

Condition of physical health of pupils of the 7th-8th classes of the comprehensive school

Margarita Mameshina

Kharkiv State Academy of Physical Culture, Kharkiv, Ukraine

Purpose: to investigate the level of physical health of pupils of the 7th-8th classes.

Material & Methods: pupils of the 7th-8th classes of the comprehensive school No. 150 of Kharkov participated in the research. The following methods were used: theoretical analysis and generalization of scientific literature, method of express-assessment of physical health, mathematical statistics.

Results: the comparative analysis of the obtained data in age aspect and on gender sign is carried out; the general assessment of the level of physical health of pupils of the 7th-8th classes is defined.

Conclusions: the insignificant prevalence of indicators of the separate components of health of boys over the data of girls and, generally, the reliable improvement of indicators of pupils with age are established; the "average" level of physical health of pupils of the 7th classes and "below the average" level of pupils of the 8th classes are determined.

Keywords: physical health, physical development, pupils of middle classes.

Introduction

The relevance of this direction of the research is explained by the deterioration in situation concerning state of health of the population of Ukraine, and especially student's youth [1; 4; 5; 12; 16].

It is established by the researches that the number of pupils, who have different violations of nervous system, musculoskeletal system, cardiovascular and respiratory system, decrease in sight, and so forth, increases during study at school [7; 8; 11]. Experts consider the main reason of the low level of health of children and teenagers decrease in physical activity [2; 7; 8]. Authors specify that the level of physical activity decreases considerably during the period from 11 till 15 years old. In their opinion – it leads to the decrease in level of physical development, motive preparedness, and, as a result – aggravation of symptoms of health of teenagers [3; 4; 16].

The analysis of scientific literature demonstrates that the volume of physical activity of pupils of middle classes does not answer their biological norm [7]. It is known that sufficient physical activity, systematic physical culture classes are the powerful mean of mobilization of reserve opportunities of organism, increase in intellectual and physical working capacity, and prevention of deviations in the state of health of children [8; 16].

However experts consider that the modern system of physical training in general education educational institutions promotes not enough preservation and promotion of health of pupils [8; 11; 14]. It is necessary to look for new approaches to improvement of physical education for the increase in efficiency of the teaching-educational process in higher educational institutions. Number of researches is devoted to the solution of noted problem [3; 9; 10; 13; 19]. However, the analysis of scientifically-methodical literature demonstrates that the system of constant and dynamic observation on condition of physical health of pupils is not customized at the present

stage yet [8; 17]. There are few scientific works, which are devoted to the determination of the level of physical health of pupils in different regions of Ukraine [4; 6; 16; 18 but other]. In particular, the researches, which are devoted to studying of this question in the Kharkiv region, are revealed not enough. Therefore, the research of the level of physical health of modern pupils of Kharkiv School for the purpose of definition of need of correction of indicators of physical health means of physical culture is timely and urgent.

Communication of the research with scientific programs, plans, subjects

The research is carried out according to the thematic plan of the research work of Kharkiv state academy of physical culture for 2013–2015 on the subject 3.5.29 "Theoretical and applied bases of monitoring of physical development, physical fitness and physical condition of different groups of the population" and the Thematic plan of the research work, for 2016–2020 on the subject "Improvement of process of physical education in educational institutions of different profile" (No. of the state registration is 0115U006754).

The purpose of the research:

to investigate the level of physical health of pupils of the 7–8th classes.

Material and Methods of the research

The research of the level of physical health of pupils of middle classes was conducted on the basis of high comprehensive school No 150 of Kharkiv. Pupils of the 7–8th classes (47 boys and 56 girls) took part in it. The following methods were applied: theoretical analysis and generalization of scientific-literature, method of express-assessment of physical health, which is offered by S. D. Polyakov with coauthors [15], methods of mathematical statistics.

Results of the research and their discussion

The level of physical health of pupils of the 7–8th classes was investigated by the technique of express-assessment, which was developed by S. D. Polyakov with coauthors [15] by five indexes: Quetelet 2; Robinson, Skibinski, Shapovalova and Ruffie. For calculation of indexes were defined: length of body (sm) and body weight (kg), vital capacity of lungs (VCL) (ml), heart rate (HR) (bpm^{-1}), arterial pressure (AP) (mm of mercury), breath holding time, on usual breath (the test of Stange), the functional test of Ruffie – 30 squats for 45 s, the number of raising of trunk in sitting position without hands for 60 s.

The comparison of average values of separate components of health of pupils of the 7–8th classes on gender sign is presented in tab. 1. The analysis of data confirms generally about the insignificant prevalence of results of children over indicators of girls, however these differences are not reliable ($p > 0,05$). The exception are indicators of VCL, raising of trunk in sitting position in 1 minute, HR at rest (P_1) and after renewal (P_3), where the reliable prevalence of results of children over indicators of girls is revealed ($p < 0,05-0,001$).

The aged comparisons of average data of separate components of health of pupils of the 7–8th classes are presented in tab. 2. Comparing indicators in the aged aspect, it is established that results of pupils, improve generally with age and these differences are statistically reliable ($p < 0,05-0,001$). The exception is made by data of HR, VCL, AP_{diast} and breath holding time at children and results of AP_{diast} and breath holding time at girls where the doubtful aged growth of data is defined ($p > 0,05$).

The carried-out analysis of average values of index of Quetelet 2 that characterizes the degree of harmony of physical development and constitution of a body, (tab. 3) found out that 27,8% of boys and 45,5% of girls of the 7th classes and on average 13,0% of pupils of the 8th classes have deficiency of body weight; at pupils of the 7th classes (27,8% of boys; 18,2% of girls) and 8th classes (48,3% boys; 21,7% of girls) constitution of a body are harmonious; harmonious (+) and harmonious constitution of a body are defined at boys of the 7th (5,5%; 13,8%) and 8th classes (27,8%; 20,7%) and respectively at girls of the 7th (3,0%; 21,2%) and 8th classes (17,4%; 43,5%). The corpulent constitution (tab. 3) is noted

Table 1

Comparison of average values of separate components of health of pupils of 13–14 years old on gender sign

Indicators	Boys		Girls	t	p
	$\bar{X} \pm m$				
13 years old					
Length of body (sm)	1557,22±16,88		1548,48±14,42	0,39	>0,05
Body weight (kg)	45,33±2,02		44,21±1,68	0,43	>0,05
HR (bpm^{-1})	83,11±2,99		81,55±2,43	0,41	>0,05
VCL (ml)	2016,67±65,11		1703,03±63,04	3,46	<0,01
AP_{syst} (mm of mercury)	113,28±2,24		115,42±1,96	0,72	>0,05
AP_{diast} (mm of mercury)	73,83±1,76		75,42±1,24	0,74	>0,05
Breath holding time (s)	30,33±1,00		30,52±0,92	0,13	>0,05
HR for 15 s (times)	P_1	16,00±0,61	15,36±0,45	0,84	>0,05
	P_2	27,89±1,12	27,15±0,68	0,56	>0,05
	P_3	17,89±0,72	17,79±0,51	0,11	>0,05
Raising of trunk in sitting position in 1 minute (times)	44,56±0,63		41,33±0,57	3,77	<0,001
14 years old					
Length of body (sm)	1619,66±9,42		1595,65±18,10	1,18	>0,05
Body weight (kg)	50,97±0,97		48,57±1,04	1,69	>0,05
HR (bpm^{-1})	88,00±3,10		90,91±3,50	0,62	>0,05
VCL (ml)	2124,14±71,37		2113,04±75,60	0,11	>0,05
AP_{syst} (mm of mercury)	120,38±2,16		122,22±2,03	0,62	>0,05
AP_{diast} (mm of mercury)	77,07±1,71		77,70±1,45	0,28	>0,05
Breath holding time (s)	32,41±1,85		32,61±2,50	0,06	>0,05
HR for 15 s (times)	P_1	20,86±1,13	18,09±0,79	2,01	<0,05
	P_2	31,93±1,16	30,78±1,27	0,67	>0,05
	P_3	25,03±1,27	21,61±1,07	2,07	<0,05
Raising of trunk in sitting position in 1 minute (times)	37,41±1,86		37,00±1,23	0,19	>0,05

Note. P_1 – HR for 15 s at rest, P_2 – HR for the first 15 s of the renewal period after loading, P_3 – HR for the last 15 s of the first minute of renewal.

Table 2

Aged average values of separate components of comparison of health of boys and girls of the 7–8th classes

Indicators	Age		t	p	
	13 years old	14 years old			
	$\bar{X} \pm m$				
Boys					
Length of body (sm)	1557,22±16,88	1619,66±9,42	3,23	<0,001	
Body weight (kg)	45,33±2,02	59,97±0,97	2,51	<0,01	
HR (bpm ⁻¹)	83,11±2,99	88,00±3,10	1,14	>0,05	
VCL (ml)	2016,67±65,11	2124,14±71,37	1,11	>0,05	
AP _{syst} [*] (mm of mercury)	113,28±2,24	120,38±2,16	2,28	<0,05	
AP _{diast} [*] (mm of mercury)	73,83±1,76	77,07±1,71	1,32	>0,05	
Breath holding time (s)	30,33±1,00	32,41±1,85	0,99	>0,05	
HR for 15 s (times)	P ₁	16,00±0,61	20,86±1,13	3,79	<0,001
	P ₂	27,89±1,12	31,93±1,16	2,51	<0,05
	P ₃	17,89±0,72	25,03±1,27	4,89	<0,001
Raising of trunk in sitting position in 1 minute (times)	44,56±0,63	37,41±1,86	3,63	<0,001	
Girls					
Length of body (sm)	1548,48±14,42	1595,65±18,10	2,04	<0,05	
Body weight (kg)	44,21±1,68	48,57±1,04	2,20	<0,05	
HR (bpm ⁻¹)	81,55±2,43	90,91±3,50	2,20	<0,05	
VCL (ml)	1703,03±63,04	2113,04±75,60	4,17	<0,001	
AP _{syst} [*] (mm of mercury)	115,42±1,96	122,22±2,03	2,41	<0,05	
AP _{diast} [*] (mm of mercury)	75,42±1,24	77,70±1,45	1,19	>0,05	
Breath holding time (s)	30,52±0,92	32,61±2,50	0,79	>0,05	
HR for 15 s (times)	P ₁	15,36±0,45	18,09±0,79	2,98	<0,01
	P ₂	27,15±0,68	30,78±1,27	2,51	<0,01
	P ₃	17,79±0,51	21,61±1,07	3,22	<0,01
Raising of trunk in sitting position in 1 minute (times)	41,33±0,57	37,00±1,23	3,18	<0,01	

Note. P₁ – HR for 15 s at rest, P₂ – HR for the first 15 s of the renewal period after loading, P₃ – HR for the last 15 s of the first minute of renewal.

at 11,1% of boys (7th) and 3,4% (8th) classes and at 12,1% of girls (7th) and 4,4% of girls (8th) classes.

Comparing average values of the index of Quetelet 2 with the rating scale, which is presented by S. D. Polyakov with coauthors [15], it is established that data of pupils of the 8th classes and results of boys of the 7th classes answer the assessment 3 points, and indicators of girls of the 7th classes – the assessment 2 points. It demonstrates that pupils of the 7–8th classes have harmonious constitution of a body with deficiency of body weight.

Considering indicators of functional condition of the cardiovascular system of pupils of middle classes (Robinson's index), it is established that boys of the 7th classes (66,8%) and boys of the 8th classes (41,4%) and girls of the 7th and 8th classes have the greatest percent of indicators of "average" level of index of Robinson (51,5%; 43,5%) respectively; boys and girls of the 7th classes (5,5%; 21,2%) – above "average" and boys of the 8th classes (10,3%). The level below "average" of condition of the cardiovascular system is defined at

pupils of the 7th classes (11,1% of boys, 18,2% of girls) and at pupils of the 8th classes (17,2% of boys, 17,4% of girls) and only 5,5% of boys and 3,0% of girls of the 7th classes and pupils of the 8th classes (3,4% of boys and 4,3% of girls) have the "high" level of indicators of this index. Also it is established by researches that 11,1% of boys and 6,1% of girls (the 7th classes) and 27,7% of boys and 34,8% of girls of the 8th classes have violations of regulation of the cardiovascular system. Pupils with the "low" level of indicators of index of Robinson can be carried to the risk group with possible increase or lowering of arterial pressure (tab. 4) [17].

The comparison of average data of index of Robinson with the rating scale, which is presented by S. D. Polyakov with coauthors [15], demonstrates that results of pupils of 13–14 years old answer the assessment 2 points. Thus, it is established that pupils of the 7–8th classes have the level of condition of regulation of the cardiovascular system below "average".

Indicators of index of Skibinski (tab. 5) that characterize functionality of system of breath, firmness of organism to

Table 3

Ratios of indicators of constitution of a body of pupils by the index of Quetelet 2 (%)

Investigated pupils	n	Constitution of a body (points)					
		2 deficiency of body weight	4 harmonious (-)	5 harmonious	3 harmonious (+)	1 corpulent	
7 class	B	18	27,8%	27,8%	27,8%	5,5%	11,1%
	G	33	45,5%	21,2%	18,2%	3,0%	12,1%
8 class	B	29	13,8%	20,7%	48,3%	13,8%	3,4%
	G	23	13,0%	43,5%	21,7%	17,4%	4,4%

Table 4

Level of indicators of regulation of cardiovascular system of pupils of 7–8 classes (Robinson’s index) (%)

Classes	n	Low	Below the average	Average	Above the average	High	
7 class	B	18	11,1%	11,1%	66,8%	5,5%	5,5%
	G	33	6,1%	18,2%	51,5%	21,2%	3,0%
8 class	B	29	27,7%	17,2%	41,4%	10,3%	3,4%
	G	23	34,8%	17,4%	43,5%	0	4,3%

the hypoxic phenomena and strong-willed qualities indicate that the greatest percent (94,4% of boys, 72,7% of girls) the 7th classes and (69,6% of girls and 89,7% of boys) the 8th classes have “low” level; below “average” – pupils of the 7th classes (5,65% of boys, 18,2% of girls) and pupils of the 8th classes (6,9% of boys and 8,7% of girls) respectively. “Average” level of functionality of system of breath, firmness of organism to the hypoxic phenomena and strong-willed qualities is established at girls of the 7–8th classes (9,1%; 21,7%) respectively, and above “average” only at 3,4% of boys of the 8th classes.

Specifies comparison of average values of the index of Skibinski to the rating scale [15], that results of pupils of the 7–8th classes answer the assessment 1 point. It testifies to low functionality of the system of breath of pupils of 13–14 years old.

The analysis of data of the index of Shapovalova, which characterizes specific intensity of physical activity (tab. 6), showed the “high” level of 55,6% of boys and 9,1% of girls of the 7th classes and of 4,3% of girls and 17,2% of boys of

the 8th classes; above “average” – at pupils of the 7th classes (22,2% of boys and 9,1% of girls) and at pupils of the 8th classes (10,3% boys; 4,3% of girls), and “average” – at boys and girls of the 7th classes (22,2%; 66,7%) respectively and at pupils of the 8th classes (48,4% of boys; 8,7% of girls). Also it is certain in 15,1% of girls (the 7th classes) and at pupils of the 8th classes (20,7% of boys; 17,5% of girls) below “average”, and at pupils of the 8th classes (3,4% of boys; 65,2% of girls) “low” level of development of force, rapidity and high-speed endurance of muscles of back and prelum abdominale. It demonstrates that pupils with below “average” and with the “low” level of indicators of the index of Shapovalova are in the risk group with possibility and increase in violations of posture, rachiocampsis, and flatfoot [15; 17].

Comparing average data of the index of Shapovalova with the rating scale, which is offered by S. D. Polyakov with coauthors [15], it is established that results of girls of the 7th classes and data of boys of the 8th classes answer the assessment 3 points, boys of the 7th classes, – the assessment 4 points, and girls of the 8th classes – 1 point. It is possible to note that

Table 5

Level of indicators of the index of Skibinski of pupils of the 7–8th classes (%)

Classes	n	Low	Below the average	Average	Above the average	High
7 class	B	18	94,4%	5,6%	0	0
	G	33	72,7%	18,2%	9,1%	0
8 class	B	29	89,7%	6,9%	0	3,4%
	G	23	69,6%	8,7%	21,7%	0

Table 6

Level of development of force, rapidity and high-speed endurance of muscles of back and prelum abdominale of pupils of the 7–8th classes (index of Shapovalova) (%)

Classes	n	Low	Below the average	Average	Above the average	High
7 class	B	18	0	0	22,2%	22,2%
	G	33	0	15,1%	66,7%	9,1%
8 class	B	29	3,4%	20,7%	48,4%	10,3%
	G	23	65,2%	17,5%	8,7%	4,3%

Table 7

Indicators of index of Ruffie of pupils of the 7–8th classes (%)

Classes	n	Low	Below the average	Average	Above the average	High
7 class	B	18	0	0	33,3%	66,7%
	G	33	0	3,0%	9,1%	84,9%
8 class	B	29	24,1%	27,6%	6,9%	34,5%
	G	23	0	26,1%	13,0%	39,2%

Table 8

The formalized assessment of indicators of physical health of pupils

Classes	Boys	Points	Girls	Points
7 class	Average	16	Average	15
8 class	Below the average	13	Below the average	12

boys of the 7th classes have above “average”, girls of the 7th classes and boys of the 8th classes “average”, and girls of the 8th classes “low” power level of the index of Shapovalova which characterizes specific intensity of physical activity.

Considering average values of index of tolerance to standard exercise stress of Ruffie, it is established that these 66,7% of boys and 84,9% of girls of the 7th classes and pupils of the 8th classes (34,5% boys; 39,2% of girls) are at the “high” level; at pupils of the 7th classes (33,3% boys; 9,1% of girls) and pupils of the 8th classes (6,9% boys; 13,0% of girls) on “above average”, and in 3,0% of girls of the 7th classes and at boys of the 8th classes (6,9% boys; 21,7% of girls) – on “average”. Also it is revealed by researches the level “below average” of indicators of the index of Ruffie at girls of the 7th classes (3,0%) and at pupils of the 8th classes (27,6% boys; 26,1% of girls), and the “low” level of reaction of the cardiovascular system to standard exercise stress is found in 24,8% of boys of the 8th classes (tab. 7). It should be noted that “low” and “below average” assessment of the index of Ruffie testifies to the insufficient level of adaptation reserve of cardiovascular and respiratory system which limits physical capacities of organism of pupils.

Specifies comparison of the obtained average data of the index of Ruffie with the rating scale [15] that indicators of pupils of the 7th classes answer the assessment 4 points, and results of pupils of the 8th classes – the assessment 3 points. Thus, indicators of reaction of the cardiovascular system to standard exercise stress at pupils of the 7th classes answer to the level above “average”, and at pupils of the 8th classes – “average”.

The general analysis of level of physical health of pupils of the 7–8th classes on indicators of indexes of Quetelet 2, Robin-

son, Skibinski, Shapovalova, Ruffie confirms the “average” level of physical health of pupils of the 7th classes and “below average” pupils of the 8th classes (tab. 8).

Conclusions

1. The analysis of average data of separate components of physical health on gender sign, has generally found lack of reliable differences ($p > 0,05$) between results of boys and girls, except for VCL indicators, raising of trunk in sitting position in 1 minute, HR at rest (P_1) and after renewal (P_3) where the reliable prevalence of results of boys over indicators of girls is revealed ($p < 0,05 - 0,001$).

2. The aged comparisons demonstrate that average indicators of pupils improve with age and generally have reliable character ($p < 0,05 - 0,001$). However, the data of AP_{diast} and breath holding time in girls and indicators of HR, VCL, AP_{diast} and breath holding time at boys have no aged reliable differences ($p > 0,05$).

3. The “average” level of physical health of pupils of the 7th classes and “below average” at pupils of the 8th classes are defined by the research. It demonstrates that pupils of the 8th classes are considered almost healthy; however have insufficient adaptation reserves of cardiovascular, respiratory systems, risk to emergence and increase in violations of posture, flatfoot, and need correction of noted deviations by purposeful influence.

Prospect of the subsequent researches in this direction is the development of the programs of the differentiated study, which is directed to the increase in functionality of organism, which will promote preservation and improvement of physical health of pupils of comprehensive educational institutions.

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Margarita Mameshina: *Kharkiv State Academy of Physical Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.*

ORCID.ORG/0000-0001-7397-3805

E-mail: ira.maslyak@mail.ru