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ОЗДОРОВЧИЙ ФІТНЕС У ФІЗИЧНОМУ ВИХОВАННІ СТУДЕНТОК ІЗ ЗАХВОРЮВАННЯМИ КАРДІОРЕСПІРАТОРНОЇ СИСТЕМИ

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Анотація. У статті обґрунтовано структуру та зміст оздоровчих фітнес-програм, застосованих у навчальному процесі студенток із захворюваннями кардіореспіраторної системи.

Завдання дослідження: виявити мотиви та інтереси студенток до занять різними видами рухової активності; визначити рівень фізичного стану студенток із захворюваннями кардіореспіраторної системи; розробити оздоровчі фітнес-програми для студенток із захворюваннями кардіореспіраторної системи та експериментально перевірити їхню ефективність.

Для розв'язання завдань використано такі методи дослідження: теоретичний аналіз та узагальнення даних наукової та методичної літератури; документальний метод; соціологічні методи (анкетування); педагогічне спостереження; медико-біологічні методи (оцінювання рівня фізичного стану, адаптаційного потенціалу, функціонального стану серцево-судинної та дихальної систем); педагогічний експеримент; методи математичної статистики.

Дослідження проведено на базі Львівської комерційної академії. У ньому взяло участь 53 студентки віком 17–18 років, які мали кардіореспіраторні захворювання. Студентки були розподілені на дві групи: контрольну групу (КГ=28 осіб) та експериментальну групу (ЕГ=25 осіб).

Доведено необхідність корекції програм фізичного виховання з урахуванням рівня фізичної підготовленості, функціонального стану кожного студента та інтересів до різних видів занять.

Установлено, що за даними оцінювання рівня фізичного стану (РФС) у 37,7% студенток він є нижчим за середній; у 60,4% – середнім; у 1,9% – вищим за середній рівень. Осіб із низьким та високим рівнями фізичного стану не виявлено.

Експериментальна перевірка розроблених програм виявила вірогідно більшу їхню оздоровчу ефективність порівняно з традиційною методикою занять. Після завершення педагогічного експерименту кількість студенток ЕГ із нижчим за середній рівнем фізичного стану достовірно зменшилася з 40,0 до 8,0% ($p < 0,05$), а кількість студенток із середнім РФС достовірно збільшилася з 60,0 до 92,0% ($p < 0,05$). Після педагогічного експерименту в КГ кількість студенток із нижчим за середній РФС недостовірно збільшилася з 32,1 до 46,4%, із середнім, навпаки, зменшилася з 64,3 до 50,0% ($p > 0,05$) та з вищим за середній – залишилася на попередньому рівні і становила 3,6%.

Ключові слова: фітнес-програма, рухова активність, рівень фізичного стану, заклади вищої освіти, здоровий спосіб життя.

HEALTH FITNESS IN PHYSICAL EDUCATION OF STUDENTS WITH DISEASES OF THE CARDIO-RESPIRATORY SYSTEM

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Abstract. The paper substantiates the structure and content of health-related fitness programs used during the educational process of students with diseases of the cardio-respiratory system.

Objectives of the study: to identify the motives and interests of students to be engaged in different types of motor activity; to determine the level of physical condition of students with diseases of the cardio-respiratory system; to develop health-related fitness programs for students with cardio-respiratory system diseases and experimentally test their effectiveness.

The following research methods were used to solve the problem: theoretical analysis and generalization of scientific and methodological literature data; documentary method; sociological methods (questionnaires); pedagogical observation; medical and biological methods (evaluation level of physical condition, adaptive potential, functional state of cardiovascular and respiratory systems); pedagogical experiment; methods of mathematical statistics.

The research was conducted on the basis of the Lviv Commercial Academy. It was attended by 53 students aged 17–18 who suffered from cardio-respiratory diseases. The students were divided into two groups: a control group (CG=28 people) and an experimental group (EG=25 people).

The necessity of correction of physical education programs is proved, taking into account the level of physical fitness, functional state of each student and interests to different types of classes.

It was established that the fitness level (FL) of 37.7% of students is lower than average; 60.4% – average; 1.9% – higher than average level. People with low and high levels of fitness were not found.

Experimental testing of the developed programs revealed a significantly greater improvement in their efficiency compared with the traditional method of training. After the completion of the pedagogical experiment, the number of EG students with a lower than average fitness level significantly decreased from 40.0 to 8.0% ($p < 0.05$), and the number of students with average FL significantly increased from 60.0 to 92.0% ($p < 0.05$). After the pedagogical experiment in CG, the number of students with lower than average FL increased unbelievably from 32.1 to 46.4%; with the average FL, on the contrary, decreased from 64.3 to 50.0% ($p < 0.05$) and with higher than average FL it remained at the previous level and amounted to 3.6%.

Keywords: fitness program, motor activity, fitness level, institutions of higher education, healthy lifestyle.

Introduction. According to some scientists, insufficient motor activity is one of the important reasons for deviations in young people's health [4, 8]. It is proved that the content of compulsory physical education, which contains only basic sports, does not attract student youth [3, 6]. In addition, while designing the physical education syllabus for students with some deviations in their health, as a rule, only the nature and severity of the disease are taken into account, classes are conducted according to the standard scheme and without considering the students' individual characteristics and their

desire to be engaged in a certain kind of physical and recreation activity [2, 5]. To increase motivation for physical activity, scientists recommend introducing various health-improving technologies of conditioning [7, 8].

According to research papers on the issue, the popular among modern youth is the pursuit of recreational aerobics, which, thanks to the emotional background and the use of simple and accessible dance-gymnastic exercises, positively affects the body: strengthens the cardiovascular and respiratory system, increases the aerobic capacity of the

body, develops strength, flexibility, coordination of movements, improves general and strength endurance contributing to increased levels of physical fitness [1, 9, 10]. Also, the health effect of lessons is to accelerate the metabolism, activate the body's immune system, correct posture, improve the psycho-emotional well-being and prevent cardiovascular disease [8, 12]. However, further study is required of the integrated effects of wellness fitness training on the cardiovascular and respiratory systems of students who have a deviation in their health status.

In this regard, optimization of motor activity as a basic factor for improving the health of students with cardio respiratory diseases by using health fitness means is relevant and socially significant.

The purpose of the research: to substantiate the structure and content of health fitness programs in the educational process of students with diseases of the cardio-respiratory system for the improvement of their health and physical condition.

Objectives of the study:

1. To identify the motives and interests of students to be engaged in different types of motor activity.
2. To determine the level of physical condition of students with diseases of the cardio-respiratory system.
3. To develop health-related fitness programs for students with cardio-respiratory system diseases and experimentally test their effectiveness.

Material and methods. The following research methods were used to solve the problem: theoretical analysis and generalization of scientific and methodological literature data; documentary method; sociological methods (questionnaires); pedagogical observation; medical and biological methods (evaluation level of physical condition, adaptive potential, functional state of cardiovascular and respiratory systems); pedagogical experiment; methods of mathematical statistics.

The research was conducted on the basis of the Lviv Commercial Academy. It was attended by 53 students aged 17–18 who suffered from cardio-respiratory diseases. The students were divided into two groups: a control group (CG=28 people) and an experimental group (EG=25 people).

Research results. The analysis of the athletes' medical cards reveals that during recent years there has been a tendency of increasing the number of chronic diseases among students. In particular, the diseases of the cardiovascular system predominate.

A survey carried out among physicians made it possible to find out their positive attitude towards the application of the latest health-improving technologies in the physical education of students who have a deviation in their health and their strong

belief in the need for health-improving activities. Out of the proposed types of recreational activities, 33.3 % of the respondents chose health-related kinds of gymnastics, 29.6 % – recreational swimming, 22.2 % – health-related aerobics, 11.1 % – sports games and 3.7 % – martial arts.

A survey carried out among students made it possible to find out that 13.2 % of them consider their health to be excellent; 41.5 % – satisfactory; 35.9 % – poor, and 9.4 % of students identified it as unsatisfactory.

The main motive that encourages students to take up physical activity is the improvement of their figure and posture (35.8 % of respondents); 22.6 % of students claim that they are engaged in physical exercises to increase the body's resistance to diseases; 20.8 % – for health improvement; 17.0 % – for the development of physical qualities, and only 3.8 % of students do it for their prestige.

It was determined that 47.2 % of students expressed their desire to practice health-related aerobics; 13.2 % – table tennis; 11.3 % – athletics; 9.4 % of respondents chose basketball; 7.5 % – badminton and shaping, and 3.9 % went in for volleyball.

Thus, the survey confirmed the feasibility of introducing the latest technologies based on developed health-related fitness programs into the educational process of physical education for students who have a deviation in health, which will enable students to intensify their health-related activity and have a positive impact on their level of physical condition (FL) and cardio-respiratory system functional state.

The definition of the adaptive capacity (AC) of the cardiovascular system made it possible to find out that a "satisfactory" adaptation to the environmental conditions was found in 48.0 % of the students of the EG and 39.3 % of the students of the CG. The tensions in the adaptation mechanisms are, respectively, in 52.0 % of the examined students in the EG and 60.7 % of those in the CG, that is, sufficient functional capabilities are provided through the mobilization of functional reserves.

The evaluation of the cardiovascular system was performed by calculating the Kvaas endurance coefficient (EC) and the minute volume of blood circulation (MVBC). 7.1 % of the CG students are evaluated as "good" for EC, 42.9 % – "satisfactorily", and 50.0 % – unsatisfactorily. Only 8.0 % of students were diagnosed with "good", 36.0 % of students were "satisfactorily" and 56.0 % were "unsatisfactorily" in EG. MVBC index is normal in rest condition in 52.0 % of students of the EG and 60.7 % the CG students, while in 48.0 % and 39.3 % of surveyed, this index is lower than norm.

The evaluation of cardio-respiratory system endurance, carried out with the help of the Skibinski index (SI), made it possible to state that 92.9% of the CG students and 92.0% of the EG students were "very bad". "Unsatisfactory" endurance by SI in the CG was found in 7.1% of students and in EG – in 8.0% of students.

It was found that according to the general evaluation of the students' fitness level (according to the method of KONTREKS-2), it does not differ significantly in both groups. It should be noted that no student had a low and high FL. Below the average fitness level was detected in 40.0% the EG students and 32.1% – in the CG students. The average FL was respectively found in 60.1% and 64.3% of students in the experimental and control groups. The fitness level above the average was available only in 3.6% of students in CG (Fig. 1).

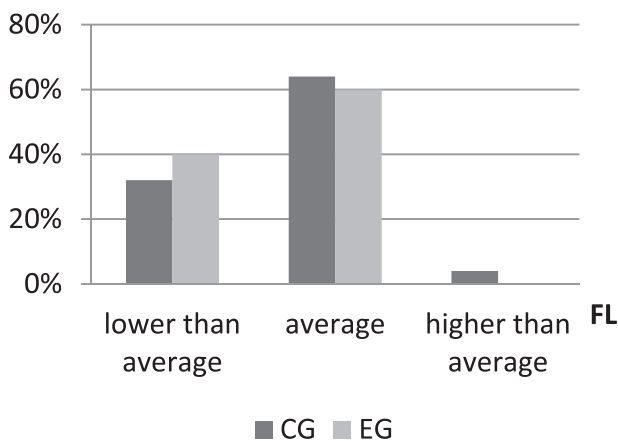


Fig. 1. Distribution of CG and EG students according to their fitness level

Thus, the analysis and comparison of the primary examination results of students in CG and EG did not reveal statistically significant differences between them, which testifies to the homogeneity of the group composition.

Then, to improve the functional capabilities of students with diseases of the cardio-respiratory system health-related fitness programs were developed in accordance with their physical condition, taking into account the nature and severity of the disease, and interests or desires.

During the recording experiment, the preconditions for designing health-related fitness programs, which include the nature and severity of the disease, the level of physical condition, and the functional capabilities of the cardio-respiratory system [5], were identified.

The elucidation of the basic principles and taking into account the methodical features of conducting basic aerobics classes allowed singling out the structural elements of health-related fitness program

for students suffered from diseases of the cardio-respiratory system. These include: the regulation of aerobic choreography, the choice of musical accompaniment, the volume of loading, their intensity and frequency per week.

According to the fitness level, the students were divided into subgroups. The regulation of aerobic choreography included differentiated use of exercises with low (super low impact and low impact) and middle impact effects on the locomotor system as well as guidance on limiting arm movements.

Classes with super low impact and musical accompaniment of 100–110 accents/min were offered to students with low and lower than average FL. Classes with low impact and musical accompaniment of 110–120 accents/min were chosen as the basis for students who had an average FL. For students with a higher than average and high FL, an average load (middle impact) with musical accompaniment of 120–125 accents/min. was offered.

In addition, health-related fitness programs for students with various FL differed in volume of load, which was regulated by the duration of classes, the number of series and repetitions of exercises. Intensity of exercises was regulated by the appropriate range of HRmax indices.

The average duration of classes was 40–60 minutes and consisted of preparatory, main and final parts. As the research has shown, due to the reduced adaptive capacity of the cardiovascular system, it is advisable to increase the duration of the preparatory and final parts. So, the classes consisted of warm-up (up to 25% of entire time), the main part (40–45%) and the cool down (up to 30%), which necessarily contained stretching exercises, elements of autotraining and a set of breathing exercises (exercises paradoxical gymnastics worked out by Strelnikova O. M. and modified breathing gymnastics "Bodyflex").

Using musical accompaniment, we adhere to the necessary requirements for tempo, genre, optimal use of rhythm, times, etc. Different aerobic steps are combined in the appropriate series. Each series was performed during one musical square (32 beats) and combined 3 to 4 aerobic steps. The series combined into a choreographic combination, which also included a certain number of repetitions. Mastering the technique of exercise was carried out gradually, due to changes in rhythm, tempo, amplitude, direction of motion. The main components of the developed health-related fitness programs are listed in Table 1.

The content of health-related fitness programs using basic aerobics was changed once every three months. To regulate the load, the heart rate mea-

surement was performed throughout the exercise. Individual parameters were calculated, namely: the maximum estimated heart rate, the acceptable range of changes in heart rate, the "planned shift" of heart rate (desired intensity) and optimal heart rate ("peak" of the training zone).

As a result of the introduction of health-related fitness programs, the following scientific data have been obtained indicating their positive impact.

The calculation of the AC revealed that after the pedagogical experiment in the CG there was no change and the state of satisfactory adaptation remained the same in 39.9% of students, and in 60.7% of students the state of the adaptation mechanisms tension was detected. In EG students, an increase of 12.0% ($p < 0.05$) among persons with satisfactory adaptation was found and 12.0% ($p < 0.05$) decrease in the number of students in the state of adaptation mechanisms tension.

The significant improvement in the cardiovascular system and fitness level of students in EG is evidenced by a decrease in Kvaas EC. At the end of the pedagogical experiment, this index reached a point "good" among 36.0% of students in EG and increased by 28.0% ($p < 0.05$), while positive changes were recorded in the students of the CG, but only by 10.7% ($p < 0.05$). In EG the number of people who rated the index as "satisfactory" increased by 24.0% ($p < 0.05$); in CG, the number of students with this index increased by 14.2% ($p < 0.05$). Among the students of the EG, the number of people whose EC was assessed as "unsatisfactory" decreased by 52.0% ($p < 0.05$), whereas in the students of the CG this figure decreased by 25.0% ($p < 0.05$).

Indices of MVBC tended to make false changes. After the pedagogical experiment the MVBC index in norm was revealed in 50.0% of the students in CG and 60.0% of the students in EG ($p < 0.05$). The rest of the students (50.0% and 40.0% respectively) had a MVBC below the norm.

The analysis of the respiratory system indices for SI shows a significant increase in the number of people with an SI evaluation as "unsatisfactory" in EG by 72.0% ($p < 0.001$) and a decrease in the number of students with a rating of "very poor". The SI rate in 78.6% ($p < 0.05$) of the students in CG corresponded to the assessment of "very poor" and "unsatisfactory" in 21.4% of students ($p < 0.05$).

An analysis of the fitness level of students in CG and EG, before and after a pedagogical experiment, indicates some changes in the studied indices. Consequently, in EG students, the flexibility index increased significantly by 15.0% ($p < 0.05$) and for students in CG it was 3.7% ($p < 0.05$). As for speed index EG students showed an improvement by 21.8% ($p < 0.05$), and CG students demonstrated the decrease in this index by 6.3% ($p < 0.05$). There was an increase by 8.6% ($p < 0.05$) of the dynamic force in EG students, while in CG students this index worsened by 2.6% ($p < 0.05$). The speed index of CG students increased by 7.8% ($p < 0.05$), while in the students of EG it was significantly improved by 17.1% ($p < 0.001$). The endurance index among the students of EG grew insignificantly by 9.6% ($p < 0.05$). On the contrary, the students of CG experienced a decrease of this index by 4.5% ($p < 0.05$). Also, unreliable changes in the overall endurance index were revealed, namely: in the students of EG, an increase

Table 1

The main components of health-related fitness programs for students with different fitness levels

Fitness level	Classes per week	Load volume			Musical accompaniment tempo (beats/min)	Arm motions	Intensity (%) HRmax	Impact influence level
		Classes duration (min)	Series number	Number of choreographic combination repetition				
Low, Lower than average	2	40–45	2	8	100–110	On waist	45–50	superlowimpact
Average	2	45–55	2–4	8–16	110–120	Up to shoulder level	50–55	lowimpact
Higher than average, high	2	55–60	2–4	16	120–125	Arms up	55–60	middleimpact

was observed by 4.2% and 0.9% for the students of CG ($p < 0.05$). The heart rate recovery index after a load increased by 29.5% ($p < 0.05$) in the students of CG, as for EG students, it significantly decreased by 25.9% ($p < 0.05$). Figure 2 shows a graphical representation of the relative deviations of the FL indices of the students in the control and experimental groups before and after the experiment.

According to the general evaluation of the FL at the end of the pedagogical experiment, it was established that no student showed its low level, however, no high FL was detected. At the same time, the number of EG students with FL below the average decreased from 40.0% to 8.0% ($p < 0.05$), and with the average FL increased from 60.0% to 92.0% ($p < 0.05$). The students in CG also did not show low and high levels of physical condition, while the number of students with lower than average level increased from 32.1% to 46.4% ($p < 0.05$), but those with the average level, on the contrary, decreased from 64.3% to 50.0% ($p < 0.05$), and the number of students with above the average FL remained at the previous level and amounted to 3.6% (Fig. 3).

The changes in the indices wellness, physical activity and mood (WAM) of students in EG according to the scale of the methodology of WAM were as follows: complaints on unsatisfactory state of health were not revealed, satisfactory state of health was detected in 56.0% ($p < 0.05$) persons, and responses indicating well-being, became more practically in 3 times (from 16.0% to 44.0%). The CG students did not state inadequate state of health, 96.4% emphasized the average well-being, but the number of responses about well-being decreased to 3.6% ($p < 0.05$).

The number of responses indicating low activity of the students in EG was not revealed, however, the number of evidence of high activity was given by 48.0% ($p < 0.05$) of the students. In CG, the number of responses indicating low activity decreased to 17.9% ($p < 0.05$), responses about average (75.0%) and high (7.1%) activity increased ($p < 0.05$). After the experiment, 64.0% of students in EG ($p < 0.01$) and 25.0% of students of CG ($p < 0.05$) had a good mood, despite the fact that the number of responses about poor mood was not recorded.

Such a difference in the indices of good mood in EG students can be explained by the fact that classes according to the health-related fitness program were conducted to musical accompaniment, which is one of the effective means of improving the emotional state.

Discussion. Researchers (Kuzmin V. A. et al., 2016) confirm our belief that the traditional educational process can not fully solve the problems faced teaching staff. In addition, the findings of researchers (Maglevanyi A. V. et al., 2009; Blavt O. Z., 2012) confirmed that under the influence of physical activity, the expansion of the body's adaptive capacity of the patients with diseases of the cardiovascular system is possible.

Also, a large number of scientists (Mordvinova, A., Burla, O., 2011; Blavat, O. Z., 2012; Syed Ibrahim et al., 2013) note the benefits of health-improving technologies in physical education classes for student youth. In particular, in his research, Blavat O. Z. (2012), focuses on the importance of taking into account not only the nature and severity of the disease in the process of physical education of students who have a deviation in their health, but also their individual characteristics and de-

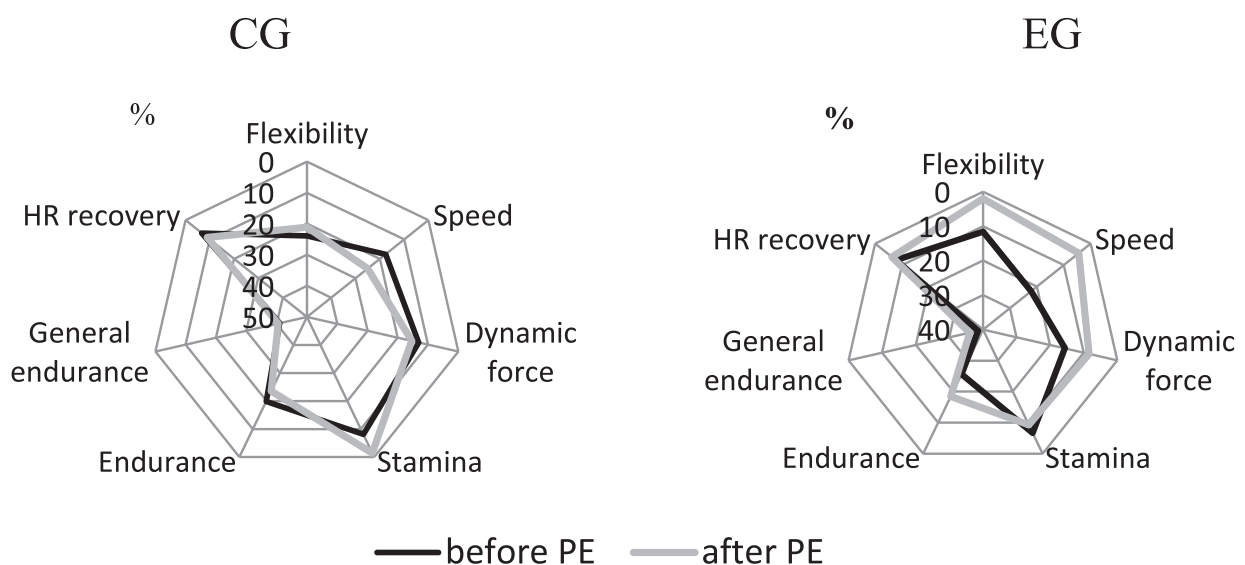


Fig.2. Relative deviation of FL indices of the students in CG and EG before and after the pedagogical experiment

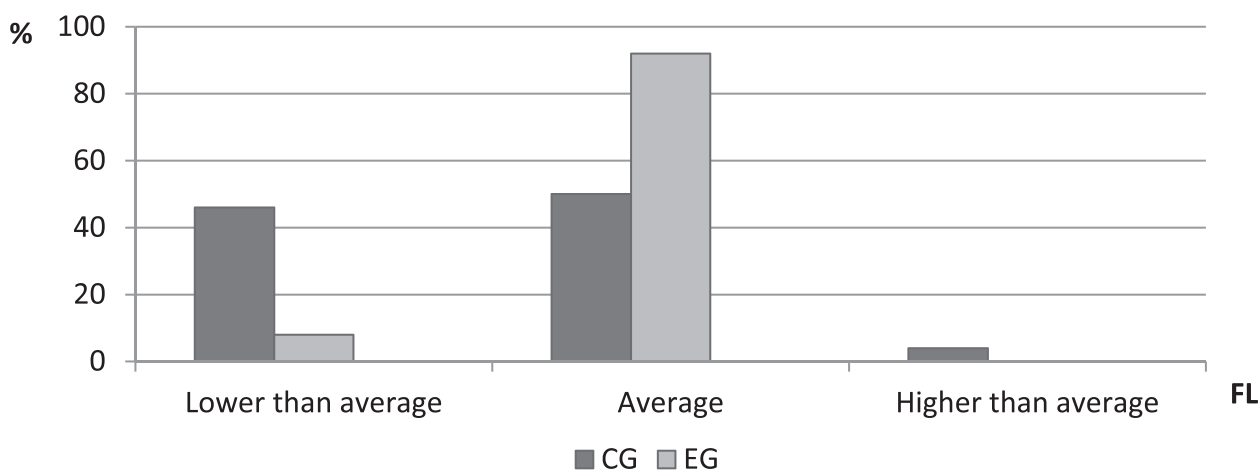


Fig. 3. Distribution of EG and CG students according to their fitness level after a pedagogical experiment

sires to be engaged in a certain kind physical and recreation activities. And researchers (Santina T., Godin G., Gagne C., Guillaumie L., 2017) found out information about the motives that affect the formation of the needs of students with diseases of the cardio-respiratory system to lead a healthy lifestyle and to be engaged in various types of motor activity

Our studies confirm that the use of modern aerobics exercises positively affects the level of students' physical fitness, improves their cardio-respiratory endurance and stabilizes the mental state.

Thus, we have identified the effectiveness of using health-related fitness programs during the physical education of students with poor health (for example, cardio-respiratory diseases), which contains basic aerobics, stretching, elements of breathing gymnastics and autotraining.

Conclusions:

1. An analysis of scientific and methodological literature shows that there are no agreed approaches to staffing groups for the training of students who have a deviation in their health and determine their optimal level of physical activity. According to specialists, it is extremely necessary to take into account not only the availability but the nature and severity of the disease of students, as well as the level of adaptive capacity of the body. The necessity of correction of physical education programs is proved, taking into account the level of physical fitness, functional state of each student and interests to different types of classes.

2. It was determined that 47.2% of students expressed their desire to practice health-related aerobics; 13.2% – table tennis; 11.3% – athletics; 9.4% of respondents chose basketball; 7.5% – badminton and shaping, and 3.9% went in for volleyball.

3. It was established that the fitness level of 37.7% of students is lower than average; 60.4% – average; 1.9% – higher than average level. People with low and high levels of fitness were not found.

4. The structure and content of health-related fitness programs with the use of basic aerobics for students with diseases of the cardio-respiratory system, which contains the following components: the regulation of aerobic choreography means, the choice of musical accompaniment, the volume of loading, frequency and intensity per week, are developed and substantiated. The regulation of aerobic choreography means involves differentiated use of low impact exercises and middle impact impacts on the musculoskeletal system, as well as guidelines for limiting arm movements. Health-related fitness programs differed in duration of classes, number of series and repetition of choreographic combinations: the number of series in complexes (from 4 to 8 series), series repetition (from 8 to 16 repetitions), musical beats (from 100 to 125 beats/min). When choosing a musical accompaniment, the requirements for tempo (moderate, average, above average), genre, optimum use of rhythm, times, etc. were observed. Intensity of exercises was regulated by the appropriate range of HRmax indices. Adjusting the corresponding parameters allowed differentiating the load of fitness programs for students according to their level of physical condition. Considering the reduced adaptive capacity of the cardiovascular system of students, it was expedient to make corrections in the time proportion of classes, having increased the duration of the preparatory and final parts to 25% and 30% of its total duration.

5. Experimental testing of the developed programs revealed a significantly greater improvement in their efficiency compared with the traditional

method of training. After the completion of the pedagogical experiment, the number of EG students with a lower than average fitness level significantly decreased from 40.0% to 8.0% ($p < 0.05$), and the number of students with average FL significantly increased from 60.0% to 92.0% ($p < 0.05$). After the pedagogical experiment in KG, the number

of students with lower than average FL increased unbelievably from 32.1% to 46.4%; with the average FL, on the contrary, decreased from 64.3% to 50.0% ($p < 0.05$) and with higher than average FL it remained at the previous level and amounted to 3.6%.

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