

## Impact of the wellness program on the quality of life of students

NATALIIA NESTERCHUK<sup>1</sup>, IGOR GRYGUS<sup>2</sup>, MYKOLA IEVTUKH<sup>3</sup>, ANTON KUDRIAVTSEV<sup>4</sup>,  
DARIUSZ SOKOŁOWSKI<sup>5</sup>

<sup>1,2,3,4</sup>Institute of Health Sciences, National University of Water and Environmental Engineering, Soborna 11 Str.,  
33028, Rivne, UKRAINE

<sup>5</sup>Nicolaus Copernicus University, Lwowska 1 Str., 87-100 Torun, POLAND

Published online: April 30, 2020

(Accepted for publication: April 15, 2020)

DOI:10.7752/jpes.2020.s2132

### Abstract

**Introduction:** Human health has a profound effect on physical performance and productivity, the country's economy, the moral climate in society, the upbringing of the younger generation, and also reflects the way and quality of life. An important factor in our society for promoting human health is a healthy lifestyle. Indicators of the general human culture can be considered attention to their health, the ability to provide individual prevention of deterioration of health, as well as conscious adherence to a healthy lifestyle. Recently, the problem of deteriorating student health has been receiving more attention because many students have different chronic conditions. Therefore, one of the priorities in shaping students' health today is to provide the right conditions for the education and education of a physically and mentally healthy person. **Material and Methods:** In our study, 152 students enrolled in their second year of study enrolled in their first bachelor's degree. By randomization, they were divided into two groups: control (n = 76) and primary (n = 76). The groups were identical in age and physical development. The control group students attended regular physical education classes according to the schedule. The students of the major also attended physical education classes on a schedule, where they implemented the developed and proposed program. **Results:** The proposed comprehensive curriculum for physical education of students took into account the results of the student survey at the beginning of the study and was divided into three periods: introductory, basic and final. Each of the physical education programs offered differed in its basic components. As a result of the implementation of the proposed physical education program, students of the main group experienced significant improvements in the results of tests that determine the state of the respiratory and cardiovascular systems: Stange test ( $60.80 \pm 0.72$  s) ( $p < 0.05$ ), Gencha test ( $29.08 \pm 0.39$  s), the Skibinsky index ( $32.42 \pm 0.92$ ) and the Ruffier functional test ( $7.30 \pm 0.28$ ). **Conclusions:** According to the results of the research, we can state the positive impact of the proposed physical education program on the level of physical health of students. A significant improvement in the functional status and physical performance of students in the core group is evident. Application of the developed program has contributed to positive changes and promotion of health, adaptation to training and improved quality of life.

**Key words:** wellness, programme, students, quality of life.

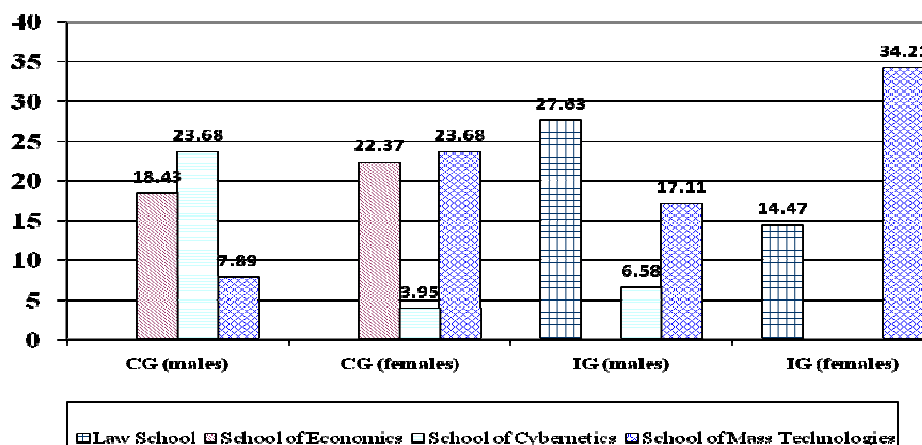
### Introduction

Health directly affects the working capacity and labour productivity, the country's economy, the moral climate in society, the education of youth, reflects the image and quality of life. Health promotion is an important factor in improving the students' quality of life. People's involvement in their own health and care, prevention of health-related conditions, personality tendencies, such as personal health consciousness in various forms of life, – all these are indicators of the overall personal culture. The scientists view the quality of life as a health-related integral characteristic of the physical, psychological and social relationship of either a healthy or sick person, based on his/her subjective perception. The World Health Organization (1998) defines Quality of Life as an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, personal beliefs, social relationships and their relationship to salient features of their environment. Numerous data show that the targeted influence on the body of the students by means of physical education makes it possible to achieve positive changes in health promotion. However, the issue lies not only in the use of optimal means of physical education, depending on age, gender, the initial level of health and performance in the workplace. Grygus (2011), Moshynsky et al. (2013), Chyzhyk and Zaporozhets (2009) argue that it is important to monitor the effectiveness of the factor's impacts on the body and to make relevant adjustments to the physical education programmes, depending on the morphological and functional status of the physiological systems of the organism. The analysis of scientific, methodological and special literature has revealed that scientists like Pshenychna and Kozytska (2004) confirmed that the influence of physical and sport activity on male and female students' health improvement is

an urgent issue; Mahlovanyi, Shymechko, Boiarchuk, and Moroz (2011) investigated the features of the physical fitness indicators for the female students of medical university; Stoianov (2002) presented the ways of updating the contents of physical education curriculums and considered recreational exercise motivation with the objective to update it; Husiev and Malynskiy (2006) studied a number of issues related to the transition of higher education institutions to teaching "Physical Education" discipline in line with the curricula compiled according to the requirements of the Bologna process; Kulakov and Demydova (2006) provided information on the organization and forms of work related to physical education of student youth. At the same time, Saluk (2012) confirmed the unsatisfactory state of the indicators of physical health, physical development and motor readiness of students. The noted researcher also substantiated positive influence of different sport means on the functional state of students. Buren (2010) developed the method of improving physical preparedness and functional state of the body of students of technical universities, and discovered that the preparedness level according to the scale of Ukrainian state tests corresponds to the levels of "average" and "below average". The analysis of a number of scientific sources shows that the harmonious combination of attention and memory, the level of mental performance and physical fitness, the functional state of the body that change while a young specialist performs his/her professional duties are important for his/her successful work.

### Material & methods

152 2<sup>nd</sup> year undergraduate students took part in the study: control group (n = 76) and intervention group (n = 76) that had identical age range and physical fitness (Fig. 1). The students of the control group were engaged in the generally accepted system of physical education, while the students of the trial (intervention) group engaged in the suggested sport and physical education programme. The overall objective of the research is to improve the *curricular*, organizational and methodical components of wellness of students of higher educational institutions, aimed at increasing the physical preparedness and formation of functional reserves of the body. According to Meshcheryakova (2006), the main parameters for creating favorable conditions for maintaining and improving the quality of health are as follows: physical fitness of a person, which is a set of morphological and functional characteristics, whereas morphological features as criteria that characterize the body fitness may be as reliable as functional ones; physical activity, which is optimal exercise for preserving and improving health and well-being, that can simultaneously serve as a characteristics of health self-control. In particular, Volkov (2011) states that the ability of the body to adapt to different types of physical activity served as the objective indicator of physical health. The facts that within the proposed physical education curriculum (1) the classes were conducted with physically healthy 2<sup>nd</sup> year undergraduate students, (2) physical education was aimed at mastering the skills of wellness self-use, at conscious understanding of its positive effect on the whole body, at the ability to independently organize physical education classes and directing it to comprehensive development, at increasing physical fitness and improving the body are its defining features. The students of the trial group were engaged in a comprehensive physical education curriculum with compulsory self-sustained workout, attending classes with a sports orientation, and exercise on training simulators.



**Figure 1. Distribution of students in groups, in percentage**

Physical education with the students of the trial group was conducted throughout the study period in the mode of educational activities and in the form of independent classes. The objective of the physical education curriculum for students was to facilitate the training of harmoniously developed and highly skilled professionals, as well as to improve the quality of life. While implementing the physical education curriculum, the researchers have foreseen the following tasks:

- ✓ education of personal integrity, charisma and fitness in students, their readiness for highly productive and effective work;
- ✓ preservation and improvement of students' health, promotion of correct formation and

comprehensive development of the body, maintenance of high working capacity throughout the period of training;

- ✓ comprehensive physical training of students;
- ✓ professional and applied physical training of students while taking into account the peculiarities of their future employment;
- ✓ students' acquisition of knowledge with regard to theory, methodology and organization of physical education and sports training;
- ✓ education of the confidence that there is a need to regularly engage in physical education and sports in students. This form, implemented at academic classes during study time, envisaged a comprehensive solution of three groups of pedagogical tasks: educational, instructional and recreational with a predominant educational orientation.

### Results

The comprehensive physical education curriculum of students was based on the results of the ascertaining experiment and included three periods: introductory, main and final ones (Fig. 2). Basing on Dimova (2012), the trial allocated a significant role to increasing the motivation to use physical culture in everyday life, including physical education classes, both academic and independent ones, and the choice of adequate means to compensate for the shortage of daily motor activity of students.

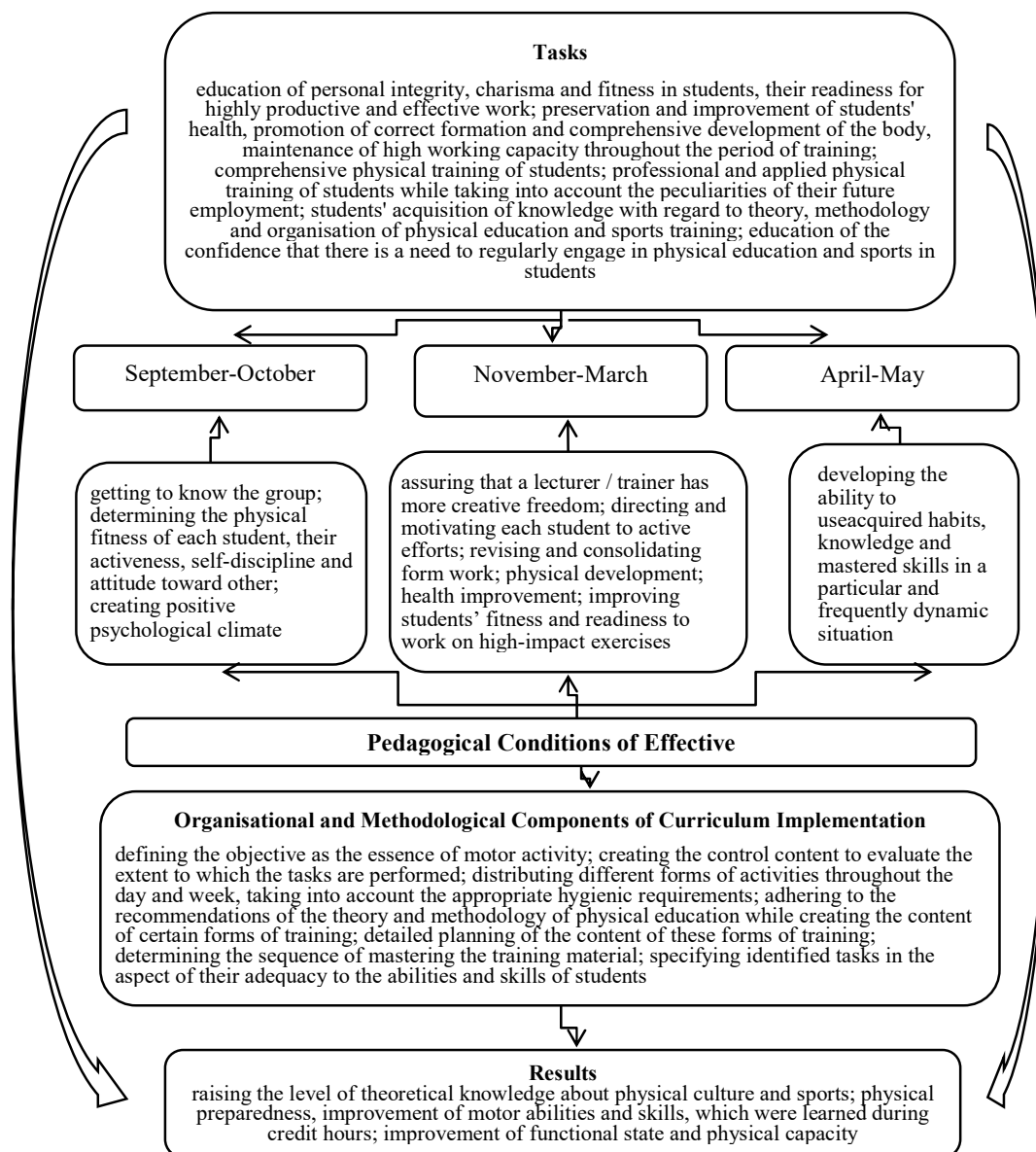
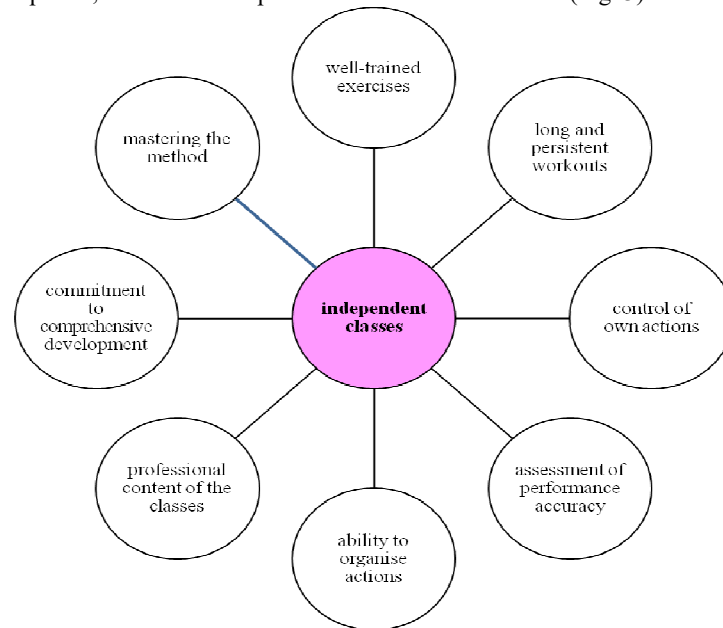


Figure 2. Block Diagram of Student Wellness through the Physical Education Curriculum

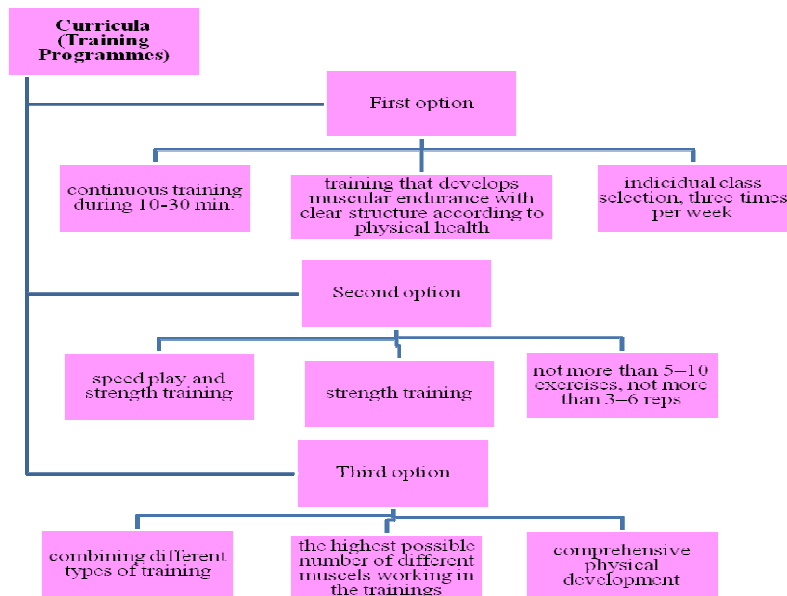
According to Nesterchuk (2017), as well as to Prusik, Mykhailova and Grygus (2013) the physical education process was organized depending on the state of health, the level of physical development and readiness of students, their sports qualifications, considering the conditions and nature of their future employment. The team offered the exercises for self-sustained workout only after the students coped with them well during the classes in the presence of a trainer. They tried to convince students that only long and persistent training can lead to the achievement of noticeable results. The team made students aware of the methods of controlling their own actions and assessing the correctness of the exercise performance. They formed the skills of organizing and presented methods of independent work, directed their independent work not only on the comprehensive development, but also on the professional content of classes (Fig. 3).



**Figure 3. Recommendations for Students with Regard to Independent Classes**

Consistency is the foremost condition for the positive influence of independent classes on the body. In the process of regular physical exercises, the student develops conditioned reflexes or certain motor skills, and then – a dynamic stereotype. Long breaks lead to loss of developed motor skills. In this case, when the student gets back to classes we recommend starting with the simplest exercises.

In the process of physical education, the project suggested the following training programme options (Fig. 4).



**Figure 4. Options of Basic Health Improvement Physical Education Curricula (Training Programmes)**

Each option of the health improvement physical education curriculum (training programme) had its own peculiarities.

*The first option of the programme* envisaged the predominant use of continuous training, which included an uninterrupted session of 10-30 minutes workout. The intensity of the exercises that develop muscular endurance was clearly determined by the physical health of the students. Each person selected some kind of physical exercises and trained three times a week depending on the interests, seasons, technical equipment.

The trainers suggested a variety of physical exercises and their complexes for the development of general endurance. The given trainings met the following requirements:

- ✓ simple training technique;
- ✓ active work of the majority of skeletal muscles;
- ✓ the ability to monitor and adjust the training load.

The trainers recommended the use of a balanced training method for the development of endurance during the independent classes. Its advantages are that optimal physical activity improves the stability of organs and systems, significantly develops cardiovascular and respiratory systems, and positively affects health in general.

The workout was based on the method of strictly structured exercises with interval load in order to increase aerobic endurance. The intensity of workout contributes to an increased heart rate (160-170 beats per minute) before the end of the exercise, rest interval: 1-3 minutes.

Due to the low level of students' physical health, the main method of endurance development was interval (2-5 repeats of 600 meters run, with a two-minute recovery).

The trainers widely used recreational jogging while forming a complex of individual classes for the development of general endurance.

*The second option of the health improvement training programme* envisaged the use of speed play and strength workout. The workout pattern foresaw not more than 5-10 exercises, not more than 3-6 reps.

*In the third option*, the trainers used complex approach, which included a combination of different loads, which involve as much muscles as possible, ensuring the improvement of the student's body organs and systems, as well as comprehensive physical development.

To compare changes in students' health, we conducted the necessary testing twice: at the initial and final stages of the study. The Stange and Genchi tests, the Skibinski Index, were used to determine the state of the respiratory and cardiovascular systems. Students' physical performance was determined using a Ruffier test.

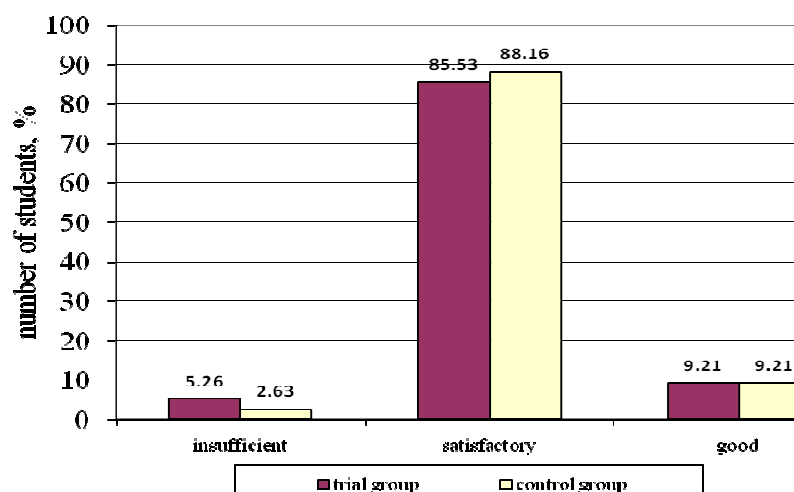
The first was a Stange test, which suggested that the student take as deep a breath as possible and hold his breath for as long as he could. According to its results, at the initial stage of the study in the students of the main group (men and women), the average values of functioning of the cardiorespiratory system were at the level of  $38.88 \pm 0.93$  s, and in the students of the control group -  $38.76 \pm 0.87$  s. At the final stage of the study, we found that the students of the main group had a significant improvement in the functional status of the cardiorespiratory system. According to the results of the Stange test, the mean values of these indicators were  $60.80 \pm 0.72$  s ( $p < 0.05$ ). At the same time, we did not observe a significant improvement in the functional status of the cardiorespiratory system in the control group students. Their performance was  $42.12 \pm 1.10$  s ( $p < 0.05$ ).

We also compared the condition of the student's cardiorespiratory system by determining the Genchi test, when the student exhaled completely and held his breath for as long as possible. According to its results, the average values of the students of the main group at the beginning of the study were as follows:  $18.34 \pm 0.44$  s, almost the same indicators were found in the students of the control group -  $18.41 \pm 0.39$  s.

These results also confirm that the condition of the cardiorespiratory system was virtually identical in the students of both groups at the initial stage of the study. At the final stage of the study, we observed a significant improvement in the functional status of the cardiorespiratory system in the students of the main group, which confirms the effectiveness of the proposed program.

The mean results obtained after the Genchi students performed in the main group students at the end of the study were  $29.08 \pm 0.39$  s ( $p < 0.05$ ). At the same time, the students of the control group did not experience significant changes in the performance of this sample, the average values of the indicators at the end of the study were at  $19.45 \pm 0.46$  s.

To determine the level of functioning of the respiratory and circulatory organs in students of both groups, we used the Skibinsky index. At the initial stage of the survey, all students had a satisfactory result:  $18.28 \pm 0.80$  points for students in the main group and  $19.02 \pm 0.82$  points for students in the control group (Fig. 5).



**Figure 5. Skibinski Index at the Beginning of the Study**

After thoroughly testing all students to determine their respiratory and circulatory system status using the Skibinski Index, we analyzed the results.

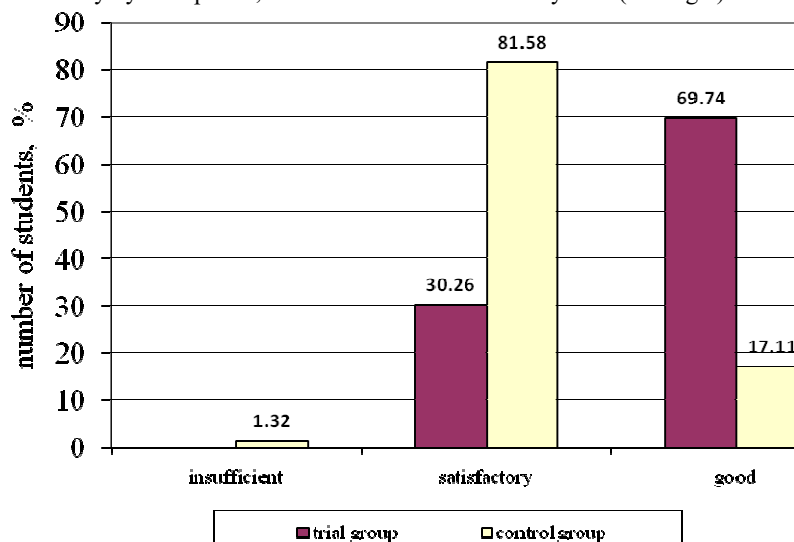
The students of the main group received the following data:

- ✓ 4 (5.26%) students of the main group at the initial stage of the study according to the results of the Skibinsky index had insufficient level of functioning of the respiratory and circulatory systems;
- ✓ 65 (85.53%) students of the main group at the initial stage of the study according to the results of the Skibinsky index had a satisfactory level of functioning of the respiratory and circulatory systems;
- ✓ 7 (9.21%) students of the main group at the initial stage of the study according to the results of the Skibinsky index had a good level of functioning of the cardiorespiratory system.

The students of the control group:

- ✓ 2 (2.63%) students of the control group at the initial stage of the study according to the results of the Skibinsky index had insufficient functioning of the respiratory and circulatory systems;
- ✓ 67 (88.16%) students of the control group at the initial stage of the study according to the results of the Skibinsky index had a satisfactory level of functioning of the respiratory and circulatory systems;
- ✓ 7 (9.21%) students of the control group at the initial stage of the study according to the results of the Skibinsky index had a good level of functioning of the cardiorespiratory system.

At the final stage of the study in the students of the main group, we noticed a significant improvement in the functioning of the respiratory and circulatory system according to the performance of the Skibinsky index, namely the average of this test in the students of the main group was  $32.42 \pm 0.92$  ( $p < 0.05$ ), is good, the indicator increased by 14.14 compared to the initial survey. Accordingly, students in the control group average score on the Skibinsky index was  $21.13 \pm 0.99$  points, increased compared to the results of the survey at the initial stage of the study by 2.11 points, but remained at a satisfactory level (see Fig.6).



**Figure 6. Skibinski Index at the End of the Study**

In the trial group it was determined that:

- ✓ only 23 (30.26%) students had a satisfactory rating of the functions of respiratory and circulatory systems;
- ✓ 53 (69.74%) students received a good rating of the functions of respiratory and circulatory systems.

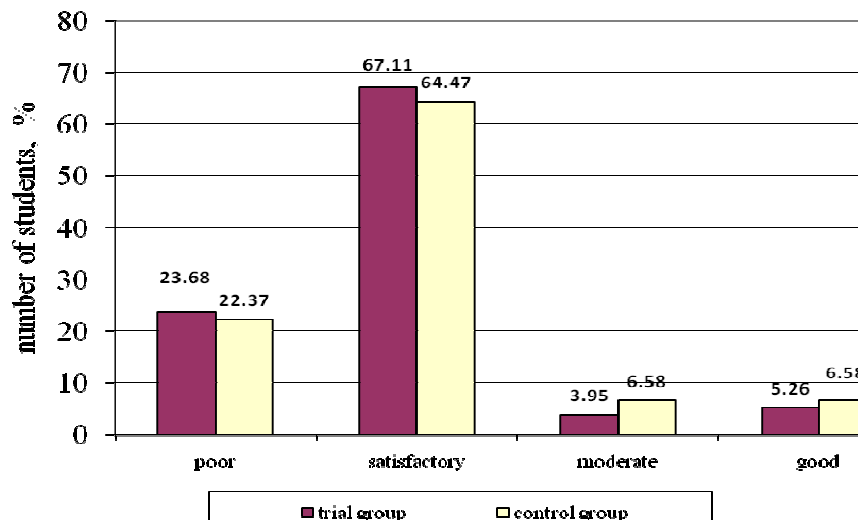
In the control group:

- ✓ 1 (1.32%) student receives insufficient rating of the functions of respiratory and circulatory systems;
- ✓ 62 (81.58%) students had a satisfactory rating of the functions of respiratory and circulatory systems;
- ✓ 13 (17.10%) students received a good rating of the functions of respiratory and circulatory systems.

Considering the identical initial data at the beginning of the study in both groups, we can explain a significant increase in the Skibinski index in the main group by the application of the proposed health recovery system, which contributed to the improvement of the functions of respiratory and circulatory systems.

The team determined the students' physical fitness (the resistance of a heart to physical effort) through the Ruffier functional test. The researchers chose this test because of its peculiarity, as it involves the measurement of the pulse before and after a short exercise of moderate intensity, i.e. in different recovery periods (Fig.7).

In particular, at the beginning of the study, 18 (23.68%) students of the main group had poor physical fitness, 51 (67.11%) – satisfactory, 3 (3.95%) – moderate and 4 (5.26%) – good one. In the control group, 17 (22.37%) students had poor physical fitness, 49 (64.47%) – satisfactory, 5 (6.58%) – moderate and 5 (6.58%) – good one.



**Figure 7. Physical performance of students of both groups on the results of the Ruffier test at the initial stage of the study**

To determine the level of physical performance of students, we applied the Ruffier test at the initial stage of the study (Table 1). Analyzing the results, we can say that, on average, students in the main group showed satisfactory results at the initial stage of the study ( $12.75 \pm 0.29$ ). In the control group students at the initial stage of the study of the performance of this sample showed an average of  $12.21 \pm 0.32$ , which also indicates a satisfactory level of physical performance.

Satisfactory physical performance caused insufficient physical activity of students, provoked deterioration of quality of life, which required justification, development and implementation of the physical education program.

Analyzing the results of the implementation of the Ruffier test by students of both groups at the final stage of the study, we can state a significant improvement in physical performance in students of the main group, compared with students in the control group (Fig. 8 and Table 1): only 2 (2.63%) students had poor physical fitness and 6 (7.89%) – satisfactory, 35 (46.05%) – turned out to become moderate, 31 (40.79%) – turned out to become good and 2 (2.63%) student received high rating ( $p < 0.05$ ). In the control group, the indicators were significantly lower: 16 (21.05%) students had poor physical fitness, 40 (52.63%) – satisfactory, 13 (17.11%) – moderate and only 7 (9.21%) – good one, whereas no students demonstrated high rating.

Table 1. Results of the Ruffier test for students in both groups

Group	Study Stage	Ruffier Test	
		results	rating
Main group	at the initial stage of the study	12.75 ± 0.29	satisfactory
	at the final stage of the study	7.30 ± 0.28	moderate
Control group	at the initial stage of the study	12.21 ± 0.32	satisfactory
	at the final stage of the study	11.47 ± 0.35	satisfactory

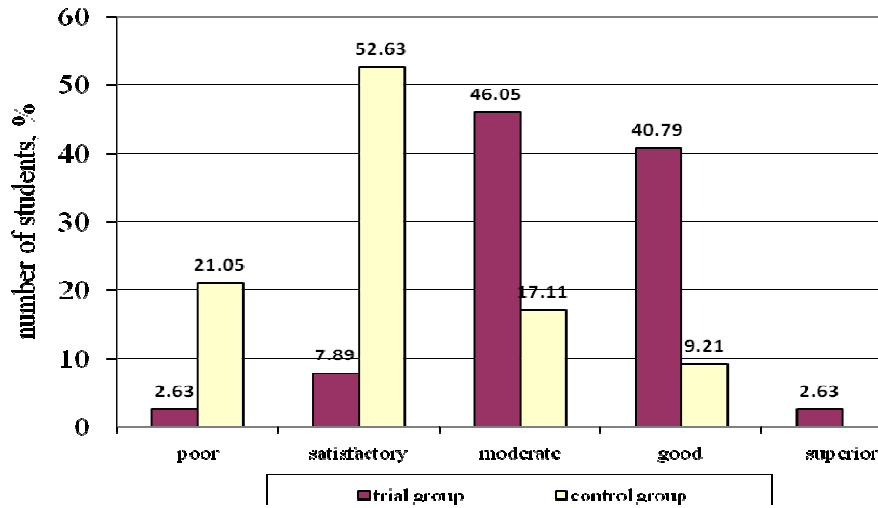


Figure 8. Physical performance of students of both groups on the results of the Ruffier test at the final stage of the study

Hence, at the end of the study, in the students of the trial group the average level of physical fitness was moderate (7.30 ± 0.28), which is explained by the correctness of the selected method of health improvement. Thanks to the personalized approach, the trial group managed to restore physical fitness and even improve it, respectively, it improved the quality of students' lives. On the contrary, in the students of the control group the average level of physical fitness remained satisfactory (11.47 ± 0.35).

## Discussion

During the period of study, the deterioration of students' health is associated with various negative environmental impacts as well as hereditary predisposition. Usually, with the start of higher education, a large number of students change their place of residence, change their working conditions, change their diet and diet. At the same time, most of the students live in hostels. In today's city, students spend a lot of time moving around, and there is a need to combine learning with work. Therefore, in addition to the above, students are forced to engage in low-skilled work: work as loaders, couriers, waiters, janitors, security guards. As a rule, it occurs in the evening or at night, which further affects the level of health. Already 30% of boys and 15% of girls combine their first courses of study and work. This leads to a significant disruption of the day mode. About one-third of students eat hot meals only once a day.

Nevertheless, only less than a quarter of the students are involved in regular health and fitness activities when they have free time, and most students lack active efforts to support their physical fitness.

The general principle of drafting a complex of exercises is to ensure that all major muscle groups participate in the movement, which, in its turn, actively influences the work of internal organs. There should be waves of increasing, and then of relatively decreasing loads. During each class, the students should receive the optimal load while performing exercises. The method of students' health improvement should be designed for mastering the skills of individual application of physical education methods, conscious understanding of their positive influence on the whole body, the ability to independently organize physical education classes and focus them on comprehensive development, improvement of physical fitness and body health.

The process of implementing the health improvement training programme should anticipate the following tasks: education of personal integrity, charisma and fitness in students, their readiness for highly productive and effective work; preservation and improvement of students' health, promotion of correct formation and comprehensive development of the body, maintenance of high working capacity throughout the period of training; comprehensive physical training of students; professional and applied physical training of students while taking into account the peculiarities of their future employment; students' acquisition of knowledge with regard to theory, methodology and organization of physical education and sports training; education of the



confidence that there is a need to regularly engage in physical education and sports in students. The organization of the physical education process should depend on the state of health, the level of physical development and readiness of students, their sports qualifications, taking into account the conditions and nature of their future employment.

The curriculum of independent classes for students in most cases included the third option of health improvement programmes (see Fig. 4). This choice was substantiated by the following provisions:

- ✓ for quite a long time there is an opportunity to perform various exercises, to change the load, to rationally alternate load and rest;
- ✓ mastering one physical exercise at the initial stages of the training through the development of individual physical abilities increases the overall health and ability to work. Later on, this leads to a significant increase in the level of certain physical abilities, but significantly reduces the reliability of other body systems and organs;
- ✓ insufficient load of some organs and body systems and excessive overload of others, observed during unilateral training, leads to atrophy or premature wear of the main systems of the human body;
- ✓ wellness classes with a different focus involve a large number of muscles, which ensures the diversified physical development of the student, the improvement of all his/her organs and systems. Change of the type of physical activity is a specific stimulus and body responds to it with a complex of protective reactions;
- ✓ in order for the process of integrated independent training to give the best result and, therefore, to ensure a high level of health, there is a need to rationally combine different exercises;
- ✓ it is very important to determine the correlation of the different wellness training components both at one lesson and at longer intervals. Scholastic use of various components in the process of independent classes not only leads to the physical fitness increase but can also adversely affect the health. In this case, the body perceives the load as a random factor and does not respond to it with the adaptation processes. Only after constant rhythmic repetition of the certain load, when the nervous system perceives it, establishes that this mode is systematic, morphological and functional processes actively start in the body. Later, when the body adapts to constant load, adaptation processes begin to weaken.

### Conclusions

Thanks to the application of the suggested personal wellness method, the team had a chance to significantly ( $p < 0.05$ ) improve the functional status and physical performance of the students of the trial group at the end of the study: there was a significant increase in the functions of the circulatory and respiratory systems based on the results of Stange's and Genchi's tests, as well as the Skibinski index determination. We acknowledged a significant improvement in the test results of the students in the trial group, which confirms a significant increase in the functions of the circulatory and respiratory systems. Thus, the breath-holding at the stage of a calm inhalation increased by 21.92 s, at the stage of a exhalation – by 10.74 s and it finally corresponded to the characteristics of healthy untrained people. That is to say, the application of the suggested personal wellness method allowed to significantly improve the functions of the circulatory and respiratory systems in the students of the trial group.

The fact that thanks to the personalized approach, the trial group managed to restore physical fitness and even improve it according to the results of the Ruffier functional test also proves this statement. As a result, due to the application of the suggested personal wellness method, the students of the trial group managed to improve adaptation and develop the possibility of restoring the functional state of the body after the load.

At the end of the study, basing on the results it is convincingly evident that the effectiveness of the proposed personal wellness method for students is expressed in higher results among the students of the trial group.

Consequently, this study complements and specifies the knowledge in the field of physical education of 2<sup>nd</sup> year undergraduate students. Moreover, it will contribute to more effective health enhancement of the student, their adaptation to educational process, and improvement of the quality of their lives.

### Acknowledgements

There were no conflicts of interest as such. The studies were carried on at our own expenses. No grants were used.

### Gratitudes

The research was carried out in accordance with the scientific theme of the Department of Health and Physical Therapy of the National University of Water and Environmental Engineering for 2017–2021 entitled "Rehabilitation and recreation technologies of recovery and support of human health" (state registration number 0117U007676).

### Conflicts of interest

The authors declare no conflict of interest.

## References

- Buren NV. (2010). Korektsiia fizychnoi pidhotovlenosti ta funktsionalnoho stanu studentiv tekhnichnykh spetsialnosti zasobamy fizychnoi kultury i sportu. Kh.
- Volkov VL. (2011). Rozvytok fizychnykh zdibnosti studentiv u systemi fizychnoi pidhotovky. K: Osvita Ukrainy.
- Grygus IM. (2011). Uluchshenie fizicheskoy rabotosposobnosti studentok 16–17 let. Fizicheskoe vospitanie studentov. 1: 51–55.
- Husiev TP., Malynskiy II. (2006). Aktualni pytannia vprovadzhennia eksperymentalnoi uchbovoi prohramy z dystsypliny "Fizyчне vykhovannia" u vyshchykh uchbovykh zakladakh Ukrainy. Pedagogika, psykholohiia ta med-biol probl fiz vykhovannia i sportu. 2: 34–37.
- Dimova AL. (2012). Effektivnost' primeneniya kompleksnoy tekhnologii fizicheskogo i psihofiziologicheskogo ozdorovleniya studentov v processe uchebnykh zanyatij po informatike. Fizicheskaya kul'tura: vospitanie, obrazovanie, trenirovka. 1: 14–17.
- Kulakov Yu, Demydova I. (2006). Analiz navchalno-ozdorovchoi roboty z fizychnoho vykhovannia u Mykolaiivskomu derzhavnomu universyteti. Pedagogika, psykholohiia ta med-biol probl fiz vykhovannia i sportu. 4: 85–87.
- Mahlovanyi AV., Shymechko IM., Boiarchuk OM., Moroz YeI. (2011). Dynamika pokaznykiv fizychnoho zdorovia studentiv, yaki zaimaiutsia sylovymy vpravamy. Pedagogika, psykholohiia ta med-biol probl fiz vykhovannia i sportu. 1: 80–83.
- Meshcheryakova GP. (2006). Organizacionno-pedagogicheskoe obespechenie realizacii zdorovesberegayushchih tekhnologij v obrazovatel'nom processe vuza. Stavropol.
- Moshynsky V, Mykhaylova N, Grygus I. (2013). Podwyższony poziom zdrowia przez stosowanie się do zdrowego stylu życia [Building better health by adhering to a healthy lifestyle]. Journal of Health Sciences. 3(10): 123-132.
- Nesterchuk NE. (2017). Teoretiko-metodicheskie osnovy ispol'zovaniya sredstv fizicheskoy rehabilitacii dlya uluchsheniya urovnya zdorov'ya pri gipotonii. Pedagogicheskoe iskusstvo. 1: 164-169.
- Prusik K, Mykhailova NIe, Grygus IM. (2013). Teoretyko-metodychni aspekty orhanizatsii fizychnoho vykhovannia studentiv. Rivne.
- Pshenychna LP., Kozytska AP. (2004). Adaptatsiia studentiv z riznym rivnem fizychnoi pidhotovlenosti ta stanom zdorovia do zaniat fizychnoiu kulturoiu u vyshchykh uchbovykh zakladakh. Pedagogika, psykholohiia ta med-biol probl fiz vykhovannia i sportu. 4: 74–80.
- Saluk I. (2012). Metodyka individualizatsii fizychnoho vykhovannia studentiv. Sportyvna nauka Ukrainy. 1: 42–46.
- Stoianov VA. (2002). Aktualizatsiia zaniat fizychnoiu kulturoiu v umovakh humanitarnykh vyshchykh navchalnykh zakladiv. Pedagogika, psykholohiia ta med-biol probl fiz vykhovannia i sportu. Kh. 5: 61–68.
- Chyzhyk VV, Zaporozhets OP. (2009). Sportyvna morfolohiia. Lutsk: PVD «Tverdynia».
- The WHOQOL Group. The World Health Organization Quality of Life assessment (WHOQOL): Development and general psychometric properties. (1998). Soc Sci Med.46:1569–1585.
- Diachenko-Bohun, M., Hrytsai, N., Grynova, M., Grygus I., Zukow W. (2019). The readiness formation of future biology teachers for healthcare-safety technologies realization in professional activity. Education and Information Technologies.24(1), 679-691.