DYNAMIC OF CHANGES IN HEALTH OF 10-11 YEARS OLD GYMNASIUM BOYS UNDER INFLUENCE OF COMPREHENSIVE EDUCATION'S LOAD

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Abstract. *Purpose:* determination of somatic health, physical condition, physical and mental workability changes of pupils under influence of comprehensive education loads at the end of first academic semester. *Material:* in the research 140 pupils of 10-11 years old age, related to main health group, participated. *Results:* we found that the reason of children' health's worsening appears at the account of increasing of intellectual pressure. This pressure can not be overcome by means of physical education, oriented on recreation and perfection of pupils' organisms. Absence of gradual relaxation of mental loads (periods of recreation and test after different intellectual tensions) results in sharpening of overtiredness at the end of first academic semester. This overtiredness negatively influences on pupils' general health. *Conclusions:* responses of children's organisms to irritators of comprehensive education's pressure are accompanied by worsening of a number of functional indicators, which have no age distinctions.
Key words: loads, somatic health, physical, mental, workability.

Introduction

By many questionings of gymnasium pupils, devoted to their attitude to learning and to expanded learning load, it was found that main strive of pupils is: wish to keep pace with comprehensive educational load; sometimes to be ahead in their progress (even at the cost of own health). That is, new Ukrainian youth explains and stresses the fact they have no time for healthy life style in conditions of such mental struggle in educational establishment of "new type". Judging by such information comprehensive education load can be regarded as a regulating factor on pupil's life functioning, which substantially influences on his (her) organism. That is why study of this factor's influence on different indicators of adolescents' health seems to be rather urgent. Domestic researchers underline that expended level of requirements to learning process causes negative changes in morphological functional state and health of children [3; 5; 12]. There is an opinion that physical education does not ensure health protection of school children. Portion of pupils with high level of adaptation potential is within 3%. Portion of pupils from group of risk (progressing of diseases) is 52.2% [9; 11]. That is why it is necessary to consider somatic types of school children, when correcting their health in the process of physical education [11]. Some researchers point that by mean statistic values of some indicators great majority of school children lags behind from passport age for one year and more [8]. Over-tension of two components (psychological and motor) can result in organism systems' failures and be dangerous for health [4; 10; 13]. It witnesses that there is demand in active application of health related technologies in educational process of comprehensive schools [4]. Other group of authors found that independent on organization of physical education in comprehensive educational establishments, response of junior school children to adaptation to academic load after summer rest is manifested in the form of over-tension of life support systems and weakening of organism's adaptation – reserve potential [2]. This fact proves results of [7], saying that there is close positive connection between physical workability and mental efficiency ($r = 0.9$; $p<0.01$). Thus, it can be assumed that in combination with intellectual pressing physical education creates very powerful for a school child comprehensive education's load at the beginning of academic year. The existing program of physical education envisages by order: "In period from 01.09 to 01.10 of every academic year testing of normative shall not be conducted and trainings shall be of recreation, health related character in order to provide pupils' adaptation to loads" [6]. Opinions of foreign researchers also are different. There is significant amount of works, which try to prove that physical education makes no harm at all to being in learning progress and can positively influence on pupils' brains [19; 21; 14]. Rather great quantity of scientists stress on demand in application of personality's means in connection of constant information pressing on brains of pupils and teachers [15; 16; 24]. There are some research centers, which work out, make prognosis and implement different methods. These methods facilitate minimization of mental overtiredness in mastering and processing of academic information [22; 28; 20]. One more category of medical scientists affirms that great portion of children's population practice immobile life style nowadays [27; 23; 18]. Thus, general picture of literature sources is rather different and contains a lot that is in common and a lot of contradictory.

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Purpose, tasks of the work, material and methods

The purpose of the work is determination of somatic health, physical condition, physical and mental workability changes of 10-11 years old pupils under influence of comprehensive education loads at the end of first academic semester. In our research 140 pupils of 10-11 years old age, related to main health group, participated. The research was conducted at the beginning and at the end of first academic semester.

Assessment of somatic health was conducted by methodic of G.L. Apanasenko. Physical condition was assessed by table of T.Yu. Krutsevych, G.L. Apanasenko. Assessment of maximal oxygen consumption (MOC) was stated by methodic of Kiev SRI of medical problems in physical culture. Physical workability was determined by PWC_{170} indicator with the help of step-test. Mental workability was registered by corrector test of Burdon- Anfimov. In sociological questioning specialists-psychologists of educational establishment participated. Processing of the received data was conducted with methods of mathematical statistic.

Results of the research

In spite of health related, recreational orientation of physical culture classes, at the beginning of academic year 1.5% from every fifth form and 3% from every sixth form refused to fulfill physical exercises by their own desire. From other half of September the quantity of such pupils increased by 4% in sixth forms and by 2% in fifth forms. At the beginning of October first wave of respiratory diseases began, which was accompanied by increasing of quantity of pupils, who were released from physical culture classes. In fifth forms it was 20% and in sixth - 33%. Up to the middle of October quantity of pupils, complaining on bad feeling, headache, dizziness, increased. Sometimes, such complains were in written form as notes from parents, informing that child feels bad, has bad sleep or is over-tired. In such cases child attends all lessons except physical culture ones. It is necessary to note that just in this period first portion of physical tests shall be passed. School competitions start because it is necessary to form school teams for district competitions. As per order this period is considered as the period of final adaptation of school children to physical exercises.

It was found that at the end of the first academic semester the studied indicators are much better than the same at the beginning of academic year. Confident difference is $p<0.05$. It should be noted that there are no confident distinctions between indicators of 10 and 11 years old boys. The exception is indicator of mental efficiency, which in 11 years old boys worsened up to 2134.07±41.91; 1511.21±63.11 ($p<0.001$). It witnesses that in sixth form learning load is higher than in fifth one. This factor influences on condition of central nervous system, on quantity of mistakes in mental work. By other indicators, children of this age respond equally to comprehensive education load. For example, functional indicators of health (Ruffiet's and Robinson's indices, physical workability, maximal oxygen consumption) substantially worsened in comparison with indicators, registered at the beginning of academic year (in 10 years old boys: 35.32±1.22; 31.26±1.23; 11 years age: 36.58±1.2; 32.59±1.04 with $p<0.05$). Total assessment of somatic health at the beginning of academic year was 6 points in fifth form and 7.87 – in sixth form. At the end of first academic semester it reduced to 3.37 in fifth form and to 5.11 in sixth form (see table 1). These substantial changes appeared at the account of changes in HBR. It is witnessed by the data of confidence difference between beginning of academic year and end of first academic semester (10 years' age: 84.87±0.96; 88.6±1.03; 11 years age: 83.29±0.69; 88.66±1.75 with $p<0.05$) (see table 2). Indicators of BP remained unchanged. It is explained by the fact that from the beginning of academic year children started to active mental functioning. It is known that every day pupils attend from five to seven lessons as per their time table. In week this load is from 32 to 34 hours, from which quantity of physical culture lessons in fifth and sixth forms is 2,5 academic hours per week (first week- three lessons, second- two lessons). From first of September to first of October physical load was not active and had adaptation character, while mental load gradually increased.

Increasing of mental tension is also witnessed by indicator of mental accuracy at the end of first academic semester: for 10 years age: 0.96±0.01; 0.88±0.01; 11 years age: 0.95±0.01; 0.86±0.01 with $p<0.00$) (see table 1). After finishing of adaptation for physical exercises period, training for passing of sport tests and formation of teams started. But mental loads did not reduced, but became still higher. It immediately caused worsening of pupils' functional indicators. Again adaptation functioning started, ensured by significant tension of neuro humoral mechanisms [1]. It is necessary to underline that during summer rest pupils accumulated significant reserve of workability. They actively fulfilled physical exercises of different intensity in children's health related establishments with complete absence of mental loads. Thus, combination of active physical and mental loads reduces somatic health's level as well as school children's physical condition. It is witnessed also by other indicators. Power index, index of explosive power and index of quickness have confident distinctions, comparing with initial values ($p<0.05$). Mean assessment of physical condition at the beginning of academic year in fifth forms was 19.96 and in sixth – 16.56. At the end of the first academic semester these points reduced: in fifth forms up to 12.77 and in sixth forms – to 13. 97 (see table 2). Results were received with permanently equal anthropological indicators and biological age. Their confident distinction from initial values was $p>0.05$ (see tables 1, 2).

Table 1.

Indicators of somatic health, mental and physical workability and maximal oxygen consumption (MOC) at the beginning of academic year and at the end of first semester

Indicator	Term	10 years age n = 70			11 years age n = 70		
		$X \pm m$	*t*	*P*	$X \pm m$	*t*	*P*
Ruffiet's index (connv.un.)	1	6.71±0.34	2.54	<0.05	5.18±0.49	2.24	<0.05
	2	7.93±0.41			6.93±0.61		
Vital index (conv.un.)	1	50.47±0.72	0.09	> 0.05	47.32±0.75	0.14	> 0.05
	2	50.56±0.7			47.46±0.68		
Power index, (kg.)	1	50.6±1.23	2.55	<0.05	52.79±1.26	2.09	<0.05
	2	46.26±1.18			48.99±1.31		
Robinson's index (conv.un.)	1	95.54±1.37	2.83	<0.05	96.21±1.59	2.81	<0.05
	2	101.61±1.65			103.77±2.17		
Body length, (cm)	1	145.27±0.6	0	> 0.05	157.17±0.67	0	> 0.05
	2	145.27±0.6			157.17±0.67		
Body weight (kg)	1	43.9±0.97	0.14	> 0.05	47.73±0.78	0.28	> 0.05
	2	43.66±1.62			47.43±0.72		
Mental efficiency	1	2202.29±51.37	2.48	<0.05	2134.07±41.91	8.22	<0.001
	2	2019.63±52.73			1511.21±63.11		
Mental accuracy	1	0.96±0.01	5.66	<0.001	0.95±0.01	6.36	<0.001
	2	0.88±0.01			0.86±0.01		
Physical workability PWC_{170}	1	540.94±25.37	2.42	<0.05	588.86±16.95	2.51	<0.05
	2	476.21±8.6			536.54±12.18		
Maximal oxygen consumption (MOC)	1	35.32±1.22	2.34	<0.05	36.58±1.2	2.51	<0.05
	2	31.26±1.23			32.59±1.04		
Total of points	1	6			7.87		
	2	3.37			5,11		

Notes: *1 –at the beginning of academic year; 2 –at the end of semester.*

Table 2.

Indicators of physical condition at the beginning of academic year and at the end of first semester.

Indicator	Term	10 years age n = 70			11 years age n = 70		
		$\bar{X} \pm m$	*t*	*P*	$\bar{X} \pm m$	*t*	*P*
VCL, (ml)	1	2174.95±2.41	0.63	> 0.05	2211.83±4.83	1.7	> 0.05
	2	2172.41±3.25			2227.36±7.74		
Biological age (conv. un.)	1	100.04±1.33	0.13	> 0.05	99.99±0.94	0.38	> 0.05
	2	100.29±1.29			100.5±0.94		
Volume of heart (cm^3)	1	109.8±0.92	0.25	> 0.05	110.04±0.78	0.28	> 0.05
	2	109.49±0.86			109.74±0.72		
CC, (cm)	1	64.21±0.42	0.27	> 0.05	66.24±0.49	0.41	> 0.05
	2	64.37±0.42			66.53±0.52		
HBR (b.p.m.)	1	84.87±0.96	2.65	< 0.05	83.29±0.69	2.85	< 0.05
	2	88.6±1.03			88.66±1.75		
BP syst. (mm. merc. col)	1	112.96±1	0.69	> 0.05	117.76±1.52	1.18	> 0.05
	2	114.0±1.12			115.26±1.48		
BP diast. (mm. merc. col)	1	69.63±1.33	1.75	> 0.05	71.77±1,17	1.28	< 0.05
	2	72.81±1.24			73.93±1.22		
Index of explosive power (conv. un.)	1	1.01±0.01	2.83	< 0.05	1.07±0.01	2.68	< 0.05
	2	0.97±0.01			1.01±0.02		
Index of quickness (conv. un.)	1	3.95±0.05	2.3	< 0.05	3.98±0.06	2.36	< 0.05
	2	3.77±0.06			3.78±0.06		
Forward bending from sitting position, cm	1	3.94±0.56	1.56	> 0.05	3.8±0.41	1.76	> 0.05
	2	2.83±0.44			2.86±0.34		
Total of points	1	19.96			16.56		
	2	12.77			13.97		

Notes: VCL – vital capacity of lungs, CC – chest circumference, HBR – heart beats rate, BP syst. – systolic blood pressure, BP diast. – diastolic blood pressure.

Discussion

Results of the conducted researches are proved by data of other scientists. For example O.M. Leschak studied school children of 8-10 years old age [7]. He registered positive changes in somatic health, physical and mental workability after summer rest in health related camp in climate of Carpathian hills [7]. In our research, at the beginning of academic year we obtained approximately the same values of the mentioned above indicators. The only difference was that we studied children of Eastern region: boys of 10-=11 years old age – pupils of Kharkov gymnasium №14. These children had summer rest in health related camps near Kharkov. Thus, we have proved the data of other authors [4; 7-11] that children good health before academic year depends on correctly organized summer rest, providing the presence of physical education means.

The received by us data are of certain novelty. We received data about duration of health level's preservation. With it, we considered conditions of modern comprehensive education's pressing on pupils' health, which exists in schools of new type. We determined that for 1.5 months from the beginning of academic year a number of vitally important functional indicators sharply worsen ($p<0.05$). At the end of first semester, after active intellectual pressing on pupils indicators (mental workability, efficiency and accuracy) became confidently different from initial: in 10 years old pupils ($p<0.05$; $p<0.001$) and in 11 years old pupils - ($p<0.001$). Indicator of physical workability was significantly different in 10 and 11 years old pupils with ($p<0.05$). So, a picture appears that physical education can not resist to mental pressing and all its measures are not effective. Actually it proves the conclusions of authors that physical education either does not fulfill its duties or it is not properly organized [2; 7]. In our opinion the reason of it is intellectual pressing, which significantly has been strengthened recent years. Example of it is report about over-loading in primary school, considering international and national experience [17]. This report determined the most favorable factors for overloading of curriculum in Ireland. Besides, in the report it is underlined that the problem of overloading of curriculum influences both on children (who feel it especially) and on teachers. Overloading of curriculum stipulates certain instability or discordance between ability to accept or activate the curriculum. The curriculum itself is perceived as overload. Besides, one more kind of intellectual pressing is informational overtiredness. Linn Akin offers a number of methodic measures for struggle with this phenomenon [25]. The author marks out: affective component – overloading, which includes mental confusion, stress and frustration; physical symptoms – headache, tiredness and depression [25]. Thus, the mentioned problems exist and will exist owing to increase of mental pressing. As per sociological questioning 75% of gymnasium pupils answered that they work mentally from 12 to 14 hour every day and even more. Every day significant percentage of day time child forces him (her) self to fulfill tasks, which he 9she) does not like. By conclusions [26; 29] it results in reduction of workability. It should be noted that the treat of intellectual pressing is mentioned in works [3; 10; 13]. But till now nobody has outlined this problem as a separate question. As well as has not regarded it as main problem of children health's worsening.

Conclusions:

1. Dynamic of changes of somatic health, physical condition, physical and mental workability under influence of comprehensive education's pressing for the period of first semester is characterized by gradual reduction, comparing with the beginning of academic year. It is accompanied by worsening of a number of functional indicators, which can equally respond to physical and mental irritators. But great majority of disciplines of new type comprehensive educational establishments are of mental character and it strengthens mental irritator.

2.Age changes of children's organism occur as per a number of anthropological indicators: body weight, height, chest circumference, vital capacity of lungs, vital index. The confidently differ between years of life ($p<0.001$) with advantage of 11 year old pupils. They can con weaken intellectual pressing and substantially help to measures of recreation.

3. It was found that indicators of physical and mental workability respond equally to pupils' health. At the end of first semester their indicators worsen both in 10 and 11 years old pupils, comparing with initial values. By age distinctions confidence is $p<0.001$ with 10 years old pupils prevailing. It shows that intellectual pressing significantly strengthens in comprehensive education's load.

4. Thus, we determined that the reason of children health's worsening results from increase of intellectual pressing. This pressing can not be overcome by means of physical education, oriented on recreation of pupils' organism. Absence of gradual relaxation, after mental loads (periods of recreation and rest after different intellectual tensions), results in sharpening of overtiredness at the end of first semester. This overtiredness negatively influences on school children's health without considering their age.

Further researches are planned for determination of special methodic, which would facilitate pupils health improvement.

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Conflict of interests

The author declares that there is no conflict of interests.

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