

ABOUT NECESSITY OF USE OF HATHA YOGA EXERCISES FOR CORRECTION OF DEFORMATION OF STUDENTS' SPINE OF SPECIAL MEDICAL GROUPS WITH VIOLATIONS OF POSTURE

Gorelov A.A., Kondakov V.L., Belikova Zh.A.

Belgorod State National Research University

Annotation. The method of application of physical drills of hatha-yoga is presented on educational trainings on physical culture with students. The volume of empiric information made more than 10000 measurements. Information is confirmed about predominance in the student environment of violations of health, related to the locomotorium and cardiovascular system (33,4% and 32,6% accordingly). Functional violations of spine are marked: pains in the back (59,8%), during (54,2%) and after (43,8%) physical loading, in pains in thurls (19,6%), in the constraint of motions after sleep (58,8%). It is set that the personal touches of vital functions of students are: deficit of motive activity, parahypnossiss and appetite, short duration stay outdoors, presence of harmful habits. Application of physical drills of hatha-yoga is recommended in employments: static, dynamic, respiratory.

Keywords: deformations, spine, scoliosis, osteochondrosis, student, medical, group, physical culture, exercises, hatha-yoga.

Introduction.

Nowadays, the problem of health improvement is still extremely urgent, that is attested by the continuing reduction of somatic indicators of adult and, what is more important, children population of Russian Federation. Increase of quantity of young people, who suffer from locomotive system (LS) faults, creates really a problem situation, because potentially unfavorable effect of such nosology sooner or later results in reduction of functionalities of separate individuals in particular and the total population in the whole.

Among nosological forms of LS faults special place is taken by scoliosis and osteochondrosis, the appearance of which is directly connected with sedentary life [7, 15, 16]. The fact that these faults are most often found among persons of intensive mental activity, in the first turn pupils and students, is an indirect evidence of it. So, by the data of S.A. Yegorova in co-authorship (2005), if, at the beginning of school years 30% of children suffer from backbone functional faults, to which scoliosis of I-II degree and incipient osteochondrosis are related, by the end of school period – 70-80% of children. Studying at higher educational institution, as a rule, only aggravates the situation: 90% of senior students have the mentioned above abnormalities.

As a result of students', who have different health abnormalities, number increasing, recent years the problem of physical training process construction for special health groups' (SHG) has become especially acute. The first turn tasks of such students training are improvement, maintenance and correction of health [8, 15]. With this, special attention shall be paid to the choice of efficient means and methods of students', having functional faults of backbone, health correction - abnormalities which cover 40-80% of special educational establishment (SEE) students.

Generalizing the opinions of specialists we can state that physical exercises, among which gymnastics, swimming and massage are considered to have the best health improving effect, are the main means for correction of backbone functional abnormalities [4, 9, 11]. These means affect on deep and surface body muscles, which form posture and condition the symmetry of muscular corset that is very efficient for physical exercises of persons suffering from scoliosis. Besides, the same means promote blood circulation in muscles, removal of local spasms, painful infiltrations, hardenings, that is efficient for physical exercises of persons, suffering from osteochondrosis [6, 13].

With that, when planning and carrying out physical culture trainings of students, having backbone functional abnormalities, there appear a problem of physical load dosing. The existence of this problem is connected with the fact that for this category of students exercises, connected with shaking and exerting pressure on joints, such as run on hard surface, jumps, dismounts, some game exercises and other sharp movements are contra-indicated. It often leads to reducing of indicators of physical load in the process of training that affects unfavorably on functional training level. This fact points at the necessity to search such physical culture means, which would affect not only on backbones of SHG students but on their functional capabilities.

We consider gymnastic Hatha Yoga exercises, which include static and dynamic exercises, promote correction of backbone abnormalities, and breathing exercises promoting rising of functional training level, exactly the required means. These exercises are recommended for physical classes with SHG students, that is reflected in Model program in discipline " Technologies of physical culture and sports activity", which was developed by S.P. Yevseyev, O.E. Aksionov (2004) for students, who study in specialty "022500 – Physical culture for persons with health abnormalities (adaptive physical culture)".

There are also dissertation researches, which experimentally prove the purposefulness of Hatha Yogy exercises for health improving classes. In particular, the works by T.N. Vlasova (1996), R.S. Minvaleeva (1999) state the positive influence of Hatha Yoga on cardio vascular system; A.F. Grigoryan (2003) proves, in his paper, positive affect on regulation of breathing; the works by S.P. Ryabinin (2005), A.A. Gorelova, T.A. Shipkova (2006), A.A. Priymakov (2009), P.P. Shishkin (2011) prove Hatha Yoga positive influence on locomotive system (LS). But no one from the

mentioned works gives the methodology of Hatha Yoga exercises application targeted to SHG students with functional abnormalities of backbone.

The data of our analytical researches witness that there is an acute necessity of scientific foundation of health improving physical culture means and methodologies of their application, which render conjugate, correcting affect on backbone state and functional training level of SHG students with backbone abnormalities.

The present paper has been prepared by the results of work on project No.6.2093.2011 “Kinesiotherapy in the system of higher educational institutions’ students health improvement”, which was carried out within the frames of Russian Ministry of education and science governmental НИОКР task to dependent higher educational institutions.

Purpose, tasks of the work, material and methods of the research.

The purpose of the research – to provide scientific foundation of Hatha Yoga exercises’ application in physical culture training of special health groups students with backbone functional abnormalities.

The purpose was achieved by solution of the following *tasks*:

- 1) To study the experience of health improving physical culture means’ application for correction of persons’ with backbone functional abnormalities health;
- 2) to research the peculiarities of health status and some aspects of SHG students’ with backbone functional abnormalities life activity;
- 3) to provide foundation of purposefulness of Hatha Yoga exercises’ application in physical culture training of special health groups students with backbone functional abnormalities;
- 4) to develop and estimate the efficiency of methodology of Hatha Yoga exercises’ application in physical culture training of special health groups students with backbone functional abnormalities.

The methods of the research: analysis and generalization of scientific literature data; questioning and talks; pedagogical observations; testing; index method; medical and biological methods of researches; pedagogical experiment; methods of mathematical statistics.

The validity and authenticity of the results were ensured by reliable theoretical and methodological ground of the research; by the correspondence of scientific methods to the set tasks; by considerable scope of empiric data (more than 10 000 measurements), which had been obtained by independent experts; by representative character of samples of the tested; by the correctness of mathematical statistics methods’ application; by using of modern IT. The research was carried out within the frames of plan of scientific and research works fulfillment by two projects, which had been supported by Ministry of science and education of Russia Federation.

1) project “Development of new health improving physical culture technologies, promoting rising of organism’s functional abilities and ensuring of students’ education high efficiency”. This project is fulfilled within the frames of ФЦП “Scientific and scientific and pedagogical personnel of innovative Russia” for 2009-2013;

2) project No.6.2093.2011 “Kinesiotherapy in the system of higher educational institutions’ students health improvement” which is carried out in the frames of program “Development of scientific potential of higher school”.

The research had been conducted from September 2007 to August 2011 and included the following stages:

1st stage – (preliminary; September 2007 – June 2009) study of the problem by relevant literature and in the practice; study of the peculiarities of health status and some aspects of different health groups students’ life activity; formulating of the research’s hypothesis, determination of the purpose and tasks of the research;

2nd stage (experimental; July 2009 – June 2010) – development of methodology of Hatha Yoga exercises application at physical culture classes with SHG students, who have backbone functional abnormalities; study of the developed methodology efficiency;

3rd stage (final; July 2010 – August 2011) – statistic processing of data, analysis and generalization of the research’s results; formulation of conclusions; preparation of practical recommendations.

Results of the research.

During studying of special literature it was established that as on to day the health degradation of Russian Federation students is an urgent one. At present, by the results of medical examinations about 40-45% of students relate to special health educational department. With this, the most frequent are different LS abnormalities of students – more than 60% of all health abnormalities of the country young population. The majority of all LS abnormalities relates to scoliosis and osteochondrosis, whose appearance is directly connected with sedentary life style.

By virtue of the increasing quantity of students with backbone functional abnormalities, whom doctors prescribe to go in for physical culture training in SHG, one of the most acute is the problem of the development of programs in discipline “Physical culture for SHG students”. In the course of the conducted theoretical researches it was established that at present time, due to the absence of physical culture single program for SHG students, physical culture departments of the majority of higher educational institutions develop such programs by their own. Their distinctive peculiarity is an attempt to solve health improving tasks by the principles of SHG formation and by selection of appropriate physical culture means.

Concerning the problem of SHG formation, there are different opinions of different specialists, but majority of them think that distribution of students in SHG groups by the students’ nosology is the most efficient, because in this case the possibility of oriented physical culture means application for students’ health improvement substantially rises. More over, distribution of students with LS abnormalities into subgroups, considering abnormalities’ varieties and level is purposeful. In particular, it is desirable to divide the students, having backbone abnormalities, osteochondrosis, flat-

footedness, arthritis and arthrosis of joints, because exercises, recommended for backbone functional abnormalities can be inefficient for flat footedness.

Arsenal of means which are proposed by specialists for health improvement of SHG students is enormous. With this, as main mean for LS abnormalities the majority of authors regard gymnastic and its varieties, such as therapeutic physical training, corrective one, yoga, Pilates's system, Thai-tsi-tsiuan and etc. Hatha Yoga exercises are, mainly, based on static stretching, which is also called continuous or passive stretching. Static stretching is the most spread method of general flexibility rising and improvement of posture in front and sagitta planes. It is safe and painless and involves slow pulling effort, under the action of which muscle becomes a little longer than usually. Such exercises shall interchange with relaxation. In general, main characteristics of Hatha Yoga exercises permitted to come to the conclusion that it is purposeful to use them at physical training of SHG students with functional abnormalities of backbone.

The study of Belgorod SRUSU students by health groups was carried out with the help of analysis of annual medical examination result. These examinations were carried out by the specialists of Belgorod SRUSU family medicine center. The obtained data completely prove that there is a trend of reduction of our students' health level and most of studied by us scientific papers point at this trend (fig.1). Besides, the data about prevailing of LS and cardio vascular system abnormalities also met with support. So, in 2008 – 2011 these abnormalities covered 33.4% and 32.6% correspondingly. With this, among LS abnormalities the prevailing place is taken by scoliosis of I-II degree (in average 43.7%).

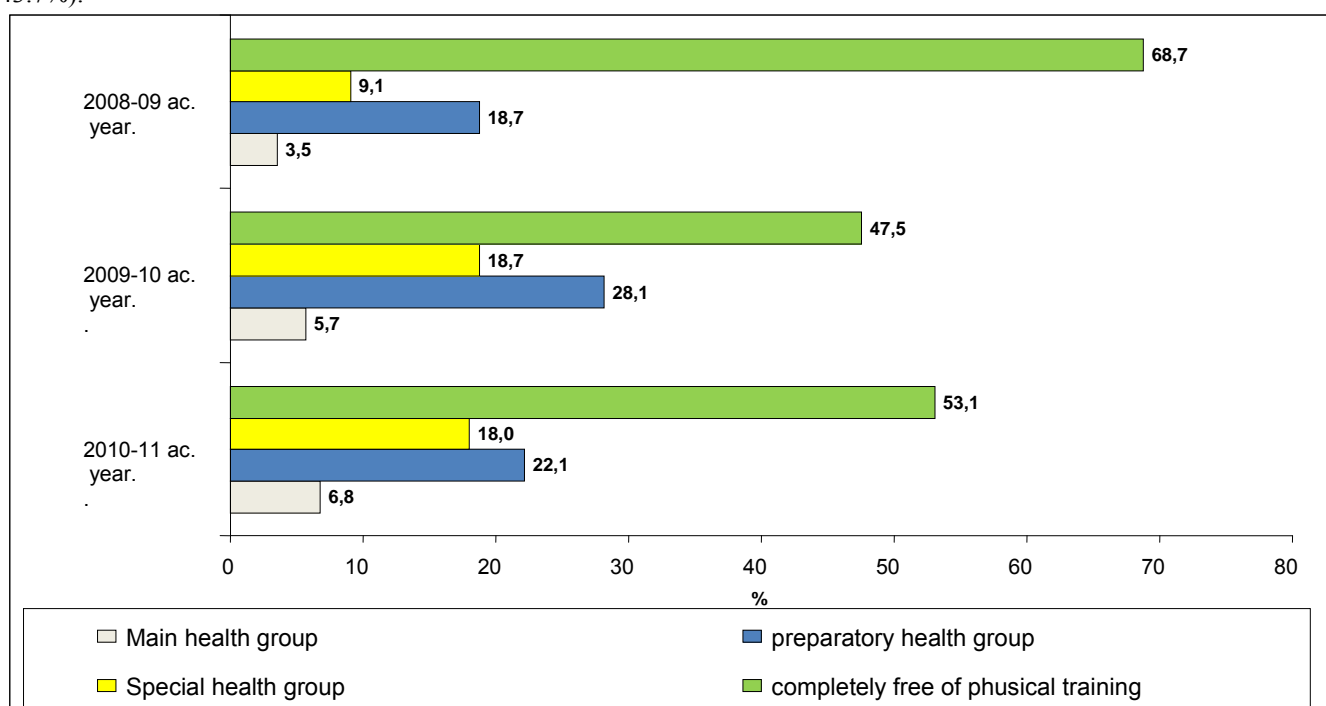


Fig.1 Distribution of Belgorod SRUSU students by health groups in 2008-2011.

Estimation of different health group students' backbone functional state and muscular corset permitted to reveal the indicators, on which backbone deformation influences the most negatively (see table 1). In particular, students with backbone functional abnormalities (BFAG) manifested weaker indicators of back muscles and prelum abdominale strength endurance ($p \leq 0,05$), of backbone mobility in font ($p \leq 0,05$) and sagitta ($p \leq 0,05$) planes, of shoulder girdler flexibility ($p \leq 0,05$), of muscular corset development asymmetry ($p \leq 0,05$). As per subjective indicators backbone functional abnormalities manifest themselves as backache in rest (59.8%), backache during (54.2%) and after (43.8%) physical load, hip joints ache (19.6%), after sleep movement constraint (58.8%).

Table 1

Functional state of backbone and muscular corset of different health groups' students.

Group	n	Lateral mobility of backbone to the right, cm			Lateral mobility of backbone to the left, cm				
		M±m	P			M±m	P		
			MHG	SHG	BFAG		MHG	SHG	BFAG
MHG	111	38,91±0,71		*	**	38,50±0,68		*	**
SHG	98	41,16±0,67	*		**	42,28±0,52	*		**
BFAG	107	47,39±0,72	**	**		49,42±0,89	**	**	

Groups	n	Mobility of backbone at turns to the right, cm				Mobility of backbone at turns to the left cm			
		M±m	P			M±m	P		
			MHG	SHG	BFAG		MHG	SHG	BFAG
MHG	111	98,47±5,36				96,24±7,38			
SHG	98	90,25±6,13				88,57±6,69			
BFAG	107	88,46±5,89				83,12±5,75			
Groups	n	Shoulder girdler flexibility (right hand), cm				Shoulder girdler flexibility (left hand), cm			
		M±m	P			M±m	P		
			MHG	SHG	BFAG		MHG	SHG	BFAG
MHG	111	10,05±0,85		**	*	13,14±0,72		**	*
SHG	98	8,52±1,37	**		*	10,72±1,60	**		**
BFAG	107	6,30±0,74	*	*		10,69±0,58	*	**	
Groups	n	Active flexibility in sitting posture (at stoop), cm				Active flexibility in standing posture (at back bending), cm			
		M±m	P			M±m	P		
			MHG	SHG	BFAG		MHG	SHG	BFAG
MHG	111	8,91±1,40		**	*	6,54±2,13			
SHG	98	5,04±2,21	**			6,32±4,12			
BFAG	107	3,93±0,60	*			4,40±0,14			
Groups	n	Passive flexibility in lying posture (at back bending), cm				General muscles endurance of back and prelum abdominale, sec.			
		M±m	P			M±m	P		
			MHG	SHG	BFAG		MHG	SHG	BFAG
MHG	111	25,64±5,62				97,63±10,68		*	***
SHG	98	21,91±6,31				73,56±9,64	*		*
BFAG	107	19,92±0,42				44,75±3,07	***	*	
Groups	n	Strength endurance of back muscles, sec.				Strength endurance of of front abdominal wall, sec.			
		M±m	P			M±m	P		
			MHG	SHG	BFAG		MHG	SHG	BFAG
MHG	111	248,00±9,12		***	***	178,51±8,98		*	***
SHG	98	116,91±8,25	***		***	204,43±5,53	*		***
BFAG	107	59,17±4,84	***	***		35,02±2,69	***	***	

* difference authenticity by Student's criterion ($p \leq 0,05$)

** difference authenticity by Fisher's criterion ($p \leq 0,05$)

*** difference authenticity by Student's and Fisher's criteria ($p \leq 0,05$)

Separately, the study of functional level of SHG students with LS abnormalities was conducted and the resulted data were compared with the data received in other health groups (table 2). Decision about such study was taken by two reasons: 1) as per the specialists' recommendations exercises with shaking, exerting over pressure on backbone (i.g. jumps, dismounts run on hard surface) are contra-indicated for the persons having backbone functional abnormalities and it restricts the range of their mobile activity, that, finally, reduces functional indicators; 2) revelation выявления of functional level indicators, which are in the zone of risk, will permit to correct orientation of health improving trainings with SHG students, who have functional abnormalities of backbone.

Table 2

Functional level of different health groups' students

Groups	n	HR in rest (beats per minute)				Ortho test (difference beats per minute)			
		M±m	P			M±m	P		
			MHG	CSAG	BFAG		MHG	CSAG	BFAG
MHG	111	78,64±1,89		*	*	13,91±2,05		*	*
CSAG	93	85,53±3,60	*			22,72±3,63	*		
BFAG	107	84,61±1,77	*			23,65±2,77	*		
Groups	n	Average blood pressure (mm of merc. Col.)				ДАД Blood pressure (mm of merc. Col.)			
		M±m	P			M±m	P		
			MHG	CSAG	BFAG		MHG	CSAG	BFAG
MHG	111	112,38±2,15			*	69,92±1,61			*
CSAG	93	113,10±2,69			*	71,15±2,00			*
BFAG	107	108,14±1,17	*	*		73,31±1,11	*	*	

Groups	n	Shtange's test (sec.)				Gench's test (sec.)			
		M±m	P			M±m	P		
			MHG	CSAG	BFAG		MHG	CSAG	BFAG
MHG	111	51,65±2,44		*		32,77±2,21			*
CSAG	93	44,62±3,69				32,75±2,66			*
BFAG	107	39,78±1,85	*			26,41±1,22	*	*	
Groups	n	Ruffier's test (standard unit)				HFCT modification (standard unit)			
		M±m	P			M±m	P		
			MHG	CSAG	BFAG		MHG	CSAG	BFAG
MHG	111	9,41±0,81		*	*	20,98±0,66		*	*
CSAG	93	11,26±1,00	*			18,01±0,59	*		
BFAG	107	11,25±0,56	*			18,63±0,59	*		
Groups	n	Skibinskaya's test (standard unit)				Estimation of cardio respiratory system (by Skibinskaya)			
		M±m	P						
			MHG	CSAG	BFAG				
MHG	111	21,12±1,36		*	*	satisfactory			
CSAG	93	15,73±1,26	*			satisfactory			
BFAG	107	13,67±0,77	*			satisfactory			

* difference authenticity by Student's criterion ($p \leq 0,05$)

** difference authenticity by Fisher's criterion ($p \leq 0,05$)

*** difference authenticity by Student's and Fisher's criteria ($p \leq 0,05$)

The conducted research permitted to establish that by functional level indicators, students with backbone functional abnormalities (BFAG) authentically do not differ from the student of CSAG (group of students with abnormalities of cardiac vascular system). Particularly, their HR in rest indicators are authentically weaker than of MHG students ($p \leq 0,05$); besides, they have weaker indicators of aerobic capabilities ($p \leq 0,05$) and resistance to hypoxia ($p \leq 0,05$), weaker physical efficiency ($p \leq 0,05$), relationship between sympathetic and parasympathetic influences on cardio vascular system's regulation ($p \leq 0,05$), weaker general state of cardio respiratory system ($p \leq 0,05$).

By means of questioning it was cleared up that characteristic features of students having backbone functional abnormalities are: deficit of motion activity, disorders of sleep and appetite, short stay outdoors, pernicious habits.

Experimental program of Hatha Yoga exercises application at trainings of SHG students with backbone functional abnormalities was developed on the base of Model program for higher educational institutions in discipline "Physical culture" (2000), which gives for physical training departments the right to independently develop academic programs for special health groups and considering the results of own researches, given above.

Content basis of the methodology was composed of Hatha Yoga exercises, which, in compliance with recommendations of B. Show (2004), were conventionally divided into simplified, classic and complicated yoga. The classification, given by the author, seemed for us to be the most acceptable for work with SHG students, because it permits to solve principle of gradualness in mastering physical exercises in the most successful way. Besides, un compliance with the recommendations of specialists, the selected means included exercises of joint gymnastic and continuous asanas as well as health improving gymnastic of Katsudzo Nishi.

Within the frames of *simplified yoga* the following static (asanas) and breathing (pranayama) exercises were applied: Surya Bheda (solar breathing); Vriksasana (tree posture); Uttanasana (front bend from standing posture); Ardha Urdhvasana (lifted leg); Virabhadrasana 1 (posture of warrior 1); Virabhadrasana 2 (posture of warrior 2); Utkatasana (chair posture); Trikonasana (triangle posture); Prasrita Padattasana (standing semi split); Dandasana (staff posture); Purvottanasana (inclined plank); Pashchimotasana (Sitting front bend); Matsiasana (fish posture); Pavana Muktasana (knee to breast); Chatura Dandasana (plank posture); Adho Mukha Svanasana (dog downward posture); Urdhva Mukha Svanasana (dog upward posture); Balasana (child posture); Gomukhasana (cow head posture); Setubandhasana (bridge posture); Bhurdzhangasana (snake posture); Halasana (plough posture); Shavasana (corpse posture).

Within the frames of *classic yoga* the following static (asanas), dynamic (vinyasa) and breathing (pranayama) exercises were applied: Garudasana (eagle posture); Parivrita Trikonasana (inverse triangle); Virabhadrasana 3 (posture of warrior 3); Nataradzhhasana (king of dance posture); Urdhva Trikonasana (stretched triangle); Uthita Parshavokonasana (acute angle); Mandukasana (frog posture); Baddha Konasana (butterfly posture); Roli (rocking on back); Vyagrasana (tiger posture); Salambhasana (birch tree posture).

Within the frames of *complicated yoga* the following series of continuing postures (static, dynamic, stretching, relaxing, breathing exercises) were applied: Nauli Kriya (cleansing breathing); Surya Namaskar (Greeting of the Sun); Ardha Urdhvasana Nataradzhhasana; Virabhadrasana 1 → Virabhadrasana 2 → Virabhadrasana 3; Adho Mukha Svanasana → Chaturana Dandasana → Mukh Svanasana → Balasana; Trikonasana → Uthita Trikonasana → Uthita Parshavokonasana → Chaturana Dandasana → Adho Mukha Svanasana → Balasana.

Table 3

Functional state of backbone and muscular corset of EG (experimental group) ($n=54$) and CG (control group) ($n=53$) students before and after pedagogical experiment

Indicators	Order of testing	EG			P EG-CG	CG			
		M± m	σ^2	P		M± m	σ^2	P	
Back muscles strength endurance, sec.	before	59,17±4,84	1262,68	***	***	61,89±4,30	979,31		
	after	179,87±8,56	3960,34			61,03±4,45	1048,86		
Static endurance of front abdominal wall muscles, sec.	before	35,02±2,69	391,52	***	***	36,54±2,71	388,41		
	after	87,99±4,19	948,55			35,76±2,71	389,26		
General endurance of back and prelum abdominale muscles, sec.	before	44,75±3,07	509,37	***	***	41,85±3,07	498,63		
	after	155,62±9,39	4756,39			46,82±3,09	506,79		
Romberg's test, sec.	before	9,07±1,16	72,28	*	***	13,68±4,03	860,56		
	after	27,80±2,37	304,16			10,52±1,19	74,99		
Backbone lateral mobility (lateral bent), sm	to the right	before	48,87±0,77	30,55			49,72±0,83	36,55	
		after	42,75±0,67	24,07			49,92±0,67	23,92	
	to the left	before	49,42±0,89	41,19			50,22±0,86	38,79	
		after	42,54±0,72	27,17			50,11±0,73	28,53	
Mobility of shoulder girdler (flexibility), sm.	to the right	before	6,30±0,74	28,50	*		5,67±0,88	43,17	
		after	11,14±0,66	23,06			5,38±0,77	31,26	
	to the left	before	10,69±0,58	17,57	*		10,82±0,61	20,59	
		after	13,52±0,66	23,35			10,55±0,61	19,62	
Backbone mobility in rotation, sm.	to the right	before	88,46±5,89	956,66			89,04±6,12	991,71	
		after	91,12±4,79	1007,12			90,34±6,70	995,74	
	to the left	before	83,12±5,75	898,73			88,23±5,45	965,61	
		after	87,03±4,67	932,81			88,98±5,11	966,09	
Bending from bench, sm.	before	4,0±0,77	31,62	*	*	5,47±1,01	54,45		
	after	12,96±0,59	18,50			6,15±1,27	85,55		
Active flexibility from sitting posture (front bent), sm.	before	3,93±0,60	18,83	*	***	2,83±1,29	87,99		
	after	13,91±0,88	41,27			3,51±1,17	69,33		
Active flexibility from standing posture (back bent), sm.	before	4,40±0,14	1,51			4,64±0,12	0,73		
	after	5,06±0,10	0,55			4,72±0,12	0,21		
Passive flexibility in lying posture (back bent), sm.	before	19,92±0,42	9,19	*	*	20,53±0,49	12,52	*	
	after	25,66±0,44	10,54			22,57±0,41	8,90		

* difference authenticity by Student's criterion ($p \leq 0,05$)

** difference authenticity by Fisher's criterion ($p \leq 0,05$)

*** difference authenticity by Student's and Fisher's criteria ($p \leq 0,05$)

As per the recommendations of A.A. Potapchuk (2007), the estimation of functional state of the tested students' backbones was carried out, considering the following indicators:

□ **Stability (steadiness)**, which was determined by absolute strength, strength endurance and by the state of ligament system. It was evaluated with the help of muscles' strength endurance, static endurance of front abdominal wall muscles and by general endurance of back and prelum abdominale muscles;

□ **Balance**, which is characterized by correct direction of body gravity center projection and symmetry. It was determined with the help of Romberg test;

□ **Flexibility (mobility)**, which is characterized by amplitudes of movements in different planes and sectors of backbone. It was evaluated by the results of amplitude measurements of movement in front (lateral mobility of backbone and shoulder girdle) and in sagitta planes (bent from bench, bent in sitting posture);

□ **Harmonicity**, which is an expressiveness of physiological bents in sagitta planes. It was diagnosed by medicine specialists from Belgorod SRUSU.

The diagnostics results witness the authentic improvement of backbone functional state of EG students in a number of the conducted tests. In particular, the tested manifested increase of back and prelum abdominale muscles strength endurance as well as increase of movement amplitude in sagitta and front planes. Flexibility improvement of shoulder girdle conditioned favorable changes in symmetry of muscles corset's development. All enumerated summarized indicators of EG students are authentically better than of CG students (see table 3).

In physical development and physical level of EG students there were found more evident positive changes than the same of CG students. According to the testing results the majority of EG tested has chest excursion, vital lung volume, strength and coordination increase. Concerning the students of CG, only chest excursion authentic positive changes were registered. By the majority of indicators the results of EG students are authentically better than of CG.

Functional level of EG students also has improved in general: authentic positive changes of BP indicators, Ruffier's and Gench's tests, Skibinskaya's index were noted, that attest the improvement of cardio respiratory system's

general state, increase of organism's resistance to hypoxia, increase of physical efficiency. Concerning CG, authentic improvements have not been detected.

The estimation of the tested students' somatic health by Apanasenko's method (1991), made it possible to establish that regular application of Hatha Yoga exercises in the training of students, having backbone functional abnormalities, promotes authentic increase of organism's aerobic capabilities, physical efficiency, strength and, as a consequence, general improvement of health level. In CG authentic positive changes were found in indicators of vital index, which characterizes aerobic capabilities of an organism and weight-height relationship. By all indicators, which were included in algorithm of calculation of somatic health by Apanasenko's methodology, excluding only Robinson's index, summarized EG results are authentically better than of CG. The summarized total indicator, which expresses health level, of EG students is 4.24 ± 0.29 points (below mean value), in CG – 1.26 ± 0.36 (low value); differences are authentic (see fig. 1).

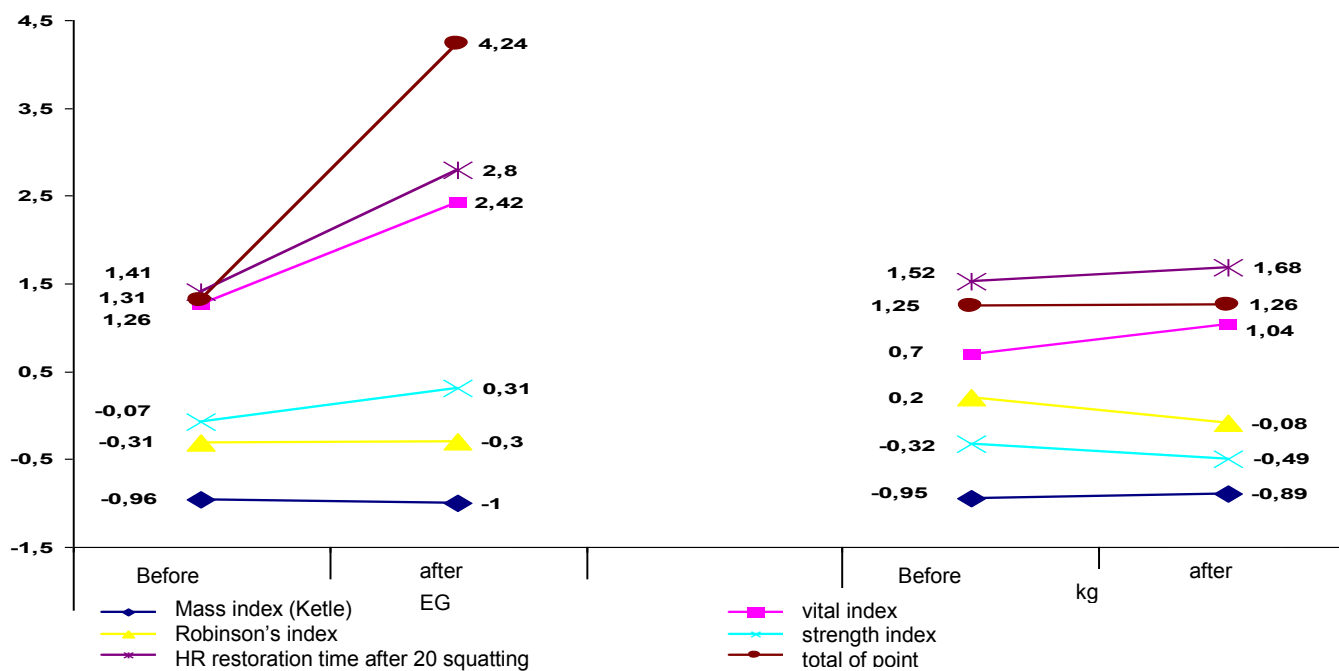


Fig.1. Somatic health level of EG and CG groups, determined by G.L.Apanasenko's method before and after pedagogical experiment.

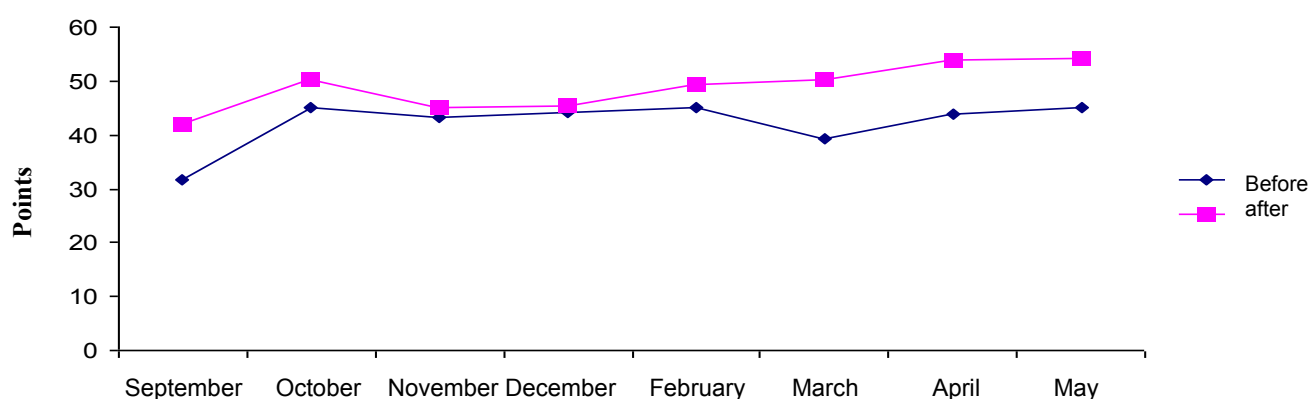


Fig.2. Dynamics of EG students' health in the process of experimental training.

Regular application of SAN blanket methodology during all experimental period permitted to make conclusion about positive affect of Hatha Yoga exercises on the tested students' self feeling, activity and mood, (see fig. 2-4).

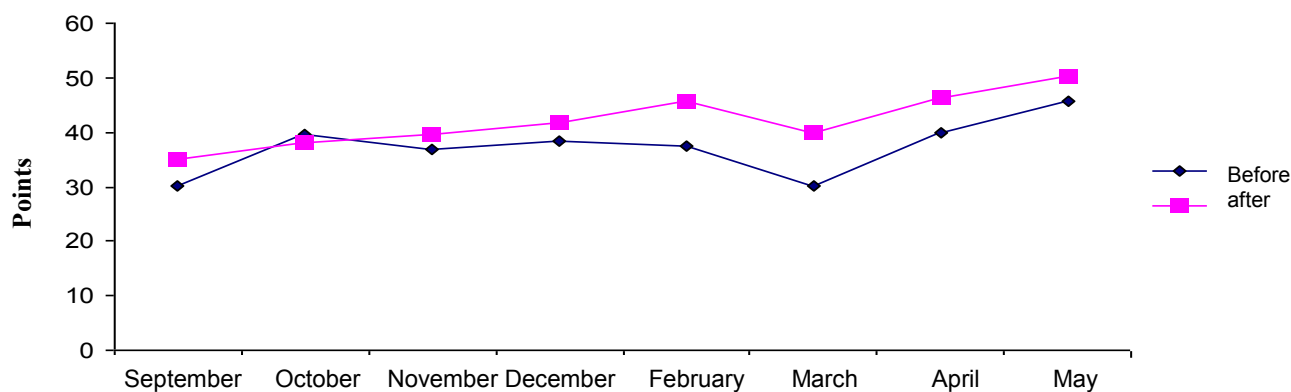


Fig.3. Dynamics of EG students' activity in the process of experimental training.

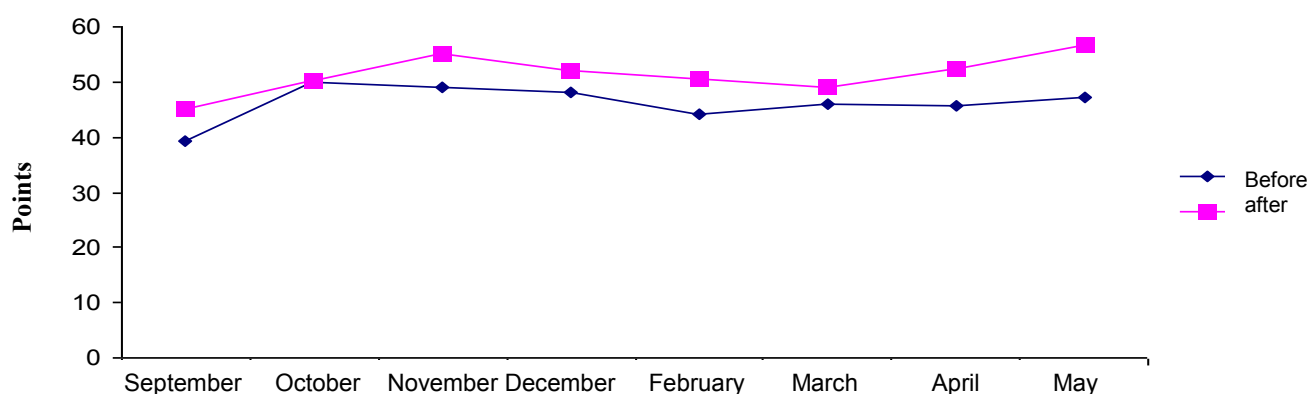


Fig.4. Dynamics of EG students' mood level in the process of experimental training.

The conducted researches confirmed the put forward hypothesis and proved the purposefulness of Hatha Yoga exercises, including static and dynamic exercises, promoting correction of backbone deformations, and breathing exercises, promoting increase of organism's functional level, application for training of SHG students, having backbone abnormalities. The developed experimental methodology exerts positive affect on backbone functional state of students, promotes increasing of functional level, general health state, improvement psychological status.

Summary.

1. At present, steady trend of students' health level reduction has being been fixed. As a result, the quantity of students, related to special health groups of physical training, is increasing. In 2011 they were 40% in average. By nosology, among students abnormalities of locomotive system are the most frequent, which are diagnosed at 40-80% of students of special educational department. By the character of locomotive system's abnormalities the first place is taken by different backbone functional abnormalities, to which, in particular, scoliosis of I-II degree and osteochondrosis of initial stage are related.

2. The main means of backbone functional abnormalities' correction are physical exercises. Gymnastic, swimming, massage have the most health improving effect. From gymnastic varieties, special health improving gymnastic exercises, Pilates's gymnastic, Hatha Yoga exercises, Thai-tsi-tsiuan exercises are the most frequently used for training of persons, having backbone functional abnormalities.

3. Students, having backbone functional abnormalities, have authentically weaker indicators of back and prelum abdominale muscles strength endurance ($p \leq 0,05$), backbone mobility in front ($p \leq 0,05$) and sagitta ($p \leq 0,05$) planes, shoulder girdle flexibility ($p \leq 0,05$), muscles corset asymmetry ($p \leq 0,05$) than the students of other health groups. By subjective information backbone functional abnormalities manifest themselves as backache in rest (59.8%), during (54.2%) and after (43.8%) physical load, as hip joints ache (19.6%), as movement constraint after sleep (58.8%).

4. Characteristic features of life activity of students, having backbone functional abnormalities, are deficit of motion activity, disorder of sleep and appetite, shot stay outdoors, pernicious habits.

5. Shaking exercises, exerting over pressure on joints; run on hard surface, jumps, dismounts, some game exercises and other sharp movements are contra indicated for students, having backbone functional abnormalities. The reduction of physical load intensity during physical training decreases the functional level of students of this category. In particular, they manifested HR indicators in rest ($p \leq 0,05$), organism's aerobic capabilities ($p \leq 0,05$), its resistance to hypoxia ($p \leq 0,05$), physical efficiency ($p \leq 0,05$), sympathetic and parasympathetic relationship's influence on cardio

respiratory system functioning's regulation ($p \leq 0,05$), weaker than the students of main health group. By all enumerated indicators students having backbone abnormalities do not differ authentically from the student with limited capabilities of cardio respiratory system ($p \leq 0,05$).

6. For physical training of students having backbone abnormalities it is reasonable to apply Hatha Yoga exercises, including static and dynamic exercises, promoting correction of backbone deformations, and breathing exercises, promoting rising of organism functional level. Application of experimental methodology resulted in authentic improvement of back and prelum abdominale muscles ($p \leq 0,05$), backbone mobility in sagitta plane ($p \leq 0,05$), shoulder girdle flexibility ($p \leq 0,05$), organism's aerobic capabilities ($p \leq 0,05$) and its resistance to hypoxia ($p \leq 0,05$), physical efficiency ($p \leq 0,05$), general state of cardio respiratory system ($p \leq 0,05$), and general level of somatic health, evaluated by Apanasenko's methodology: 1.31 points – before experiment, 4.24 points – after experiment.

7. In the process of pedagogical experiment positive influence of experimental methodology's application of Hatha Yoga exercises on self feeling, activity, mood of students, having backbone abnormalities, was found.

References:

- 1 Belikova Zh.A., Gorelov A.A., Kondakov V.L. *Kul'tura fizicheskaia i zdorov'e* [Culture physical and health], 2010, vol.1(26), pp. 68-72.
- 2 Belikova Zh.A., Kondakov V.L. *Ekonomicheskie i gumanitarnye issledovaniia regionov* [Economic and humanitarian researches of regions], 2011, vol.3, pp. 57-65.
- 3 Belikova Zh.A., Kondakov V.L. *Kul'tura fizicheskaia i zdorov'e* [Culture physical and health], 2012, vol.3(39), pp. 93-101.
- 4 Bishaeva A.A. *Fizicheskaia kul'tura* [Physical culture], Moscow, Academy, 2010, 304 p.
- 5 Bogoeva M.D. *Postroenie processa fizicheskogo vospitaniia studentov special'noj medicinskoj gruppy s ogranichennymi vozmozhnostiami serdechno-sosudistoj sistemy* [Construction of process of physical education of students of special medical group with the limited possibilities of the cardiovascular system], Cand. Diss., Sankt Petersburg, 2011, 253 p.
- 6 Bulanov L.A. *Pozvonochnik i sustavy* [Spine and joints], Moscow, Astrel, 2009, 187 p.
- 7 Gorelov A.A., Rumba O.G., Kondakov V.L. *Nauchnye problemy gumanitarnykh issledovanij* [Scientific problems of humanitarian researches], 2008, vol.6, pp. 28-33.
- 8 Gorelov A.A., Rumba O.G., Kondakov V.L. *Teoreticheskie osnovy fizicheskoi kul'tury* [Theoretical bases of physical culture], Belgorod, Litkaravan, 2009, 124 p.
- 9 Dubrovskij V.I. *Lechebnaia fizkul'tura i vrachebnyj kontrol'* [Medical physical education and medical control], Moscow, Medical agency of news, 2006, 598 p.
- 10 Egorova S.A., Shumakova N.Iu., Egorov N.A. *Adaptivnaia fizicheskaia kul'tura* [Adaptive physical culture], 2005, vol.4(24), pp. 15-17.
- 11 Epifanov V.A. *Lechebnaia fizicheskaia kul'tura* [Medical physical culture], Moscow, GEOTAR-Media, 2006, 568 p.
- 12 Kopejkina E.N. *Postroenie processa fizicheskogo vospitaniia studentok s narusheniami v sostoianii dykhatel'noj sistemy* [Construction of process of physical education of students with violations in a state of the respiratory system], Belgorod, 2010, 239 p.
- 13 Krucevich T.Iu. *Teoriia i metodika fizicheskogo vospitaniia* [Theory and method of physical education], Kiev, Olympic Literature, 2003, T.1, T.2, 424 p.
- 14 Rumba O.G. *Sistema pedagogicheskogo regulirovaniia dvigatel'noj aktivnosti studentov special'nykh medicinskikh grupp* [System of the pedagogical adjusting of motive activity of students of special medical groups], Dokt. Diss., Sankt Petersburg, 2011, 498 p.
- 15 Timoshina I.N., Parfenova L.A., Kupcov I.M., Ostrovskij E.A. *Fizicheskaia kul'tura: vospitanie, obrazovanie, trenirovka* [Physical culture: education, education, training], 2006, vol.4, pp. 23-25.
- 16 Weiss N. R., Weiss G., Petermann F. Incidence of curvature progression in idiopathic scoliosis patients treated with scoliosis in-patient rehabilitation (SIR): an age – and sex – matched controlled study. *Pediatric Rehabilitation*. 2003, vol.6(1), pp. 23-35.

Information about the authors:

Gorelov A.A.: gorelov@bsu.edu.ru; National Research University Belgorod State University; Pobeda 85, Belgorod, 308015, Russia

Kondakov V.L.: kondakov@bsu.edu.ru; National Research University Belgorod State University; Pobeda 85, Belgorod, 308015, Russia

Belikova Zh.A.: kondakov@bsu.edu.ru; National Research University Belgorod State University; Pobeda 85, Belgorod, 308015, Russia

Cite this article as: Gorelov A.A., Kondakov V.L., Belikova Zh.A. About necessity of use of Hatha Yoga exercises for correction of deformation of students' spine of special medical groups with violations of posture. *Physical Education of Students*, 2013, vol.2, pp. 35-44. doi:10.6084/m9.figshare.156378

The electronic version of this article is the complete one and can be found online at: <http://www.sportpedagogy.org.ua/html/arhive-e.html>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (<http://creativecommons.org/licenses/by/3.0/deed.en>).

Received: 04.02.2013

Published: 03.04.2013