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AGE FEATURES OF PHYSICAL DEVELOPMENT PARAMETERS AND COMPONENT COMPOSITION OF THE BODY OF YOUNG URBAN ATHLETES

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Abstract:

The article is devoted to the study of age-related features of the parameters of physical development and the component composition of the body of young urban athletes. It is shown that various types of sports specializations have a significant impact on the parameters of physical development and body composition of urban youths.

Keywords: sports anthropology, anthropometry, body composition, bioimpedance analysis, young athletes.

INTRODUCTION: The reason for the decline in the level of health of the population of Uzbekistan, as in many other countries, is called a sedentary lifestyle of the urban population. In this connection, in sports science, an integrated approach becomes the determining strategy in the selection of individuals for professional sports [3]. Therefore, it is necessary to study the main patterns of changes in the level of physical development and body composition at an early age, which are integrative indicators of the functional state of the child's body. Systematic physical loads that athletes experience in the course of their professional activities inevitably lead to various morphological and functional rearrangements of the body, the nature of which depends on the type, intensity and duration of the load [1-3]. Due to the fact that the level of physical performance is directly dependent on the parameters of the physical state, there is a need for an in-depth study of somatometric indicators of athletes. Monitoring of morphological and functional indicators allows revealing the mechanisms of adaptation to physical loads and is of great importance in assessing the degree of readiness of athletes for competitions and predicting sports results [4-7]. At the same time, the optimal values of these indicators for different sports differ to some extent [8]. In this regard, it is of considerable scientific and practical interest to study the characteristics of the physical condition of athletes subjected to physical loads of various intensity and volume. The purpose of the study is to study the age-related characteristics of the parameters of physical development and the component composition of the body of young urban athletes.

MATERIALS AND METHODS: From 2018 to 2022 278 boys and young men aged 9–18 years old studying in secondary educational schools in Namangan (188 students of a sports school and 90 secondary schools) were examined. Due to the small number of groups at annual intervals, all examined children and adolescents were divided into 3 age groups (Table No. 1).

Table No. 1
Age groups and number of examined schoolchildren

Age group	Number	Athletes	Non-athletes
9–12 years old, primary school age	76	46	30
13–15 years, adolescence	118	88	30
16–18 years old, senior school age	84	54	30
Total	**278**	**188**	**90**

All types of physical activity are divided according to the intensity of loads into very high, high, medium and low intensity. It should be borne in mind that the factors limiting performance depend on the type of physical activity, which can be divided into 5 main groups according to the classifications of sports [6]: game sports, martial arts, cyclic sports, speed-strength and difficult - coordination. Therefore, according to the specifics and intensity of loads, the study took into account representatives of several sports, namely: game types (1), martial arts (2), cyclic types (3), complex coordination (4), as well as the control group (5), including schoolchildren who do not go in for sports (Table No. 2).

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Table No. 2
Группы испытуемых в зависимости от спортивных специализаций

Groups	Name of groups	Sports
1	Game types	Basketball, volleyball, football, tennis, etc.
2	Martial arts	Various types of wrestling (judo, freestyle, taekwondo, boxing, etc.)
3	Cyclic events	Athletics, cycling, etc.
4	Difficult-coordinating	Gymnastics, archery, etc
5	Control group	Schoolchildren not involved in sports

Table 3 shows the number of examined children and adolescents, representatives of various sports, taking into account age periodization.

Table #3
The number of examined children and adolescents, representatives of various sports, taking into account age periodization

Name of groups of sports specializations	Groups	Groups of boys			Total
		Jr school age	Adolescent your age	Older school age	
Game types	1	12	30	14	56
Martial arts	2	14	24	20	58
Cyclic views	3	10	16	10	36
Difficult-coordinating	4	10	18	10	38
Control group	5	30	30	30	90
Total		76	118	84	278

All measurements were carried out according to the standard method adopted at the Research Institute of Anthropology, Moscow State University. M.V. Lomonosov [6]. The survey program included the following indicators: the height of anthropometric points above the floor; transverse dimensions of the body; girth dimensions; thickness of skin-fat folds; body mass.

To determine the parameters of the component composition, an AVS-01 Medass bioimpedance analyzer (NTC Medass, Moscow) was used. The measuring and current electrodes were superimposed according to the standard tetrapolar scheme. The following parameters were determined: fat mass (FM), active cell mass (ACM), muscle mass (MM), lean mass (TM), total body water (BW), extracellular fluid (ECF), basal metabolic rate (OB), specific metabolism (UO), phase angle (FU) [11-14].

Statistical analysis of the obtained results was carried out using the statistical package ≪STATISTICA 6.0≫. The analysis of primary data included standard statistical processing to obtain estimates of the main statistical parameters (X, S). In addition, a normalization procedure was used. This method allows you to unify the series by presenting individual measurements as their deviation from the group arithmetic mean in units of standard deviation, which makes it possible to compare the features of intragroup differentiation regardless of age. In order to establish interdependencies between the studied indicators, methods of multivariate statistical analysis were used. To assess the reliability of intergroup differences in determining the physical development and body composition of subjects involved in various sports, the method of one-way analysis of variance (one-way ANOVA) was used [6].

Results and discussion: Of greatest interest is the comparison of the data obtained by age periods, as well as the identification of the influence of various sports on the body of children and adolescents.

Total body measurements. Among the considered morphological indicators, body length, body weight, waist and hip circumferences, body mass indices and waist/hip index express data on the total body size [5]. Statistical data of these signs by sports groups are given in Table No. 4.

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Table No. 4
Basic statistical indicators (X, S) of body size in children and adolescents, depending on sports specialization

Groups of boys/ Sports	N	Body length (cm)		Body weight (kg))		BMI (kg/m2		Waist (cm)		Hip (cm)		Index waist hips	
		X	S	X	S	X	S	X	S	X	S	X	S
Primary school age:	46	148,8	7,4	42,5	8,4	19,2	2,3	64,2	5,4	77,2	5,9	0,8	0,0
Game types	12	145,0	0,0	42,2	1,8	20,4	0,8	65,4	0,7	78,9	0,6	0,9	0,0
Martial arts	14	154,0	11,4	45,1	10,9	19,7	3,1	65,0	7,1	77,5	8,2	0,8	0,0
Cyclic species	10	158,0	13,1	50,1	12,7	20,1	2,2	66,0	6,5	81,4	8,9	0,8	0,0
Difficult-coordination	10	147,1	5,3	41,0	8,1	19,0	2,3	63,9	6,1	78,2	5,0	0,8	0,0
Control group	30	140,0	7,1	34,1	8,5	17,0	2,9	60,7	6,6	71,6	7,3	0,9	0,0
teenage age	88	157,7	10,9	49,0	11,7	19,9	3,4	67,9	8,4	81,5	8,5	0,8	0,1
Game types	30	165,1	11,2	55,9	12,1	21,0	3,2	69,9	7,0	85,9	7,9	0,8	0,0
Martial arts	24	156,9	12,6	51,1	13,8	20,9	3,9	68,4	8,2	81,5	9,4	0,8	0,1
Cyclic species	16	152,8	12,4	42,0	9,2	18,1	2,8	64,0	8,0	75,4	8,0	0,8	0,1
Difficult-coordination	18	154,2	8,5	46,8	12,6	19,9	4,0	69,8	11,9	80,0	9,7	0,9	0,1
Control group	30	159,5	9,9	49,1	10,7	19,6	3,2	67,4	7,0	82,4	7,4	0,8	0,0
senior school age	54	167,2	7,3	57,5	9,3	20,5	2,7	70,2	6,0	87,1	5,3	0,8	0,0
Game types	14	171,6	6,0	58,4	6,7	19,8	2,0	69,9	4,2	87,5	3,4	0,8	0,0
Martial arts	20	166,0	7,1	58,4	10,3	21,1	3,0	70,3	5,9	87,1	5,9	0,8	0,0
Cyclic species	10	164,7	8,1	57,6	11,5	21,2	3,6	71,5	11,3	86,7	5,8	0,8	0,1
Difficult-coordination	10	168,7	5,2	59,7	1,7	21,0	0,7	70,2	0,5	87,7	0,2	0,8	0,0
Control group	30	166,6	7,3	55,9	9,0	20,1	2,6	70,1	6,2	87,1	5,5	0,8	0,0

Table No. 4 shows that in children of primary school age (9–12 years old) involved in cyclic sports, the highest parameters of total body dimensions are determined (body length - 158 cm, body weight - 50.1 kg, waist circumference 66 cm , thigh girth 81.4 cm), compared with boys from other groups who had lower indicators of physical development (body length - 140.0-154.0 cm, body weight - 34.1-45.1 kg, waist circumference 60.7-65.0 cm, hip circumference - 71.6-78.9 cm). The average parameters of total body sizes in children of primary school age were as follows: body length - 148.8, body weight - 42.5, waist circumference 64.2 cm and hip circumference 77.2 cm.

In adolescence (13-15 years), representatives of team sports have higher parameters of physical development (body length - 165.1 cm, body weight - 55.9 kg, waist circumference 69.9 cm, hip circumference 85.9 cm) , compared with similar indicators of peers from other sports groups. And the average parameters of physical development in adolescence were as follows: body length - 157.7, body weight - 49.0, waist circumference 67.9 cm and hip circumference 81.5 cm.

At senior school age (16–18 years old), young men of game and complex coordination types are distinguished by high parameters of physical development (body length - 171.6 and 164.7 cm, body weight - 58.4 and 59.7 kg, waist circumference - 69.9 and 71.5 cm, thigh circumference 87.5 and 87.7 cm). Compared with the data of the surveyed from other groups in this age group.

According to the results of the ANOVA analysis of variance, significant differences ($p<0.005$) between the compared sports groups of boys were expressed for these characteristics.

The highest indicators reliably ($p<0.005$) are characterized by young men involved in playing sports and martial arts, and the lowest - by children of the control group who do not go in for sports (Table No. 4).

Asis known, the size and growth rate, on the one hand, are regulated by hereditary factors, and on the other hand, they develop under the influence of the environment [6–8]. Many works have proven the

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hypothesis that practicing one or another sport has a significant impact on physical development [3,9]. As the results of the analysis of variance show, significant differences ($p<0.001$) in body length were found between representatives of the compared groups of children throughout the entire age range.

The intensity of the growth process in all considered groups is different ($p<0.001$). Boys in playing sports have the greatest growth increase at the age of 10–11 and 16–17 years. Boys involved in cyclic, complex coordination sports and martial arts enter the phase of intensive growth earlier, at the age of 9–10. Stabilization of the growth process is observed in children involved in martial arts, from 10 to 15 years old, in representatives of cyclic types - from 11 to 15 years old, in representatives of playing and complex coordination types - from 13 to 16 years old. The increase in body length in the boys of the control group occurs up to 15 years, that is, after 15 years, they have a relative stabilization of growth.

Based on the presented data, it can be concluded that in male athletes, the 2nd phase of accelerated growth is observed after 15 years, when in non-athletes, after passing the peak of the growth rate, body length stabilizes.

Bioimpedance analysis of body composition. Bioimpedance analysis of body composition is the right way to an ideal figure.

Bioimpedance is a diagnostic method that allows assessing the absolute and relative values of body composition parameters, as well as the body's capabilities and the risks of developing certain diseases.

Table No. 5 presents the main statistical parameters (X, S) of bioimpedance analysis (BIA) indicators in the examined boys and young men (9–18 years old).

When analyzing the main statistical parameters of the body composition in children and adolescents aged 9–18 years (table No. 5), depending on sports specializations, lower values of a number of indicators were determined compared to the ranges of normal values developed by the STC MEDASS, program ABC-01-036 [9,12,13]. A decrease in specific metabolism, along with an increase in the value of extracellular fluid (ECF), was revealed in adolescents and senior schoolchildren - representatives of playing and complex-coordinating sports and the control group.

Table No. 5
Main statistical indicators (X, S) BIA of body composition in children and adolescents (9–18 years old), depending on sports specializations

Indicators BIA	**FU (deg.)**		**ZhM (kg)**		**AKM (kg)**		**MM (kg)**		**TM (kg)**		**Water (kg)**		**VKL (kg)**		**Main. exchange (kcal)**		**Udel. exchange (kcal/m2)**	
normal range values [10]	5,4–7,8 (град.)		6,8–13,5 (кг)		22,4–34 (кг)		19–31 (кг)		40,6–61,8 (кг)		29,7–45,1 (кг)		11,9–18 (кг)		1296–1550 ккал		883–974 (ккал/м2)	
Youth groups	X	S	X	S	X	S	X	S	X	S	X	S	X	S	X	S	X	S
Junior school age																		
game types	5,1*	0	10	3	15	0	16*	1	31*	1	23*	1	16	1	1091	8	878*	15
martial arts	6,1	1	7	2	21	7	22	7	38*	10	28*	8	13	4	1265	209	927	57
Cyclic Views	6,2	1	8	2	23	8	24	8	41	12	30	9	15	2	1337	268	915	46
Difficult-coordinate	4,9*	0	9	3	15	2	17*	3	31*	5	23*	3	16	3	1076	73	858*	39
Control	4,8*	0	7	4	13*	3	14*	3	27*	5	20*	4	14	3	1013	88	907	68
Adolescence																		
game types	5,8	1	9	5	25	5	27	4	46	7	34	5	22*	4	1392	144	868*	62
martial arts	6,1	1	8	5	23	7	24	6	42	9	31	8	16	4	1342	210	916	53

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Cyclic Views	5,6	1	6	4	19*	5	21	6	36*	8	26*	6	16	5	1204	142	906	60
Difficult-coordinate	5,3*	1	8	6	19*	5	22	5	38*	8	28*	6	19*	4	1216	151	871*	54
Control	5,2*	1	9	5	20*	4	23	4	40*	7	29*	5	20*	3	1237	142	841*	53
senior school age																		
game types	6,0	1	9	3	27	4	29	2	49	5	36	4	23*	2	1457	119	859*	60
martial arts	6,6	1	8	4	28	5	30	4	50	7	37	5	21*	4	1504	155	916	59
Cyclic Views	6,3	0	10	7	26	5	28	4	47	8	35	6	21*	3	1440	144	890	52
Difficult-coordinate	6,2	0	9	4	28	3	30	3	51	6	37	4	23*	3	1489	93	884	18
Control	6,1	1	10	5	25	4	28	3	46	6	34	5	21*	3	1408	132	868*	48

* - Deviations from the population ranges of normal values developed by STC MEDASS, program ABC-01-036 [1, 10].

Also, a decrease in the values of active cell mass (ACM), lean mass (TM) and total body water (TOB) in adolescent boys, representatives of cyclic sports was determined. It should be noted that children and adolescents in the control group show a decrease in a number of indicators: phase angle and muscle mass (MM), active cell mass (ACM), lean mass (TM), total body water (TOW), and specific metabolism (SW) (table No. 5). Deviation from population norms is very often associated with increased risks: excessive development of adipose tissue is characterized as obesity, muscle tissue as hypertrophy of muscle tissue, and excess fluid as edema. And, conversely, with low values of adipose and muscle tissues, they speak of exhaustion and protein-energy insufficiency, with a lack of fluid, dehydration of the body. The body mass index scale helps to understand how the value of the estimated fat mass of an individual corresponds to the "typical", "population average" physique and distribution of body composition components.

The Total Body Fluid Scale is used to assess hyper- and hypovolemia. However, it should be remembered that the fluid content is maximal in the skeletal muscle mass and internal organs, and with increased values of lean mass (TM), increased values of total body water (TOW) should be considered normal. And, conversely, at low values of TM, values below the middle of the normal interval should be considered normal [3,4,9].

In children of primary school age involved in cyclic sports, high values of body composition parameters were determined (FU - 6.2o, AKM - 23 kg, MM - 24 kg, TM - 41 kg, OVO - 30 kg, OB - 1337 kcal), compared with representatives of other groups who had low body composition indicators (FU - 4.8-6.1o, AKM - 13-21 kg, MM - 14-22 kg, TM - 27-38, OBO - 20-28 kg, OB - 1013–1265 kcal) (Table No. 5).

In adolescence, young men involved in team sports showed high values of body composition parameters (FU - 5.8o, AKM - 25 kg, MM - 27 kg, TM - 46 kg, OVO - 34 kg, OB - 1392 kcal), compared with similar indicators of their peers from other sports groups.

In boys of senior school age involved in martial arts and complex coordination sports, high values of body composition parameters were determined (FU - 6.6 and 6.2o, AKM - 28 kg for athletes of both groups, MM - 30 kg for athletes of both groups, TM - 50 and 51 kg, OVO - 37 kg for athletes of both groups, OB - 1504 and 1489 kcal). Compared with the surveyed athletes from other groups in this age range (Table No. 5).

Based on the results of the analysis of variance, significant differences ($p<0.001$) in body composition values between the compared groups of children and adolescents are determined. It should be noted that single combat athletes have the highest parameters of the body composition, which reflects the high motor activity and good physical performance of athletes. On the contrary, in the examined children and adolescents of the control group, low values of body composition parameters are determined.

CONCLUSION: The results of the study show that sports specialization has a significant impact on the

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physical development of boys and young men. Boys and youths involved in team sports are characterized by high stature and leptomorphic body type. In adolescence, high values of body composition (phase angle, AKM, MM, TM, RVO, OB) are revealed compared to those of their peers from other groups, with the exception of such signs as extracellular fluid and specific metabolism.

Young wrestlers are characterized by lower growth compared to representatives of team sports, large chest girth, as a brachymorphic body type.

It should be noted that martial arts athletes have the most adequate parameters of the body composition (FM, AKM, MM, TM, OVO, OO), without deviations from the range of normal values, except for an increased ECL at an older age.

In general, young athletes of cyclic sports have average values of indicators of physical development and body composition, compared with peers from other groups. At the same time, they have reduced values of AKM and RVO in comparison with the range of normal values [10]. Although representatives of complex-coordination sports have the lowest values of physical development indicators compared to other groups of subjects, it is important that at an older age they have high values of body composition parameters (FU, AKM, MM, TM, VKL, GVO, OB). Representatives of the control group who do not go in for sports have the lowest values of indicators of physical development and body composition parameters (FU, AKM, MM, TM, VKZH, GVO, OB). Bioimpedance analysis showed that athletes significantly differ from the average statistical population norm in terms of body composition.

It should be noted that sports have a positive impact on the formation of body composition and health indicators of children and youth.

The study of the component composition of the body in young athletes seems to be especially promising in the monitoring mode for assessing their functional state, physical development, as well as the adequacy of the applied physical loads during training microcycles. The analyzed characteristics of the component body composition of athletes should also be used to predict sports results and selection for various sports.

The data obtained confirm the expediency of using in comparative studies, first of all, relative values, as the most informative and indicative in assessing the physical condition of urban athletes.

In the future, body composition and health indicators of these groups of children should be considered in more detail, or a new range of normal body composition values for the urban young generation should be developed.

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