

Original Article

Features of Physical Rehabilitation of Students with various Diseases Studying at Universities

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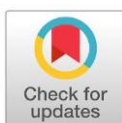
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Abstract

Background of the Study: The health status of students in the context of COVID-19 and during the war in Ukraine is changing, which requires the study and implementation of new methods in physical education at universities. **Purpose:** The aim of the study was to substantiate the necessity of physical rehabilitation within the university curriculum, individualized according to the assessment of health, physical development, and physical fitness of the students from a special medical group, to improve the students' quality of life. **Materials and Methods:** The study engaged 362 students aged 19.54±1.41 years. Among those surveyed in the special medical group consisted of 143 students. The students were divided into 4 subgroups according to their medical charts analysis, in order to differentiate rehabilitation physical education means and the activity regimen. The students of groups I and II were recommended sparing physical exercise regimen, groups III and IV – sparing and sparing-training physical exercise regimen. **Results:** The implementation of the offered method improved both students' somatic health (the poor health level group decreased by 25.6% of the students, the average health group – by 9% of the students upon completing the study) and physical fitness level (the average health group increased by 18% of the students, 4.8% at the end of the study showed health level which exceeded the average one; the share of the students with poor physical fitness decreased by 22.9%). This made possible the re-distribution of the students into different physical education groups (finally the physical rehabilitation group decreased by 13.2%). **Conclusions:** The conducted studies established that differentiation of physical education methods related to the students' somatic disorders is beneficial. These data provide the basis for implementing physical rehabilitation into the university curriculum within physical education classes.

Keywords: somatic health, physical rehabilitation, academic group students, differentiation of physical education methods, physical fitness

Introduction

The issue of preserving and restoring the health of young people is certainly becoming more and more relevant in modern society. A huge number of negative environmental factors permanently affect the health of society. The war, which has been going on for three years, affects the self-esteem of health, physical abilities, emotional and

mental health of the entire population involved in the military conflict. The impact of traumatic events of war can lead to a decrease in the quality of life of young people for many years even after the end of real combat events. Constant stress also overloads the nervous system, which can interfere with work, study, and even everyday activity. Stress can also affect inflammatory processes in the body.

High mental and static strain experienced among university students, loss of extra motion activity, inactive lifestyle, and smoking addiction lead to deterioration of their cardiovascular and respiratory system functions, sight problems, disordered metabolism, decreased resistance of the body to various diseases, which aggravate their health (Bashavets, 2011; Kosynskyj, 2011; Bouchard et al, 2012; Bergier et al., 2014; Andrieieva et al., 2023; Skrypchenko et al., 2024).

The literature analysis showed that in Ukraine more than half (52 %) of all students are physically inactive; about 28% spend less than 150 minutes a week doing physical exercises, with an irregular character of these exercises, predominantly represented by hiking and morning exercises (Blavt, 2012; Bushuev, 2007; Korol, 2014; Griban et al., 2020 (a); Griban et al., 2020 (b)). Only 20% of the Ukrainian students do exercises regularly, attending sports clubs and fitness centers. At the same time, 43% of the European students are engaged in high-intensity activities, and 59% - in moderate intensity. 49% of American students go in for physical activity sports, with 21% of them engaged in moderate-intensity exercises and 28% - in moderate-intensity (Lee et al., 2007; Loza, 2012; Dabrowska-Galas M. et al., 2013; Espelage et al., 2013; Guk, 2014;).

According to the scientists Bojko (2012), Futorny (2013), Petruk & Kuznetsova (2013), Sobko et al. (2016), Tretyakova et al. (2016), reaching optimum health by the youth is possible by correct management of university physical education classes, especially in the physical rehabilitation academic groups (special medical groups), the share of which, unfortunately, is increasing. This, in turn, requires specialists who will be able to provide methodical and practical recommendations on conducting the physical rehabilitation classes (Bielicova, 2009; Liannoi, 2015), plan and implement the offered recommendations, manage and control the physical training classes conducted with the physical rehabilitation academic groups in university (Kutz & Leonova, 2014; Golod, 2015; Dorofieieva et al, 2019; Mozolev et al., 2020).

The authors suppose that the introduction at physical rehabilitation classes of definite differentiation of the methods aimed at improving physical endurance, emotional state and body's resistance to unfavorable environmental factors will provide for not only improving their somatic health, but increase students motivation for preserving the health. All the above mentioned, in turn, provides for the urgency of the study.

Material and Methods

Participants

362 students of the 1st-3rd study years from Bogomolets National Medical University participated in the study. The participants were aged from 18 to 20 years (19.54 ± 1.41), 170 females and 192 males. 143 of them (39.5%) were referred to the physical rehabilitation academic sports group (special medical group), 74 (51.75%) females, and 69 (48.25%) males correspondingly. The individual medical charts of the physical rehabilitation academic group (special medical group) students were analyzed and included in the study only upon obtaining the student's written consent.

Experimental construct

All students of the physical rehabilitation academic group (special medical group) were divided into 4 groups due to analysis of their medical charts, to differentiate the rehabilitation physical exercises and motion regimens offered to them. The subgroup "I" included 69 students (48.25%) with heart diseases (rheumatism, rheumo-carditis, rheumatoid compensated heart disorders), tonsillar-cardiac syndrome, and chronic diseases of bronchi, lungs, and kidneys. The subgroup "II" was represented by 37 students (25.87%)

with gastrointestinal diseases, endocrine diseases, and functional disorders of the central nervous system. The subgroup “III” included 14 students (9.8%) with muscle-skeletal disorders, and the “IV” subgroup included 23 students (16.08%) with vascular disorders: hyper- and hypotension, and sight problems (Table 1).

Table 1 Distribution of the physical rehabilitation academic group students by subgroups (n=143)

№	Subgroup	«I» (n=69)		«II» (n=37)		«III» (n=14)		«IV» (n=23)	
		n	%	n	%	n	%	n	%
1	Males	34	49.27	17	45.94	10	76.92	8	34.78
2	Females	35	50.73	20	54.06	4	23.08	15	65.22

Experimental Method

According to the obtained data analysis, the following physical rehabilitation methods were offered to be implemented in the physical education classes for the physical rehabilitation academic group:

- The students of the subgroups «I» and «II» were recommended only “sparing regimen” classes. The exercises included ideomotor exercises and coordination exercises. Up to 30% of all exercises included auto training and relaxation exercises, without sports games and games including motions.
- The students of the subgroup “III” to correct the muscle-skeletal disorders (disorders of the vertebral column, ribcage, and feet) were recommended to try correction methods. To strengthen the vertebral column muscles and spinal muscles the authors tried correcting exercises. To restore joint mobility, ease motions, strengthen the muscles, and improve general endurance the authors recommended mechanotherapy. The trainings were conducted in a sparing training regimen.
- The students of the subgroup “IV” didn’t do exercises with abrupt movements and high muscle-skeletal strain. The classes were conducted only in the health-sparing and health-sparing combined with training regimens.

Evaluation of the students’ somatic health by G.L. Apanasenko method.

This study includes measuring and interpreting the anthropometric (body weight, height, power dynamometry), physiological (pulmonary life capacity, heart rate, blood pressure) and functional parameters (*Martine-Kushelevskiy test*), which were used for calculation of the morpho-functional indices. Somatic health was evaluated by total score which corresponded to the calculated characteristics, determining functional classes which ranged from “high” to “low”.

Evaluation of physical development level by index method

according to anthropometric results parameters (height, body weight, chest circumference, muscle strength). Index of physical development (IPD) is defined according to the formula:

- $IPD = \text{height of the standing person (cm)} - (\text{body weight, kg} + \text{chest circumference, cm}).$

Evaluation of physical fitness

The authors applied express control of physical fitness by 11 criteria: passport age data; standard body weight according to gender, age, and height; standard arterial pressure according to gender, body weight, and height; pulse at rest; flexibility – bending down and touching above and below the zero point; speed - «race test» measuring the speed of grasping a falling ruler with a stronger hand; dynamic power – maximum height of jumping in height; speed fitness – maximum frequency of raising straight legs to 90° from the supine

position during 20 seconds, with hands behind the head; speed and power fitness – maximum frequency of bending arms at the front plank position during 30 sec.; general distance fitness – running during 10 min., pulse recovery after 20 deep knee bends during 30sec. According to the obtained results, the physical fitness level was assessed.

The infectious index was evaluated according to the number of ARVI a person had caught during the year.

Statistical analysis

The statistical data were processed using the **STATISTIKA 10.0 software**. The data are expressed as a mean average \pm standard deviation (SD). Fisher's criterion was used to check the standard distribution of the study variables. In case of irregular distribution logarithm transformation was conducted. The two-directional duplicate measurement STATISTIKA 10.0 was used for comparing the data received between the early and late periods of the swimming rehabilitation program introduction. The reliability of the data was determined by the Wilson criterion, as the reliability criterion was $p < 0.05$.

Results

The analysis of the distribution of the students between physical rehabilitation groups shows that presumably the students of the 1st-3rd study years are characterized by heart pathologies and respiratory diseases; the second place among all pathologies belongs to gastrointestinal diseases, endocrine disorders, and central nervous system functional disorders; while the least common are muscle-skeletal traumas and sight problems.

The analysis of the student's somatic health and their infectious index showed that their general infectious index was equal to 3.07. This exceeds the standards and may provoke exacerbation of chronic diseases after acute respiratory viral infections. The high infectious index was defined in students of subgroups «I» and «II» (3.19 and 3.43 respectively). In subgroups «III» and «IV» the infectious index was probably lower (2.32 and 2.60 with $p < 0.05$), though it exceeded the standard.

The majority of the physical rehabilitation group students (special medical group) showed poor and lower-than-average somatic health (53.8% and 33.6% respectively). The average level was established in 17 students (11.9%). The high and higher than average health level wasn't detected in any of the surveyed.

The worst parameters of health were found in subgroup «I», which is related to the character, level, and peculiarities of the chronic diseases development, and, consequently, severe limitation of physical exercises. Low poor level was characteristic for more than a half of the students (56.5%), the lower-than-average level was revealed in 28.9%, and the average level – only in 14.5%.

The same health dynamics were detected in the students of subgroup «II», which is explained by the chronic disease development. Poor level of somatic health was revealed only in 28 students (75.7%), 8 students (21.6%) showed the level which was higher than the average, and 1 student (2%) showed average health level. The comparison of the male and female health in this subgroup didn't detect any considerable difference.

The students of subgroups «III» and «IV» had significantly better somatic health data than the other group representatives. Generally, their health level was lower than the average.

Such a dynamic pattern was detected when the physical development of the rehabilitation group students was estimated. The best physical development data were found in the subgroup «III» students, which was explained by peculiarities of the muscle-skeletal disorders, which aren't permanent and steady, and, in most cases, students of this group were finally re-distributed to the pre-basic and basic physical training academic groups. The comparative analysis of the physical development index didn't show a significant difference between boys and girls.

The student's fitness was assessed by total score, which was the evaluation criterion. According to the data, the total majority of the students, 87 people (60.8%) were

characterized by low physical fitness. These were presumably students of subgroups "I" and "II". The lower-than-average level was stated in 38 students (26.6%), most of which belonged to subgroups "III" and "IV". 18 students (12.6%) were characterized by an average level of physical fitness. None of the students showed high and higher than average physical fitness levels.

Introduction of the offered physical rehabilitation means into physical education of High school students provided for a 13.2% decrease in the physical rehabilitation group (tab. 2). There has been defined a tendency toward quantitative decrease of subgroups «I», «II» and «IV». In the subgroup «III» the total majority of the students referred to the physical pre-basic group.

Table 2 Distribution of the physical rehabilitation academic group students before and after introduction of physical rehabilitation

№	Subgroup	«I»		«II»		«III»		«IV»		Totally	
		<i>before</i>	<i>after</i>	<i>before</i>	<i>after</i>	<i>before</i>	<i>after</i>	<i>Before</i>	<i>after</i>	<i>before</i>	<i>After</i>
		<i>n=69</i>	<i>n=66</i>	<i>n=37</i>	<i>n=33</i>	<i>n=14</i>	<i>n=7</i>	<i>n=23</i>	<i>n=18</i>	<i>n=143</i>	<i>n=124</i>
1	Males	34	32	17	17	10	5	8	7	69	61
2	females	35	34	20	16	4	2	15	11	74	63

The repeated analysis and assessment of somatic health, physical development index, and physical fitness level confirmed the effectiveness of the offered practical recommendations which affected the mentioned characteristics.

Regular exercise of aerobic rights reduces stress levels, improves and stabilizes mood, improves sleep, and improves self-esteem. Ways that physically influence stress: a decrease in the level of hormones that are responsible for the physiological reaction to stress; stimulation of the production of neurotransmitters, which are natural painkillers and are responsible for improving mood. For help, a person has the right to avoid negative thoughts and maintain a calm and clear mind. You have the right to help overcome hormone-induced stress and muscle tension. With regular physical exercise, a young person develops physical self-improvement, which brings awareness of mastery over the body and the situation, pride, and confidence in oneself.

The assessment of physical rehabilitation group students' health showed positive changes. The poor level rate decreased by 25.6% compared to the early study period, the level "lower than average" increased by 18%, and the "average" physical health level rate increased by 9%. The reliable dynamic pattern of somatic health was detected in all groups, both male and female.

The same pattern was observed in the characteristics of physical development and physical fitness of the students.

A significant re-distribution of the students by the physical development groups was detected in subgroups "II", "III" and "IV". After introduction of the physical rehabilitation into the curriculum, 1% of the students were referred to group I of physical development, and the II physical development group increased by 25.9% (due to the re-distribution of the students from subgroup "IV"). The number of students referred to group "III" significantly increased (In subgroup "I" by 18.9%, in subgroup "II" by 15.2%, in subgroup "III" by 15.8% and in subgroup "IV" by 5.2%). The number of students referred to Group IV significantly decreased (in Subgroup "II" by 7%, in Subgroup "III" by 8.1%, and in Subgroup "IV" by 26.8%).

Also, it is necessary to note the re-distribution of students between subgroups «I», «II» and «IV». These students in the late study period showed average and "higher than average" levels of physical fitness (Table 3). This way, to improve the physical fitness of the physical rehabilitation group students it is necessary to implement individualized physical rehabilitation.

Table 3 Evaluation of physical fitness of the physical rehabilitation group students before and after implementation of physical rehabilitation

Physical fitness level	Study stage	Totally		Subgroup «I»		Subgroup «II»		Subgroup «III»		Subgroup «IV»	
		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Poor	Before	87	60.8	56	81.2	17	45.9	2	14.3	12	52.2
	After	47	37.9	29	43.9	11	33.3	–	–	7	38.9
Lower than average	Before	38	26.6	13	18.8	8	21.6	6	42.85	11	47.8
	After	33	26.6	24	36.4	7	21.2	–	–	2	11.1
Average	Before	18	12.6	–	–	12	32.4	6	42.85	–	–
	After	38	30.6	12	18.2	12	36.4	5	71.4	9	50.0
Higher than average	Before	–	–	–	–	–	–	–	–	–	–
	After	6	4.8	1	1.5	3	9.1	–	2	28.6	–
High	Before	–	–	–	–	–	–	–	–	–	–
	After	–	–	–	–	–	–	–	–	–	–

Discussion

The study assessed the effectiveness of implementation and the effect of various rehabilitation means on physical fitness, somatic health, and multifactorial resistance of the physical rehabilitation group students. As far as we know, this is the first study which offers differentiation of physical education means for the physical rehabilitation group students due to their somatic diseases.

The previous studies determined the interrelation of physical fitness as a factor of positive motivation for physical activity (Blavt, 2012; Bielisova, 2009; Fotynyuk, 2017; Andrieieva et al., 2023) studied some parameters of physical fitness and somatic health of the special medical group students. Belykh (2013), Fotynyuk (2017), Golod (2015), Gryban (2020 (b), Pidluzhnyak & Shemchak (2012) dwelt on basic perspectives of the physical education of university students, during physical rehabilitation particularly.

Nowadays there are many studies that reveal the essence and structure of the physical education process (Bashavets, 2011; Fotynyuk, 2017; Pivneva & Rumba, 2013; Prysazhnuk, 2013; Sobko et al., 2016), but, unfortunately, none of them studies the essence and structure of differentiated methods applied with the physical rehabilitation group students according to the existing nosology.

Yorks et al. (2017), Kuts & Leonova (2014) defined the intensity and criteria of adequate physical exercise volume, Loza (2012) revealed the theoretical aspect of health strengthening basic ways, Mozolev et al. (2020) studied peculiarities of the application of the physical education traditional methods applied in physical rehabilitation groups and their effect on physical fitness parameters. Pidluzhniak et al. (2012), Lianno (2015), Grinko et al. (2024) determined the effectiveness of certain physical education methods in physical rehabilitation groups and their effect on somatic health and life quality of the students.

An important factor in the study is that the offered differentiation of physical education methods for the physical rehabilitation group students according to their somatic diseases not only increased their somatic health and physical fitness level, but contributed to re-distribution of the students to the basic and pre-basic physical training groups.

Another distinctive feature of the offered method is its availability, regarding both implementation and use of methods.

Conclusions

The conducted studies established that differentiation of physical education methods related to the students' somatic disorders is beneficial. The physical rehabilitation group should be divided into 4 subgroups: I- students with heart diseases and tonsillar-cardiac syndrome, chronic diseases of the lungs, kidneys, and bronchi; II – students with gastro-intestinal diseases, endocrine diseases, and functional disorders of central nervous system;

III - students with muscle-skeletal disorders; IV – students with vascular diseases: hyper- and hypotension. A sparing physical regimen was recommended for the students of subgroups I-II, sparing-training regimen – for subgroups III and IV. Such an organization provides for the improvement of physical fitness and somatic health levels among the physical rehabilitation group students.

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Conflicts of Interest: The authors declare no conflict of interest.

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