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Features of Individual and Typological Indicators of Physical Development of Young Athletes of the Republic Sakha (Yakutia)

ABSTRACT. The comparative analysis of indices of individually typological constitutional peculiarities of athletes and male teenagers not involved in sport was carried out. The results revealed that athletic trainings do not affect anthropometric indices, Caucasian boys are more advanced than their Mongoloid peers in physical development ($p < 0,05$). Higher prevalence rate of Kettle and Rohrer's indices at athletes as well as normal BMI and best indicators of heart rate, blood pressure and vital capacity were noted among athletes as compared with the another group.

Keywords: physical development, young athletes.

INTRODUCTION. A morphological and functional characteristic of the organism is now considered as one of the indicators of individual health [2].

It is now important to study features of physical development in assessing the state of health of the child population, as it reflects the formation of morphological and functional properties of an organism [4].

The status of physical development allows to characterize the level of health, to predict the further development of children and teenagers to determine their willingness to work and sports life, to conduct rational planning of training loads of physical culture and sports in different groups of physical education [4].

There is a view that somatic indicators may evolve under the influence of sports, and sports specialization exerts modifying effects on skeletal figures, as well as girths of the body [1].

The aim of this study is to compare features of individual and typological characteristics of the organism of young athletes and adolescents not involved in sports.

MATERIALS AND METHODS

The study was conducted on the basis of the health and recreation center of the Institute of Physical Culture and Sports of North-Eastern Federal University named after MK Ammosov. The observation was held in 2 groups of male adolescents aged 16. The main group consisted of 93 young athletes, professional athletes of Sport School №5. Sports experience was ranged from 2 to 4 years. Control group consisted of 49 apparently healthy teenagers, without bad habits, not involved in sports, but attending physical education lessons in secondary school.



Examination included anthropometric research methods, the definition of somatotype by Eysenck, the calculation of the index of skeletons; study of muscle, bone and adipose tissue, blood pressure (BP), heart rate (HR), hand muscle strength, vital capacity (VC) according to conventional techniques.

The statistical processing has been performed using the software package IBM SPSS Statistics 21.

RESULTS AND DISCUSSIONS

The comparative analysis of the physical development of young people not involved in sports shows no significant differences between the physical developments (Table 1). Athletes' chest excursion is less than 12.3%, with higher rates of chest circumference.

The analysis comparing the two groups of adolescents of different race showed that Caucasian boys outperform their peers of the Mongoloid race in the physical development. Teens-Mongoloids lag behind in terms of body weight by 13.7% ($p=0,003$), growth of 4.8% ($p=0,05$) in the study group; in the control group - by 15.2% ($p=0,003$) and 3.2% ($p=0,05$) respectively. Based on the research results, we can say that sports do not affect human somatotype as growth – size is genetically determined by 90-95%.

The investigation of constitution in terms of muscle, fat and bone components showed that in the main group the component of the muscle is on average 6.5% ($p=0,000$) higher and fat is 28.1% ($p=0,000$) lower than in the the control group (Table 2). Kettle's and Rohrer's indexes of overall weight and growth are indicators of changes under the influence of training. Kettle's and Rohrer's indexes are higher in athletes than in young men not involved in sports (Table 2).

The analysis of calculated rates of different ethnicity in the control group showed that the index of Kettle and Rohrer in Caucasian boys is higher than that of the Mongoloids. In the main group the study of type of constitution showed increased muscle and decreased fat components as compared with the control group of the Mongoloid race. It was noted that the relative weight of the fat component of the Caucasian athletes is 32.3% ($p=0,000$) higher than in the control group of peers of the same race.

The analysis of functional parameters revealed that athletes have the best indicators of heart rate and vital capacity, and optimum normal blood pressure for their age (Table 3).

The analysis of somatotype by Eysenck revealed dolihomorphic (56.9%) and mesomorphic (40.8%) body types among athletes with normal body mass index (59.1%). The results of the studies of teenagers not involved in sports showed that most of them have dolihomorphic body type (71.4%) with low body weight (59.1%).



CONCLUSION

The comparative analysis of the physical development of healthy young men aged 16 not involved in sports and young athletes suggests that athletic training does not affect anthropometric indices: Caucasian boys are more advanced in the physical development than their peers of the Mongoloid race ($p < 0.05$). The indicators of Kettle and Rohrer's indices are higher in the group of athletes than in the comparison group. In addition, the best indicators of heart rate, blood pressure and vital capacity have been marked in teenagers involved in sports.

The study also found that the body mass index is significantly different in comparison groups ($p < 0.01$). Thus, normal BMI is more common in athletes (59.1%). For teenagers who are not involved in sports - BMI is below normal (59.1%).

Among the athletes there are boys with dolichomorphic and mesomorphic body types. Teens who do not exercise have dolichomorphic body type.

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Table 1.

Comparative characteristics of anthropometric indicators of athletes and young people not involved in sports, different ethnicity

Anthropometric indices	p	Core Group, M + m			The control group, M + m		
		Total (n=93)	Mongoloid race (n=59)	Caucasian race (n=34)	Total (n=49)	Mongoloid race (n=31)	Caucasian race, (n=18)
1. The body mass	$P_{1=0,003}$	61,19±9,38	58,29±7,09*	67,57±12,11	59,85±10,33	56,79±6,79	66,95±13,51
2. Height	$P_{1=0,05}$	171,06±7,54	168,46±6,86*	177,01±6,26	172,08±6,81	170,45±6,7*	176,14±6,26
3. Body length	$P_{1=0,016}$	90,91±4,31	90,05±4,05*	93,07±3,96	90,39±4,03	89,92±4,22	91,41±3,49
4. Arm's length	$P_{1=0,006}$	75,02±3,63	74,15±3,57*	77,21±3,29	76,26±3,27	75,76±3,04	77,55±3,75
5. Leg's length	$P_{1=0,000}$ $P_{2=0,015}$	87,93±5,69	86,16±4,92*	92,55±5,6	90,26±4,97	89,16±4,05**	93,36±4,65
6. The body mass index		20,83±2,12	20,51±1,86	21,45±2,83	20,15±2,78	19,54±2,04	21,52±3,79
7. Girth of chest	$P_{1=0,002}$ $P_{2=0,021}$	87,46±5,71	86,39±4,97*	89,86±7,24	84,82±6,17	82,63±4,41*	89,75±6,62
8. Inhalation	$P_{1=0,002}$ $P_{2=0,019}$	91,76±5,75	90,66±5,21*	94,07±6,86	88,99±5,89	86,85±4,48*	93,82±6,03
9. exhalation	$P_{1=0,004}$ $P_{2=0,000}$	85,29±5,52	84,32±4,51*	87,45±7,31	81,61±5,96	79,5±4,24*	86,25±6,85
10. Excursion		6,47±1,95	6,34±2,07	6,62±1,94	7,38±2,11	7,34±2,19	7,57±2,14

Wherein M - means value, m - standard deviation

Note. * - P1 differences between the races paired in the same group; ** - P2 differences between groups of the same race, *** - differences with the control group

Table 2

Estimated young athletes and young men are not involved in sports, different ethnicity

Estimate	P	Core Group , M±m			Control group , M±m		
		Total (n=93)	Mongolo id race (n=59)	Caucasian race (n=34)	The total (n=49)	Mongolo id race (n=31)	Caucasian race (n=18)
The area of the body	P₁=0,01	1,72±0,16	1,67±0,13*	1,85±0,17	1,72±0,15	1,67±0,12*	1,83±0,17
Kettle's index		356,68±43,40	345,44±34,23	380,49±58,4	346,98±52,49	332,84±35,1	379,36±70,95
Life index		63,00±10,55	63,77±10,78	61,65±10,29	62,72±10,02	64,2±9,74	58,4±9,53
Chest index	P₂=0,001	51,15±2,89	51,32±2,74**	50,75±3,4	49,32±3,37	48,53±2,89	50,99±3,76
Defatted mass index	P₂=0,000	1,09±0,11	1,1±0,11**	1,08±0,10	1,00±0,11	0,99±0,10	1,01±0,12
Rel. Bone mass component		18,72±1,76	19,05±1,79	19,31±1,82	19,30±2,10	19,68±2,02	18,46±2,24
Rel. mass of the fat component	P₁=0,05 P₂=0,000 P₃=0,000	10,49±3,17** *	10,11±3,2**	10,91±3,16**	14,59±4,96	13,77±3,45*	16,12±7,24
Rel. muscle mass component	P₂=0,000 P₃=0,000	50,52±2,90** *	50,67±2,39**	50,82±3,28	47,26±3,97	46,7±3,49	48,37±4,37
Rohrer's index	P₂=0,011	1,22±0,12	1,22±0,12**	1,21±0,14	1,17±0,16	1,15±0,13	1,22±0,21

Wherein M - means value, m - standard deviation

Note. * - P1 differences between the races paired in the same group; ** - P2 differences between groups of the same race; *** - P3 differences with the control group

Table 3

Comparative characteristics of the functional parameters of athletes and young men are not involved in sports

Functional indices	P	Basic group, M±m			Control group, M±m		
		The total (n=93)	Mongoloid race (n=59)	Caucasian race (n=34)	Total (n=49)	Mongoloid race (n=31)	Caucasian race (n=18)
Heart Rate	P ₂ =0,027	71,03±9,16	70,56±7,85 **	71,65±11,82	76,12±9,73	76,16±7,73	74,8±13,58
ADC		114,25±11,29	113,49±11,81	117,96±9,48	119,57±16,57	119,97±15,6	117,87±18,11
ADD		72,26±9,30	71,31±8,96	74,22±9,54	75,33±11,83	75,68±10,69	73,8±13,82
AD_puls		41,99±9,17	42,19±9,07	43,74±9,12	44,24±10,15	44,29±11,17	44,07±8,75
VC		3810,75±613,30	3 684,75±556,95	4095,65±667,75*	3693,88±532,45	3 616,13±515,17	3 833,33±601,98
The right hand strength	P ₁ =0,025	39,69±8,19	38,32±7,9	41,00±8,6	38,02±9,42	35,87±10,33*	42,8±5,72
The left hand strength	P ₁ =0,009	36,61±8,73	35,03±8,77	37,91±7,93	36,10±8,23	33,35±8,47*	41,47±5,19
Body force		118,04±21,33	117,02±19,87	114,52±22,26	116,10±27,20	119,32±30,99	112±19,57

In the main group of Caucasian athletes indicators of VC and wrist strength is higher than the indicators of the Mongoloid athletes.