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Comparative description of the level of physical development of primary school students on the basis of functional indicators of the cardiorespiratory system (on the example of andijan region)

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Abstract---In the modern world, much attention is paid to creating conditions for the healthy physical, mental and emotional development of children, which is a priority for the future of any society. Therefore, to carry out physiometric / anthropometric research and develop and implement a set of measures to strengthen their health in order to continuously monitor the level of physical development and health status of school-age children during education. In turn, it has scientific and practical significance in terms of the prevention of various diseases that are likely to occur (Kholmiraeva, Iskandarova, Zaynabiddinov, Khalilov, Ergash, Khushmatov, 2018).

Keywords---cardiorespiratory, morpho-functional, cardiovascular, stress, contraction frequency.

Introduction

Assessment of the functional state of the cardiovascular / respiratory system is important in terms of identifying trends in the health status and development of the younger generation and clarifying the influence of environmental factors on it (Korobko,2002) . Morpho-functional regulatory mechanisms that characterize the state of adaptation to the influence of various factors in primary school students are not fully developed, which in turn determines the specific responses of the cardiorespiratory system to the effects of “stress” factors associated with the educational process in school. In particular, some researchers have reported significant changes in the functional parameters of the cardiorespiratory system under the influence of stress in the learning process in primary school students (Chub,2013).

Materials and Methods

Between The research presented in the article is based on the secondary school No. 17 in Ulugnor district of Andijan region of the Republic of Uzbekistan, the secondary school No. 26 in Pakhtaabad district, the secondary school No. 4 in Marhamat district, the secondary school No. 30 in Andijan and Khanabad. was carried out in secondary schools No. 5 (Figure 1). In general, the territory of the republic in terms of altitude is *desert* (located at an altitude of 250-400 / 500 m above sea level), *hills* (located at an altitude of 400-500 to 1000-1200 m above sea level), *mountains* (1000-1200 / 2700 above sea level). - located at an altitude of 2800 m), *pastures* (located at an altitude of > 2700–2800 m above sea level) are classified into altitude climatic zones.

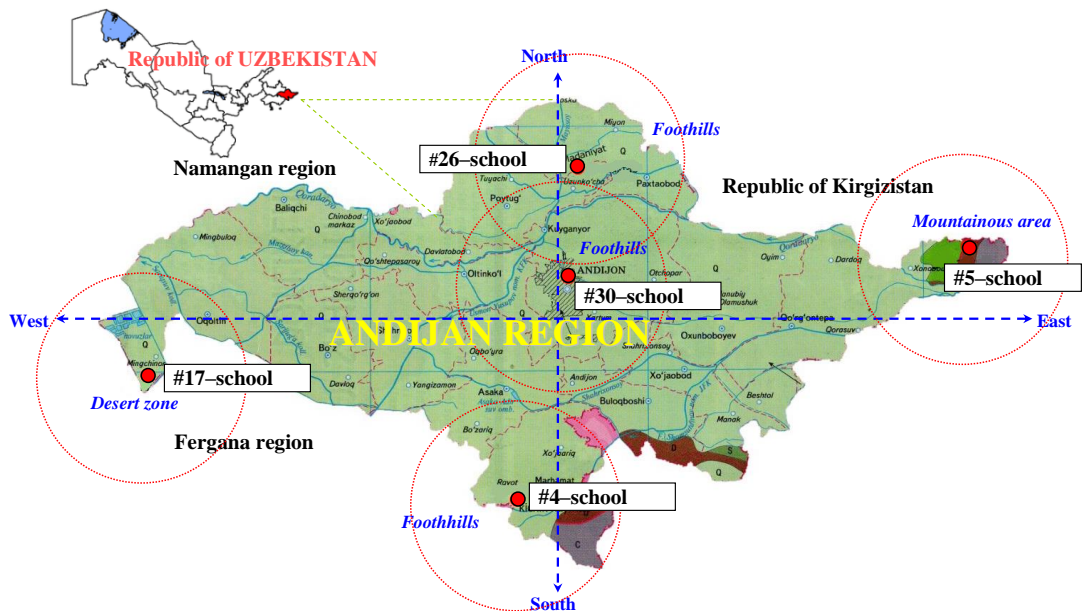


Figure 1. Map of the location of secondary schools where the study was conducted

The territory of Andijan region consists of plains, hills and mountainous climatic-geographical regions, the western and north-western part of which is located at an altitude of ~ 400-420 m above sea level (desert zone); The south-eastern part is located at an altitude of ~ 800-900 m above sea level (hill zone), as well as at an altitude of > 1000 m (mountain zone) (Soliev, 2014). According to some literature, the desert zone is classified into low desert (located at an altitude of 0-200 m above sea level) and high desert (located at an altitude of 200-500 m above sea level) (Hasanov, Gulomov, Qayumov, 2010). Mountain ranges at an altitude of 1000-2000 m above sea level - low mountains; ~ 2000-3000 m high mountains and 3000-5000 m high mountains are alpine mountains. The relief of the Fergana Valley, which also includes the Andijan region, is classified into the following stages according to the vertical elevation zones: 1st stage - 300-400 m above sea level; 2 - pagona - 400-600 m; Step 3 - 600-1200 m altitude. Currently, there are 740 secondary schools in Andijan region under the Department of Public Education.

Secondary school No. 17, where the study was conducted, is located on the territory of Mingchinor village, Ulugnor district, Andijan region. Ulugnor district is located in the western part of Andijan region (geographical coordinates: 40 ° 44 'N 72 ° 46' N) and was founded on December 26, 1973. It covers an area of 440 km² and has a sharp continental / subtropical climate. , the average air temperature in January is -4 ° C, in July +24 ... + 28 ° C, the average annual rainfall is 195-200 mm, the population is 47,300 people. Secondary school No. 26, where the study was conducted, is located on the territory of Madaniyat village, Pakhtaabad district, Andijan region. Pakhtaabad district is located in the north-east of Andijan region, has an area of 26,033 km², temperate climate, ~ 300 m above sea level, population 165,000 people (Uzbek, Kyrgyz, Tajik, Russian, Uyghur, Tatar).

Secondary school No. 30, where the study was conducted, is located on Navoi Avenue, Old City, Andijan. Secondary school No. 4, where the study was conducted, is located on the territory of Kichik Nayman village assembly, Marhamat district, Andijan region. Marhamat district is located in the southern part of Andijan region (coordinates of geographical location: 40 ° 30 'N 72 ° 20' N), was founded on 29.09.1926 (center is the city of Marhamat), area 320 km², northern and northern The eastern part is flat, the rest is mountainous (altitude ~ 1500 m above sea level), as well as in the south-western part there are Alay mountain ranges, Ulugtag and Tuyamoyin adyr region (altitude ~ 920 m above sea level). The Moylisoy adyr region is located in the northern part of the country. The climate is sharply continental, the average temperature in January is -2.9 ° C, in July + 26.1 ° C, the average annual rainfall is 218-320 mm, the population is 119,800 Uzbek, Kyrgyz, Russian, Tatar, Korean, Uyghur, Kazakh, Ukrainian nationalities). More than 28,000 students study in more than 40 secondary schools in Marhamat district. Secondary school No. 5, where the study was conducted, is located in the eastern part of the Andijan region, in the city of Khanabad (geographical location: 40 ° 48 'N 73 ° 00' N) in the village Topalina. The climate of Khanabad is subtropical, with a mountainous region at an altitude of ~ 603 m above sea level. The population of the city is 35,181 people (Uzbeks, Kyrgyz).

Results and Discussions

We In our study, the vital capacity (l) of the lungs of primary school students (7–11 years) was analyzed (Table 1).

Table 1
Values of lung capacity (l) in primary school students in some schools of Andijan region of the Republic of Uzbekistan ($M \pm m$)

Ulugnor district		Secondary school No. 17 located in									
		Boys (n=85)					Girls (n=79)				
Lung vital capacity (l)	7 years old (n=19)	8 years old (n=21)	9 years old (n=16)	10 years old (n=17)	11 years old (n=12)	7 years old (n=16)	8 years old (n=12)	9 years old (n=19)	10 years old (n=18)	11 years old (n=14)	
	1,15± 0,03	1,18± 0,04	1,22± 0,04*	1,51± 0,06**	1,60± 0,07**	1,10± 0,06	1,14± 0,05*	1,19± 0,08**	1,23± 0,09**	1,32± 0,06**	
	Secondary school No. 26, located in Pakhtaabad district										
	Boys (n=90)					Girls (n=82)					
	7 years old (n=16)	8 years old (n=19)	9 years old (n=11)	10 years old (n=21)	11 years old (n=23)	7 years old (n=17)	8 years old (n=16)	9 years old (n=12)	10 years old (n=24)	11 years old (n=13)	
	1,24± 0,04	1,41± 0,03	1,46± 0,06*	1,54± 0,04**	1,63± 0,05**	1,18± 0,05	1,20± 0,07*	1,28± 0,04**	1,39± 0,07**	1,41± 0,06**	
	Secondary school No. 4 located in Marhamat district										
	Boys (n=76)					Girls (n=88)					
	7 years old (n=14)	8 years old (n=18)	9 years old (n=12)	10 years old (n=13)	11 years old (n=19)	7 years old (n=11)	8 years old (n=22)	9 years old (n=17)	10 years old (n=23)	11 years old (n=15)	
	1,25± 0,05	1,34± 0,05	1,36± 0,05*	1,44± 0,07**	1,65± 0,06**	1,12± 0,04	1,18± 0,03*	1,21± 0,03**	1,32± 0,04**	1,38± 0,05**	
	Secondary school No. 30 in Andijan										
	Boys (n=82)					Girls (n=78)					
	7 years old (n=14)	8 years old (n=12)	9 years old (n=18)	10 years old (n=20)	11 years old (n=18)	7 years old (n=16)	8 years old (n=11)	9 years old (n=17)	10 years old (n=22)	11 years old (n=12)	
	1,37± 0,05	1,55± 0,04	1,68± 0,08*	1,70± 0,08**	1,73± 0,07**	1,23± 0,06	1,45± 0,08*	1,64± 0,04**	1,68± 0,05**	1,71± 0,08**	
	Secondary school No. 5 in Khanabad										
	Boys (n=87)					Girls (n=84)					
7 years old (n=19)	8 years old (n=14)	9 years old (n=24)	10 years old (n=13)	11 years old (n=17)	7 years old (n=14)	8 years old (n=17)	9 years old (n=18)	10 years old (n=16)	11 years old (n=19)		
1,37± 0,04	1,44± 0,04	1,76± 0,07*	1,84± 0,08**	1,87± 0,04**	1,26± 0,06	1,34± 0,04*	1,58± 0,05**	1,70± 0,06**	1,76± 0,08**		

Note: Represents the level of statistical reliability of the difference between the values of other experimental groups (II, III, IV and V) in relation to experimental group I (7 years) (* - $r < 0.05$; ** - $r < 0.01$).

Based on the results of the study, it was observed that the vital capacity of the lungs (l) in primary school students in the surveyed schools increased linearly in the range of 7–11 years. Studies have shown that the rate of increase in lung vital capacity (l) in primary school students (7–11 years) in №17 schools is 39.2% in boys aged 7–11 years, 6.1% in 7–9 years, and 9–11 years. was found to be 31.2%. The value of this indicator was found in girls - 20%, 8.2% and 10.9%, respectively. The study also found that the rate of growth of lung vital capacity (l) in primary school students in 626-school was 31.5% in boys aged 7–11 years, 17.7% in 7–9 years of age, and 11.6% in 9–11 years of age. %. The value of this indicator in girls was 19.5%, 8.5% and 19.6%, respectively. The rate of growth of lung vital capacity (l) in primary school students in the next №4-school is 32% in boys aged 7–11 years, 8.8% in 7–9 years of age and 21.3% in 9–11 years of age. detected. The value of this indicator was 23.2%, 8% and 14%, respectively, in girls (Figure 2).

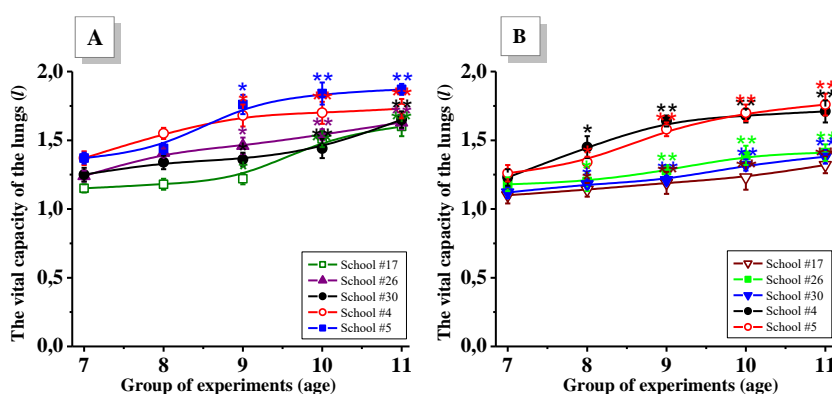


Figure 2. Dynamics of changes in the values of lung vital capacity (l) in the 7–11 age range in primary school students in the schools where the study was conducted. A. In boys. B. In girls. On the ordinate axis - the vital capacity of the lungs (l), on the abscissa axis - experimental groups (7–11 years) * – for control, $p < 0,05$, ** – $p < 0,01$

Studies have shown that the rate of growth of lung capacity (l) in primary school students in №30-school is 26.3% in boys aged 7-11 years, 22.6% in 7-9 years and 2.9% in 9-11 years was found to be The value of this indicator in girls was 39%, 33.4% and 4.3%, respectively. The rate of increase in lung vital capacity (l) in primary school students in school №5 was 36.5% in boys aged 7–11 years, 28.5% in 7–9 years of age, and 6.3% in 9–11 years of age. %. The value of this indicator in girls was 39.7%, 25.4% and 11.4%, respectively. In general, the dynamics of growth rate of pulmonary vital capacity (l) in primary school students (7–11 years) in secondary schools №17, №26, №4, №30 and №5 – shown in Figure 3.

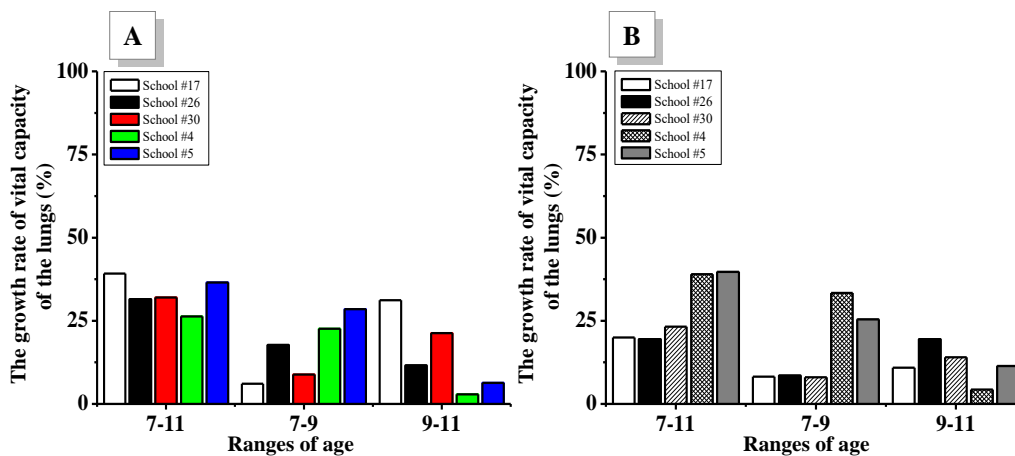


Figure 3. Growth rate of lung vital capacity (l) values in the 7–11-year-old range in primary school students in the schools surveyed. A. In boys. B. In girls. On the ordinate axis - the growth rate (%) of the value of the vital capacity of the lungs (l) is expressed

In particular, in primary school students (7–11 years) in schools №17, №26, №4, №30 and №5, the minimum-maximum (average) values of lung vital capacity (l) in boys were 1.15–1.28 (1.26) l; 1.18–1.55 (1.38) l; 1.22–1.76 (1.49) l; 1.51–1.84 (1.61) l and 1.60–1.87 (1.69) l, in girls - 1.1–1.26 (1.19) l, respectively; 1.14–1.45 (1.26) l; 1.19–1.64 (1.38) l; 1.23–1.68 (1.46) l; Vibration in the range of 1.32–1.76 (1.62) l was found. In the study, the lung capacity (l) in primary school students (7–11 years) in schools №17, №26, №30, №4 and №5 was linearly described in the sequence of schools located in desert, hill and mountain climatic zones. was found to be increasing. Significant differences in the values of this indicator were observed between №17-schools located in the desert zone and №5-schools located in the mountainous zone, where the minimum-maximum (average) values of lung capacity (l) of boys and girls in these schools respectively - by 1.15–1.28 (1.26) and 1.2–1.39 (1.36) times.

It is known that the functional state and reserve capacity of the cardiorespiratory system in the human body determines the degree of adaptation of the organism to physical loads, the formation of a purposeful response in changing environmental conditions (Kholmiraeva, Zaynabiddinov, Khalilov, Khushmatov, 2018). In the next phase of the study, indicators of functional activity of the cardiovascular system of primary school students - including heart rate (times / minute), systolic / diastolic blood pressure (mm s. U.) was studied on a comparative basis (Table 2).

Table 2
Functional indicators of the cardiovascular system of primary school students (7-11 years) in some schools of Andijan region of the Republic of Uzbekistan (M ± m)

Secondary school No. 17 located in Ulugnor district										
Indicators	Boys (n=85)					Girls (n=79)				
	7 years old (n=19)	8 years old (n=21)	9 years old (n=16)	10 years old (n=17)	11 years old (n=12)	7 years old (n=16)	8 years old (n=12)	9 years old (n=19)	10 years old (n=18)	11 years old (n=14)
Heart rate (times / minute)	95±4	92±4	89±3	84±5	79±4	93±4	93±2	85±5	83±3	82±5
Arterial blood pressure (mm s.u.): systolic; diastolic	101,4 ±5,8	101,8 ±4	104,6 ±6,6	102,3 ±8,8	100,5 ±4,7	103,3 ±4,4	102,5 ±6,6	101,5 ±5,4	104,4 ±4,8	104,8 ±5,2
	55,2±2,2	59,6±4,6	60,4±4	62,2±4,3	63,7±5,6	58,4±3,5	60,7±4,3	61,4±4,5	64,2±6,7	64,8±5,5
Secondary school No. 26, located in Pakhtaabad district										
Indicators	Boys (n=90)					Girls (n=82)				
	7 years old (n=16)	8 years old (n=19)	9 years old (n=11)	10 years old (n=21)	11 years old (n=23)	7 years old (n=17)	8 years old (n=16)	9 years old (n=12)	10 years old (n=24)	11 years old (n=13)
Heart rate (times / minute)	93±3	94±3	92±3	86±3	79±2	95±3	94±3	92±4	88±3	85±5
Arterial blood pressure (mm s.u.): systolic; diastolic	103,4 ±5,2	100,5 ±4,4	102,6 ±4,4	104,6 ±4,7	102,8 ±5,6	101,6 ±3,5	105,5 ±8,8	98,7±5,8	104,2 ±4,7	104,7 ±4,6
	60,4±3,6	64,4±5,3	65,3±5,2	65,7±4,4	64,1±3,8	61,2±4,6	63,5±4,4	65,5±4,8	63,7±5,7	65,3±5,2
Secondary school No. 4 located in Marhamat district										
Indicators	Boys (n=76)					Girls (n=88)				
	7 years old (n=14)	8 years old (n=18)	9 years old (n=12)	10 years old (n=13)	11 years old (n=19)	7 years old (n=11)	8 years old (n=22)	9 years old (n=17)	10 years old (n=23)	11 years old (n=15)
Heart rate (times / minute)	94±2	93±3	90±2	84±2	78±3	94±3	94±4	87±4	85±2	86±4
Arterial blood pressure (mm s.u.): systolic; diastolic	102,7 ±4,6	98,7±4,8	101,8 ±5,7	102,4 ±3,5	103,5 ±5,7	103,6 ±3,8	104,5 ±5,2	103,5 ±4,6	105,4 ±4,5	105,7 ±5,8
	58,6±2,7	65,2±4,5	63,9±3,7	64,8±2,4	65,8±3,6	60,7±3,9	62,7±5,5	64,3±4,7	65,2±5,8	67,4±4,6
Secondary school No. 30 in Andijan										
Indicators	Boys (n=82)					Girls (n=78)				
	7 years old (n=14)	8 years old (n=12)	9 years old (n=18)	10 years old (n=20)	11 years old (n=18)	7 years old (n=16)	8 years old (n=11)	9 years old (n=17)	10 years old (n=22)	11 years old (n=12)
Heart rate (times / minute)	93±4	94±5	90±3	84±3	80±4	93±5	90±3	88±5	86±3	85±5
Arterial blood pressure (mm s.u.): systolic; diastolic	102±3	102,7 ±5,6	103,8 ±4,7	102,4 ±5,5	101±6,8	102,6 ±4,6	105,5 ±5,5	104,5 ±3,8	104±5,9	104±4,7

s.u.): systolic; diastolic	59±3, 6	63±4, 8	64±3, 3	65,8± 5,5	65,9± 4,6	61±4, 4	63,7± 4,5	64,8± 4,8	66,3± 5,2	67,4± 6,8
Secondary school No. 5 in Khanabad										
Indicators	Boys (n=87)					Girls (n=84)				
	7 years old (n=19)	8 years old (n=14)	9 years old (n=24)	10 years old (n=13)	11 years old (n=17)	7 years old (n=14)	8 years old (n=17)	9 years old (n=18)	10 years old (n=16)	11 years old (n=19)
Heart rate (times / minute)	94±3	90±4	95±5	85±4	82±4	87±5	90±5	84±4	84±3	85±5
Arterial blood pressure (mm s.u.): systolic;	105,2 ±4,4	104,7 ±5,4	105,8 ±5,2	103,6 ±2,8	105,6 ±6,4	104,6 ±6	104,8 ±5,7	105,4 ±3	105,7 ,2	104,4 ±6,2
diastolic	61,5± 3,2	68,2± 5,6	68,9± 6,7	66,8± 4,4	67,7± 4,6	63,9± 5,7	65,7± 3,5	65,5± 4,9	66,3± 4,6	69±4, 5

Note: Represents the level of statistical reliability of the difference between the values of other experimental groups (II, III, IV and V) compared to experimental group I (7 years) (* – $p < 0,05$; ** – $p < 0,01$)

Studies have shown that the spectrum of heart rate (times / minute) in primary school students (7–11 years) in schools №17, №26, №4, №30 and №5 is 95–79, respectively, in boys; 93–79; 94–78; 93–80 and 94–82; in girls, respectively - 93–82; 95–85; 94–86; 93–85 and 87–85, respectively, with a linear decrease in heart rate in both sexes in the range of 7–11 years. It is noted that the anthropometric parameters of the human body change significantly during childhood under the influence of various factors (Kholmiraeva, Iskandarova, Zaynabiddinov, Khushmatov, 2018). For example, some researchers have studied the dependence of functional parameters of the respiratory system on environmental conditions based on the measurement of lung vital capacity (l) in primary school students using the method of spirometry. It was also noted that the vital capacity of the lungs in primary school students was 2.12–2.35 l in the control group, and in the case of scoliosis, this figure is significantly reduced (Abramova, 2013).

In the study, the value of blood pressure (systolic / diastolic) in primary school students (7–11 years) in schools №17, №26, №4, №30 and №5 (mm s. U.) In boys - 101, respectively. 4 / 55.2–100.5 / 63.7; 103.4 / 60.4–102.8 / 64.1; 102.7 / 58.6–103.5 / 65.8; 102 / 59–101 / 65.9 and 105.2 / 61.5–105.6 / 67.7. The value of this indicator in the sequence of schools for girls is 103.3 / 58.4–104.8 / 64.8, respectively; 101.6 / 61.2–104.2 / 65.3; 103.6 / 60.7–105.7 / 67.4; 102.6 / 61–104 / 67.4 and 104.6 / 63.9–104.4 / 69. The spectrum of heart rate (systolic / diastolic) readings (systolic / diastolic) (mm s.u.) of the heart rate obtained in the studies generally corresponds to the normative standard values. In particular, according to the available literature, in the range of 6–12 years, the heart rate is 78–100 beats per minute and systolic / diastolic blood pressure is 100–126 / 60–82 mm Hg. u. is defined as.

At the same time, there is no significant difference in the dynamics of the growth rate of blood pressure (systolic / diastolic) (mm s. U.) Within individual schools. However, an increase in arterial blood pressure (systolic / diastolic) was found in the desert zone compared to the №17-school in the mountain zone. In particular, the value of blood pressure (systolic / diastolic) in primary school students (7–11

years) in boys and girls in school №5 compared to №17-school - 1.03 / 1, respectively, in boys and girls. , 1.2 and 1.02 / 1.08 times higher, respectively.

Conclusion

In primary school students (7–11 years), a linear increase in lung capacity was observed in a series of desert, hilly, and mountainous areas. There was also a linear decrease in heart rate in primary school students (7–11 years) in schools №17, №26, №30, №4 and №5, as well as in the desert compared to school №17 in the desert. Arterial blood pressure (systolic / diastolic) was found to be 1.03 / 1.12 and 1.02 / 1.08 times higher in boys and girls in school №5, located in the zone. Currently, the WHO has developed general normative standards as a standard for indicators of physical development of children, but the researchers note the expediency of using regional normative standards in this area. It is noted that in different climatic and geographical zones, the rate of physical development of children and adolescents has a different intensity. Comparing the results of monitoring the level of physical development and fitness of children based on the dynamics of anthropometric / functional indicators with the values of standard norms in each age range allows to assess the compliance of the level of physical development and fitness with the average. In addition, based on the study of anthropometric indicators of the organism of children living in different geographical zones, to solve theoretical / practical problems of medical geography and human ecology, in connection with population migration, urbanization and environmental degradation, different climatic and geographical conditions it is possible to determine the mechanisms of morpho-physiological adaptation. Based on the results obtained, a differential approach is recommended based on the development of standards / norms of anthropometric indicators in primary school students (7-11 years), taking into account the influence of climatic and geographical factors in the development of a set of medical / pedagogical correction, preventive measures.

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