the body in young athletes varies, and as in adults, adipose tissue increases (Table No. 2.2.3.)

Bioimpedanceometry (BIR) or bioimpedance analysis is a method of diagnosing human body composition by measuring impedance - the electrical resistance of body parts - in different parts of the body. The device used to perform bioimpedance measurement is called a bioimpedance meter (Tanita). The method is based on measuring the bioelectric resistance of body tissues ("impedance" - resistance, "bioimpedance" - resistance of biological tissues). On the basis of the received data the conclusion about normative broken hydration of tissues, lipid and water-salt exchange is made and the results are monitored during the whole period of training work. According to the data in Table 2 translated, it should be noted that the average result of boys' body weight was 59.9 kg, their physique is large. Since the normal percentage of water $\bar{X} = 67.5\%$. The physique of trained, but observed lack of fat body weight (6.4%). Table 2.2.3.

Table 1: Body composition data of young soccer players in the Bioimpedansometric method.

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№	Surname and first names of students	Hight (cm)	Weight (kg)	% total fat	% water	Muscle mass (kg)	Phusique	Metabolic rate	Physiological age	Bone mass density index	Internal fat
	Norm										
1	Begmatov Azizbek	176	65,8	3,0	69,6	59,4	8	1847	12	3,1	1
2	Platov Izzat	170	63,9	-7,5	65,8	56,1	8	1755	12	3	1
3	Ortikboyev Dierbek	182	66,4	-5,0	66,5	59,9	8	1861	12	3,1	1
4	Týkhtasinov Zainiddin	169	61,7	-5,5	68,2	55,3	8	1726	12	2,9	1
5	Khabibjonov Shohzhokhon	168	64,4	10,2	63,6	55,0	5	1727	12	2,9	1
6	Rakhmatullaev Shazod	166	56,9	-6,2	67,3	50,7	8	1592	12	2,7	1
7	Ergashev Davron	168	59,0	-5,9	67,5	52,8	8	1651	12	2,8	1
8	Tursunov Jahongir	174	64,3	-6,7	65,9	57,0	8	1779	12	3,0	1
9	Sarimsakov Abror	180	62,2	-5,0	70,9	56,2	8	1750	12	3,0	1
10	Shokirov Ramzan	171	63,1	-6,3	66,8	56,1	8	1751	12	3,0	1
11	Ganizhanov Husan	180	58,6	-5,0	67,1	52,9	7	1653	12	2,8	1
12	Akbarov Jahongir	157	46,4	-5,0	71,8	41,8	8	1342	12	2,3	1
13	Zhumabaev Suhrob	172	66,8	-5,7	68,0	59,8	8	1861	12	3,1	1
14	Yodgarov Ahmad	185	79,9	12,4	60,3	66,3	5	2091	12	3,5	1
15	Toshpulatov Asadbek	180	72,4	-6,6	65,9	64,3	8	2002	12	3,4	1

Table 2: Form for measuring body composition using the bioimpedance method

	Body Fat Percentage			The percentage of internal fat (%)			Bone mass content (kg)			The percentage of water in the body (%)
	Low level	Optimal	High level	Standart	Elevated level	High level	Low level	Optimal level	High level	Standart level
Standart	11-13%	14-20%	21-23%	1-6	7-12	13-30	до 65 кг 2,66kg	65-95 кг 3,29 кг	от 95 кг 3,69 кг	60-70%

Antropometric body type

«->» - low level

«0» - moderate level

«+» - high level

Code	Type	Fat	Muscles
1	Hidden fullness	++	--
2	Fullness	+	-
3	Heavyweight	+	+
4	Not trained	0	-
5	Standart	0	0
6	Trained	0	+
7	Thin	-	-
8	Muscular	-	+
9	Very muscular	-	++

№	Surname and first names of students	Hight (cm)	Weight (kg)	% total fat	% water	Muscle mass (kg)	Phusique	Metabolic rate (kcal)	Physiological age	Bone mass density index	Internal fat
	Standart	-	-		60%	-	8	-	12	-	1-2
1											
2											
n											
	∑ average										

Discussion

Correlation analysis is used to determine the degree of closeness of the interconnection between two random variables X and Y. The coefficient/correlation is used as a measure of bonding. The correlation coefficient is estimated by sampling the volume of n related observation pairs (x, y) from the joint general population X and Y. There are several types of correlation coefficients, the application of which depends on assumptions about the joint distribution of X and Y values.

Based on the above-mentioned speed and physiological indices of the athletes, we have created a sample in Excel file format consisting of eight observations (rows) and twelve indices (columns), a copy of which was then used as the source data for the

correlation analysis program. Because the processed file has fewer observations, in addition to the parametric method (calculation of correlation coefficient by Pearson-Brave method) non-parametric method (method of rank correlations of Kendal and Spearman) of calculation of correlation coefficients are used.

The Results of the Research

Before starting the calculations, descriptive statistics and exploratory analysis programs were performed to determine the basic statistical characteristics and check the distribution of the initial data for normality (Table 1).

The table shows the name, average, standard deviations, and the number of all the studied indicators.

Table 3: Descriptive Statistics Table

№	Indexes	Average	Std. dev.	N
1	2	3	4	5
1	10m running	1,8825	,17990	8
2	30m running	4,5375	,20070	8
3	Shuttle running 5*30m	31,8638	1,09520	8
4	Test«8» «eight»	15,4075	,55633	8
5	Hight (cm)	170,7500	4,43203	8
6	Body mass (kg)	61,2125	5,62810	8
7	% total fat	2,0875	9,72220	8
8	% water	65,8750	3,00464	8
9	Muscle mass (kg)	52,9625	3,51281	8
10	Phusique	6,6250	1,40789	8
11	Metabolic rate	1665,3750	107,59705	8
12	Bone mass density index	2,8250	,17525	8

Table 2 presents the correlation matrix containing paired correlation coefficients obtained as a result of the work of the program for calculating correlation coefficients by the Pearson-Brave method.

Table 4: Pearson pair correlation table

Correlation by Kendal	10m running	30m running	Shuttle running	Test «8» «eight» «пкa»	Hight (cm)	Body mass (kg) (кг)	% total fat	% water	Muscle mass (kg)	Physique»я	Metabolic rate
30m running	,805*										
Shuttle running5*30m	,586	,652									
Test «8» «eight»	,548	,824*	,737*								
Hight (cm)	,454	,091	,245	,228							
Body mass (kg)	,100	-,015	,538	,320	,123						
% total fat	-,015	-,183	-,259	-,072	-,131	,526					
% water	,035	,098	-,407	-,312	-,102	-,973**	-,596				
Muscle mass (kg)	,092	-,034	,615	,313	,252	,951**	,302	-,910**			
Physique	-,069	,082	,049	-,145	-,063	-,685	-,940**	,761*	-,515		
Metabolic rate	,095	-,033	,603	,313	,229	,968**	,350	-,929**	,998**	-,551	
Bone mass density index	,147	-,035	,628	,300	,414	,879**	,180	-,829*	,979**	-,420	,967**

An analysis of the data in the table showed that, out of the speed characteristics of athletes, the 10-meter run correlates not with all physiological indicators, except for the growth indicator, has no correlation, and growth correlates with an average degree of tightness with a correlation coefficient equal to $r = 0.454$.

The indicator of running 30 m also does not correlate with all, even with growth, physiological indicators, except for the “eight” test $r = 0.8$.

The shuttle running indicator 5 * 30 m showed a completely different picture concerning the physiological characteristics of athletes. This indicator correlates with physiological indicators of body length and the percentage of total fat in a weak degree, and with the latter in the opposite direction, with coefficients equal to $r = 0.245$ and $r = -0.259$, respectively. And with indicators, body weight, percentage of water, muscle mass, metabolic rate and bone density index, with an average degree of bond strength with the corresponding correlation coefficients $r = 0.538$, $r = -0.407$, $r = 0.615$, $r = 0.603$, $r = 0.628$. Only the type addition indicator did not correlate with the shuttle run indicator.

The “eight” test indicator with three physiological indicators (growth, percentage of total fat, and type of addition) had no correlation and correlated with other physiological indicators to an average degree of tightness with a correlation coefficient in the side-chapel $r = 0,300$.

Due to the smaller number of observations, in addition to the parametric method, we had to use nonparametric method for calculating pair correlation coefficients based on the Kendal rank method of correlation (Table 3) and Spearman (Table 4).

According to the Kendal ranking method (Table 3), the 10-meter running correlates on average with the growth indicator ($r = 0.556$) and with the percentage of total fat and water in the body, to a weak degree, respectively $r = -0.327$ and $r = 0.266$.

Running on 30 m by this method had a correlation connection only with the index of the percentage of fat of the total in the opposite direction with the value of correlation coefficient, equal to $r = -0,327$, and with other physiological indexes of running on 30 m did not correlate.

The shuttle running 5 * 30 m according to the Kendal rank correlation method had the same weak tightness of connections with two physiological indicators: muscle mass and metabolic rate ($r = 0.286$). This indicator also weakly correlated with bone mass index ($r = 0.355$), and shuttle running did not correlate with other physiological indicators.

The «eight» test only correlated with three indicators, but weakly. These indicators are growth, body weight, and the percentage of water in the body with the corresponding correlation coefficients $r = 0.327$, $r = 0.367$, and $r = -0.286$.

The correlation of the «eight» test with other physiological indicators was very weak.

Table 5: Kendal pair correlation table

Correlation by Kendal	10m running	30m running	Shuttle running 5*30M	Test «8» «eight»	Hight (cm)	Body mass	% total fat	% water	Muscle mass (кг) (кг)	Physique	Metabolic rate
30m running	,667*										
Shuttle running 5*30m	,473	,618*									
Test «8» «eight»	,327	,473	,571*								
Hight (cm)	,556	,222	,182	,327							
Body mass (кг)	-,182	-,036	,214	,357	,255						
% total fat	-,327	-,327	-,214	-,071	-,036	,429					
% water	,255	,109	-,143	-,286	-,182	-,929**	-,500				
Muscle mass (кг)	-,109	-,109	,286	,143	,327	,786**	,357	-,857**			
Physique	,252	,168	,041	-,206	-,084	-,536	-,866**	,536	-,371		
Metabolic rate	-,109	-,109	,286	,143	,327	,786**	,357	-,857**	1,000**	-,371	
Bone mass density index	,000	,000	,355	,197	,401	,749*	,197	-,749*	,906**	-,273	,906**

According to the Spearman ranking method (Table 4), the 10-meter run correlates on average with the growth indicator ($r = 0.590$) and with the percentage of total fat in the body in the opposite direction and with the type of addition, lower than the average degree, respectively $r = - 0.443$ and $r = 0.285$.

Table 6: Spearman pair correlation table

Correlation by Sperman	10m running	30m running	Shuttle running 5*30M	Test «8» «eight»	Hight (cm)	Body mass	% total fat	% water	Muscle mass (кг)	Physique	Metabolic rate
30m running	,777*										
Shuttle running 5*30m	,587	,766*									
Test «8» «eight»	,407	,611	,690								
Hight (cm)	,590	,271	,299	,503							
Body mass (кг)	-,060	,000	,405	,476	,395						
% total fat	-,443	-,419	-,310	-,024	-,060	,619					
% water	,228	,168	-,262	-,333	-,275	-,976**	-,667				
Muscle mass (кг)	-,144	-,132	,333	,214	,359	,905**	,429	-,929**			
Physique	,285	,158	,126	-,252	-,095	-,693	-,945**	,693	-,441		
Metabolic rate	-,144	-,132	,333	,214	,359	,905**	,429	-,929**	1,000**	-,441	
Bone mass density index	,037	,037	,408	,284	,510	,840**	,259	-,840**	,964**	-,327	,964**

Conclusions

Running 30 m above the mentioned method very weakly correlates with the physical index of growth ($r = 0.271$) but with the index of the percentage of total fat in the body in the average degree and the opposite direction

with the value of the correlation coefficient, equal to $r = - 0.419$, and with other physiological indicators correlation was not observed.

The shuttle running 5 * 30 m according to Spearman’s rank correlation method had lower average connections

with the following physiological indicators: height, body weight, total fat percentage, muscle mass, metabolic rate and bone density index with corresponding correlation coefficients 0.299, 0.405, -0.310, 0.333, 0.333, 0.408.

Test «eight» to an average degree correlated with two physiological indicators. These indicators - growth ($r = 0.503$) and body weight ($r = 0.476$), and with two indicators - the percentage of water in the body and bone density index, weakly correlated with the corresponding correlation coefficients $r = -0.333$ and $r = 0.284$.

To develop the speed abilities of the players at the stage of advanced training to use the means of special physical training using a situational method. It is necessary to assess the data during the preparation.

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Conflict of Interest: Nil

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