

## THE ORGANISM REHABILITATION AND PREVENTION DURING THE PANDEMIC COVID-19 METHODS BY GENERAL PHYSICAL TRAINING

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### ABSTRACT

The article discusses the methods of rehabilitation of the body of people of older age groups (40-59 years old) who have had Covid-19. A method of using physical exercises to support the respiratory and cardiovascular systems is proposed. The results of experiments carried out during the pandemic from April-May to August (2020) are presented. The experiment involved the teachers of the National University of Uzbekistan, as one of the most vulnerable groups of the population.

**KEYWORDS:** Impact of Covid-19, Oxygen Consumption, Respiratory System, Oxygen Saturation, Hypoxia, Hypocapnia, Exercise, Physical Activity, Movement, the Cardiovascular System.

### INTRODUCTION

To date, it has been established that to counteract SARS-CoV-2 there is a need for the use of physical exercises, since physical activity is the basis for the prevention of many diseases [1]. Physical activity is a powerful preventive and therapeutic intervention for most pre-existing chronic conditions that increase the risk of severe SARS-CoV-2 infection and mortality [1,2].

With insufficient physical activity or its deficiency, the body's resistance to colds and active actions of pathogens decreases. Persons leading a sedentary lifestyle with a lack of physical activity are more likely to suffer from respiratory and circulatory diseases. A special category of people at risk are the teachers and students. To maintain the level of health, it is necessary to carry out a set of measures to identify hypoxia and hypocapnia, and also to overcome them. It has been proven that in people of mental labor, muscle activity causes an effort to flow positive impulses in the cerebral cortex and improves the work of those parts of it that are already included in a certain activity at the moment.

According to WHO, the average age of patients with COVID-19 disease and its complications is 51 years old, the most severe forms developed in elderly patients (60 years or more). Moreover, 20% of all cases of COVID-19 are accompanied by pneumonia [3]. However, despite the high average age of patients, cases of COVID-19 have also been reported in other age groups, including those with a severe course [4]. In addition to cardiorespiratory complications, such consequences as decreased cognitive functions, impaired coordination of movements, disorientation in space are described, 15% of patients have signs of micro-strokes (according to MRI data), 43% of patients complained of muscle pain [5]. A long-term decrease in performance after suffering COVID-19 has been described as a reflection of the syndrome of post-viral asthenia [6].

Most of the staff and teachers of higher educational institutions work under conditions of intense mental activity,

mental stress, hypokinesia and hypodynamia, hypocapnia and hypoxia. Exercise raises emotional attitudes, trains the cardiovascular system, and improves health. People engaged in aerobic exercise have a more economical heart, better ventilation of the lungs, and develop the skill of correct breathing while walking [7].

Since teachers belong to one of the vulnerable groups of the population, due to sedentary work, as well as a result of strict quarantine, they need a special approach to physical training. The physiological characteristics of this category of persons are distinguished by a decrease in a number of protective functions of the body, immunity, as well as a deterioration in the work of the cardiovascular system and ligamentous apparatus.

SARS--CoV-2 is characterized by symptoms of secondary immunosuppression, manifested in the late beginning of the synthesis of interferons and activation of the key inflammatory factor - NLRP3-inflammasome [8].

Studies carried out in humans confirm a close relationship between the level of physical activity and the effectiveness of immune defense against viral infection [9].

Epidemiological and randomized clinical trials confirm a 40-45% reduction in sickness days for acute respiratory infections, such as colds, in both young and older adults with active lifestyles compared with those with a predominantly sedentary lifestyle life [10]. The effectiveness of protection against viral infections is largely correlated with the degree of physical activity. Moderate physical activity has a positive effect on the human immune system, reducing the risk of morbidity and severity of viral infections, while prolonged and high-intensity physical and large psycho-emotional stress in sports can have the opposite effect, causing immunosuppression and increasing the risk of viral and opportunistic infections [11].

Since moderate physical activity helps to normalize the immune response, including reducing cytokine inflammation, there is no doubt that moderate-intensity physical activity has a quick and effective positive effect on immune function and inflammation, which should help reduce the severity of COVID-19 outcomes [12] and / or be a preventive method, especially for those with concomitant diseases such as metabolic disorders, especially in the elderly. Regular physical activity reduces the severity of infection episodes and the number of days with symptoms.

It has been shown that in the context of the COVID19 pandemic, along with the development of complications of the disease, one of the most significant symptoms not only in sick people, but also in non-sick people, and especially those who have been in quarantine and self-isolation for a long time, are psychosomatic disorders, anxiety and depression. In this regard, the effectiveness of physical activity in preventing and treating anxiety and depression may have advantages around the world during this stressful global crisis [13]. Regular physical activity reduces the severity of infectious episodes and the number of days with symptoms of the disease [14].

It is important that physical activity also increases the effectiveness of vaccines [15], so an active lifestyle will continue to be relevant at every stage of the pandemic [16].

Exercise technologies are mainly aimed at:

- Health promotion;
- Hardening the body and improving the vital functions of all its systems;
- Strengthening the body's defenses;

- Increasing the level of mental and motor performance;
- Possible elimination of functional deviations in physical development;
- The elimination of residual effects after the postponed diseases;
- Acquisition of skills and abilities necessary and acceptable for vacationers for independent education and training physical culture and sports;
- Instilling in a person the conviction of the need to regularly engage in physical culture and sports.

Taking into account the results of this study and based on the general principles of the methodology of physical education in this experiment, we tried to implement the idea of using general physical training based on self-control of the physical state of the body. Many teachers of a non-physical culture university are distinguished by a highly developed ability to overcome oxygen deficiency. They are able to “endure”, be able to “endure” various hypoxemic and hypercapnic shifts, several times higher than similar changes than those of students who have not previously engaged in physical exercise or sports. (Hypercapnia - an increase in the level of carbon dioxide (CO<sub>2</sub>) in the blood, hypoxemia - a decrease in the oxygen (O<sub>2</sub>) content. It is known that oxygen must enter the body without interruption and in sufficient quantities, otherwise, a decrease in oxygen in the blood (hypoxemia) and the accumulation of carbon dioxide (hypercapnia) lead to the development of a condition called hypoxia. And if hypoxia takes place, then it is already clear that hypercapnia and hypoxemia were also involved, therefore they are considered universal symptoms of respiratory failure.). There are various functional tests that allow you to obtain objective data on the functional state and are useful in practical terms: they characterize recovery processes and provide information for assessing the student's functional readiness for physical exercises [18].

The simplest hypoxic tests include the Shtange and Genchi tests [17,19,20]. They allow us to assess the adaptation of a person to hypoxia and hypoxemia, as they give some idea of the body's ability to withstand a lack of oxygen. In our case, students with high rates of hypoxemic tests tolerate physical activity better. The fulfillment of some physical exercises, on which a certain result depends to some extent, is largely determined by the level of development of the strength of certain muscle groups in those engaged in physical exercises.

In this regard, physical exercise (health-improving physical culture) is an integral component of rest, health improvement and treatment - all this is one of the factors in leading a healthy lifestyle [18-21].

### **Research Methodology and Organization**

Experimental studies were conducted under the constraints associated with the Covid-19 pandemic. Research methods: survey, anthropometric measurements, testing of health indicators (heart rate, reaction to orthostatic test, study with an oximeter, etc.), Research conducted among teachers and employees of the National University of Uzbekistan showed that 87% of women would like to improve their health, 50% - to lose weight, 50% - to get joy from movement, 31% - to relieve fatigue. The Covid-19 pandemic has made its own adjustments, health indicators have changed, as well as wishes [19,22].

During the period of being in quarantine, all the teachers and staff of the university were measured oxygen content in the blood and pulse values. The first studies were carried out in April-May 2020. The research involved 19 female teachers and their families. Unfortunately, it was not possible to avoid infection for the teachers who participated in the research. Most of the teachers (13 people) suffered from Covid-19 in a mild form, i.e. no lung complications, no

pneumonia. The second research was conducted between July and August 2020.

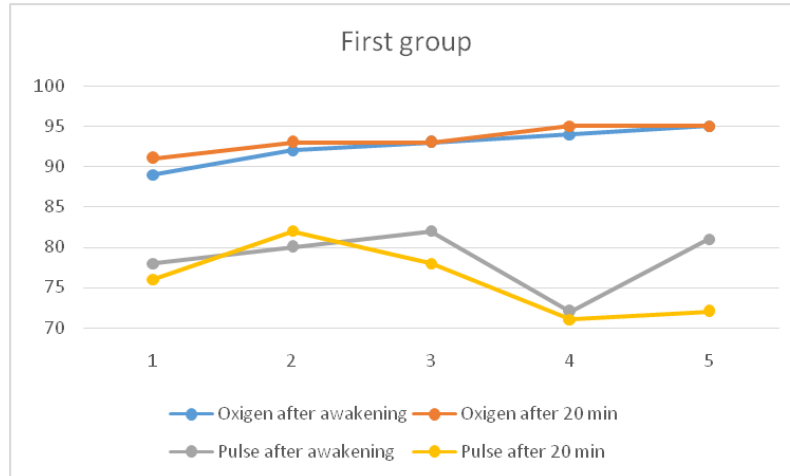
The values of the measurement results were averaged and all the teachers were divided into three groups: group 1 - lung oxygen saturation ranged from 89 to 95%, group 2 - lung oxygen saturation ranged from 88 to 93% and group 3 - lung oxygen saturation ranged from 88 to 95 % (tables 1 and 2, figure. 1-3). The measurements were taken in the morning, immediately after waking up and after 20 minutes (measurement protocols) [23].

**Table 1: Oxygen Content Immediately after Waking up (April-May)**

Measurement Number	Group 1		Group 2		Group 3	
	Saturation	Pulse	Saturation	Pulse	Saturation	Pulse
1	89	78	88	70	88	78
2	92	80	87	69	89	68
3	93	82	89	75	92	72
4	94	72	94	80	95	78
5	95	81	93	68	95	81

**Table 2: Oxygen Content 20 Minutes after Waking up (April-May)**

Measurement Number	Group 1		Group 2		Group 3	
	Saturation	Pulse	Saturation	Pulse	Saturation	Pulse
1	89	78	88	70	88	78
2	92	80	87	69	89	68
3	93	82	89	75	92	72
4	94	72	94	80	95	78
5	95	81	93	68	95	81



**Figure 1. Group 1 (April - May 2020).**

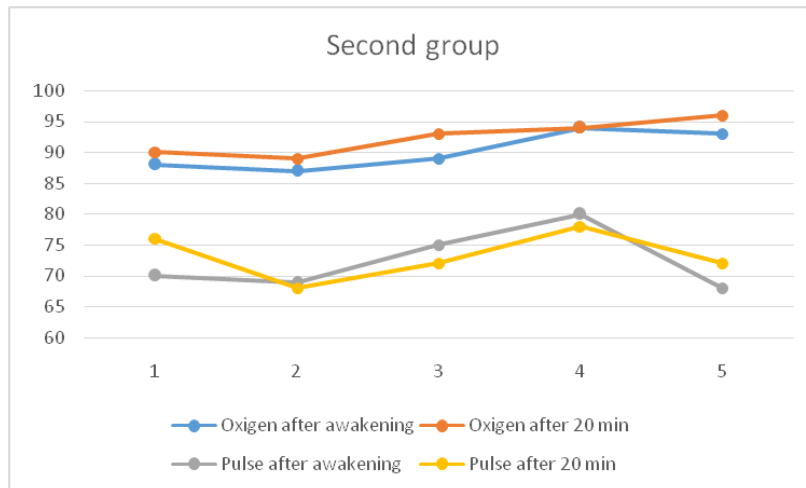


Figure 2: Group 2 (April - May 2020).

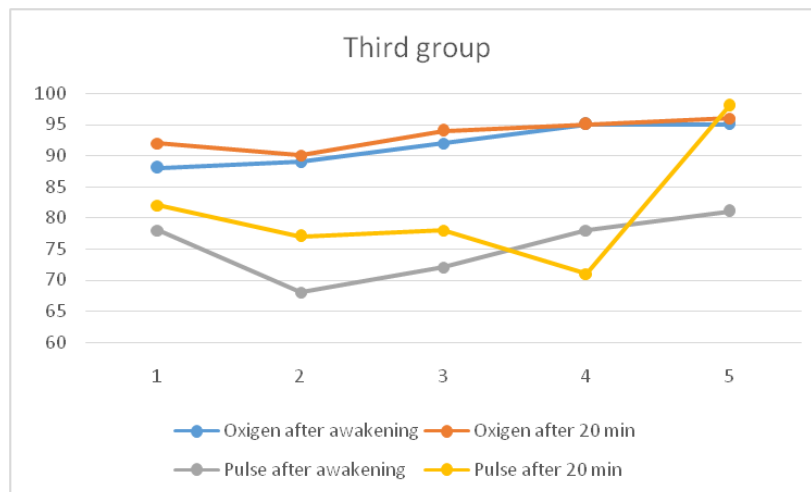


Figure 3: Group 3 (April - May 2020).

The research involved women of different ages: from 45 to 60 years. The first and second groups (Figure.1,2) included teachers from different faculties, the third group included physical education teachers (Figure.3).

Since the period July-August coincides with the vacation period and at the same time, a second quarantine was introduced. The teachers were offered a set of exercises to improve well-being and to maintain health. The complex of morning exercises included exercises to improve lung ventilation and increase mobility.

Teachers of the humanities faculties - group 1 led a normal life taking into account quarantine restrictions (Figure.4), groups 2 and 3 of teachers performed morning exercises (Figure. 5,6).

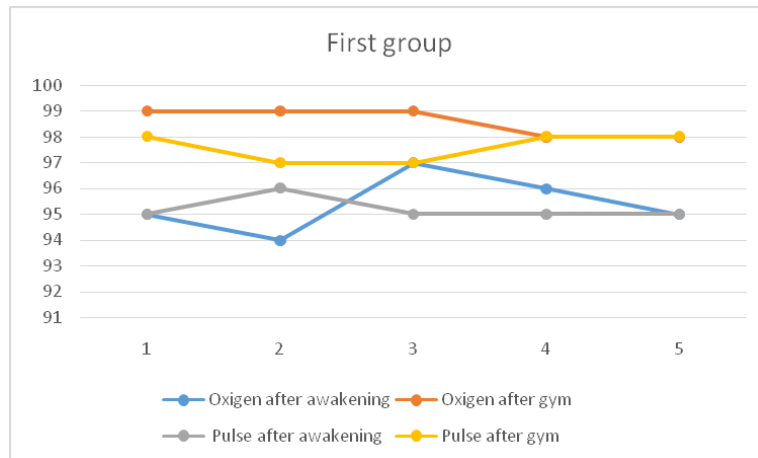
The results of blood oxygen content and pulse were different from the previous ones (Tables 3 and 4).

**Table 3: Oxygen Content Immediately after Waking up (August)**

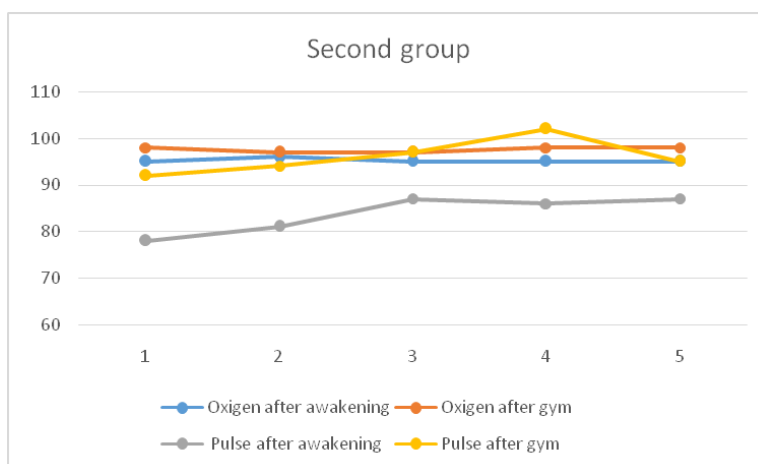
Measurement Number	Group 1		Group 2		Group 3	
	Saturation	Pulse	Saturation	Pulse	Saturation	Pulse
1	95	63	95	78	95	62
2	94	61	96	81	96	60
3	97	62	95	87	97	61
4	96	60	95	86	97	60
5	95	61	95	87	97	61

**Table 4: Oxygen Content 20 Minutes after Waking up (August)**

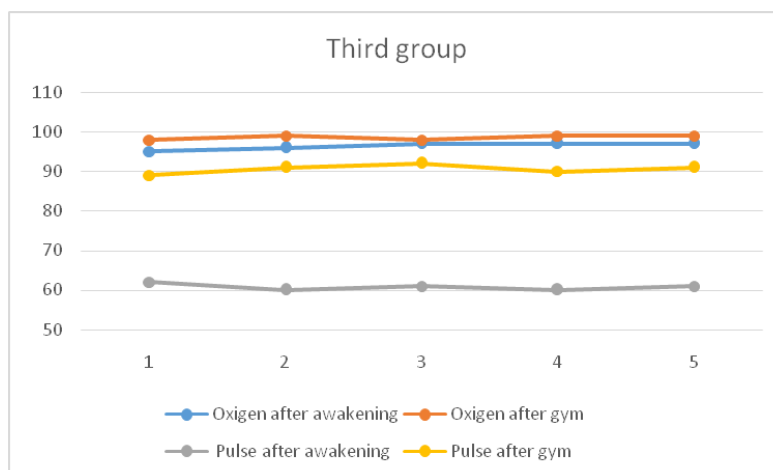
Measurement Number	Group 1		Group 2		Group 3	
	Saturation	Pulse	Saturation	Pulse	Saturation	Pulse
1	99	87	98	92	98	89
2	99	92	97	94	99	91
3	99	92	97	97	98	92
4	98	90	98	102	99	90
5	98	88	98	95	99	91



**Figure 4: Group1.**



**Figure 5: Group 2.**



**Figure 6: Group3.**

The graphs show fluctuations in changes in the oxygen content in the blood and pulse: very sharp drops in indicators in groups 1 and 2, relatively small changes in parameters, which show that exercise can significantly improve oxygen saturation and stabilize the heart rate, which is especially important in case of viral lung lesions. infection during the Covid-19 pandemic. The most important section of the work being carried out is functional diagnostics, and in particular, testing of physical working capacity, functional readiness, adaptive reserves and other characteristics of the functional state of teachers [24-26]. This applies equally to health-improving physical culture.

### **Effect of Oxygen Consumption on overall Physical Condition**

One of the indicators of physical performance is the potential ability of a person to show maximum physical effort in static, dynamic and mixed work. Physical performance is associated with a certain amount of muscular work, which can be performed without reducing a given (or established at the maximum level for a given individual) level of the body's functioning, primarily, it's cardiovascular and respiratory systems. Since the experiment involved teachers who had an underestimated level of muscle work, complexes of physical exercises were developed for them, including exercises for all muscle groups [26-28]. The methodology for performing the exercises provided for the stage-by-stage inclusion of all muscle groups in the work, starting with the shoulder girdle and ending with stretching elements, which was aimed at aerobic exercise.

### **RESULTS**

The results obtained confirmed that the introduction of physical exercises into the everyday life of teachers significantly increases the quality of life, further growth of the indicators of general physical fitness among the students. Despite the different sequence of the programs in all experimental groups, at the end of the experiment, there was a significant improvement in the results of saturation and individual functional indicators.

The results of the experiment showed that the training effect of the morning set of exercises changes to a certain extent depending on the aspirations of the performers themselves, which is obviously due to the level of general fitness. So, among those engaged in the 3rd experimental group, in comparison with the 2nd and 1st groups (see Fig. 4-6), a more significant increase in such performance indicators as lung saturation and stabilization of the heart rate in a short time was revealed.

The obtained experimental data on the stages of various programs of physical education, serve as an argument in recommending the introduction of compulsory physical exercises in the everyday life of teachers and significantly increase the quality of life by improving general physical indicators, as well as the body's resistance. This is the most important argument in times of a pandemic like Covid-19.

### **Methods for Restoring the Body after Suffering Covid-19**

After analyzing the literature [30-32], we identified methods of prevention and rehabilitation after COVID-19.

- Prevention of coronavirus infection
- Specific prophylaxis (vaccination).
- Non-specific prophylaxis (early diagnosis and detection of the infected, adherence to the self-isolation regime, a distance of 1.5-2 m and measures of social isolation, personal hygiene, personal respiratory protection, disinfection measures, medicines for local use, measures to strengthen immunity).
- Drug prophylaxis (intranasal forms of IFN- $\alpha$ )
- Measures to prevent the spread of COVID-19 in a medical organization.
- In this aspect, one of the main tasks of the prevention of Covid-19 is to carry out a set of measures to strengthen the functions of the body in the fight against the virus.
- The main directions of rehabilitation of survivors of COVID-19
- Respiratory function rehabilitation
- Rehabilitation of muscle dysfunction
- Rehabilitation of neurological, psychological and cognitive functions
- Nutritional rehabilitation
- Rehabilitation of comorbid disorders
- Drug rehabilitation (prevention of late thrombosis and thromboembolism, acceleration of the resolution of consolidates in the lungs)
- Pulmonary rehabilitation methods
- Inspiratory training: breathing exercises
- Forced expiratory maneuver with forced expiration
- Method of active cyclic breathing
- Postural (positional) drainage
- High-intensity magnetotherapy
- Magnetotherapy + laser
- Electrotherapy + ultrasound



- Induction therapy
- Muscle Dysfunction Rehabilitation Methods
- Exercise
- Inspiratory training through the use of simulators
- Vibration and percussion therapy
- Electromyostimulation

## CONCLUSIONS

One of the obvious priorities in the period after the peaks and waves of the COVID-19 pandemic will be increased concern for the health of teachers, students and society as a whole, as well as the consolidation of enhanced security measures aimed at preventing the spread of coronavirus infection during physical education and sports, and holding mass events., including requirements for the degree of occupancy of premises, the use of personal protective equipment, medical examinations and others.

## REFERENCES

1. Jordan R.E., Adab P., Cheng K.K. Covid19: risk factors for severe disease and death. *BMJ*. 2020;368:m1198. <https://doi.org/10.1136/bmj.m1198>
2. Smirnov V.S., Totolyan A.A. Congenital immunity in coronavirus infection. *Infection and immunity*. 2020;10(2):259268.<https://doi.org/10.15789/22207619-III-1440>
3. Chaolin H., Yeming W., Xingwang L., Lili R., Jianping Z., Yi H., et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020;395(10223):497–506. [https://doi.org/10.1016/s0140-6736\(20\)30183-5](https://doi.org/10.1016/s0140-6736(20)30183-5)
4. Nieß A.M., Bloch W., Friedmann-Bette B., Grim C., Halle M., Hirschmüller A., et al. Position stand: return to sport in the current Coronavirus pandemic (SARSCoV2 / COVID19). *Deutsch Z Sportmed*. 2020;71(5):1–4. <https://doi.org/10.5960/dzsm.2020.437>
5. Sun P., Qie S., Liu Z., Ren J., Li K., Xi Y. Clinical characteristics of hospitalized patients with SARSCoV2 infection: A single arm metaanalysis. *J Med Virol*. 2020;92(6):612–617. <https://doi.org/10.1002/jmv.25735>
6. Wang X., Liu W., Zhao J., Lu Y., Wang X., Yu C., et al. Clinical characteristics of 80 hospitalized frontline medical workers infected with COVID19 in Wuhan, China. *J Hosp Infect*. 2020;105(3):399–403. <https://doi.org/10.1016/j.jhin.2020.04.019>
7. Gorbunov S.A., Gorbunov S.S. The implementation of innovative approaches in the system of physical education // *Theory and practice of physical culture*, 2010, №5. Pp.33-35.
8. Huang C., Wang Y., Li X., Ren L., Zhao J., Hu Y., et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020;395(10223):497–506. [https://doi.org/10.1016/s01406736\(20\)30183-5](https://doi.org/10.1016/s01406736(20)30183-5)

9. Nieman D.C., Wentz L.M. The compelling link between physical activity and the body's defense system. *J Sport Health Sci.* 2019;8(3):201–217. <https://doi.org/10.1016/j.jshs.2018.09.009>
10. Nieman D.C., Henson D.A., Austin M.D., Sha W. Upper respiratory tract infection is reduced in physically fit and active adults. *Br J Sports Med.* 2011;45(12):987–992. <https://doi.org/10.1136/bjism.2010.077875>
11. Khanferyan R.A., Radysh I.V., Surovtsev V.V., Korosteleva M.M., Aleshina I.V. The importance of physical activity in the regulation of antiviral immunity. *Sports medicine: science and practice.* 2020; 10 (3): -pp. 27–39. <https://doi.org/10.47529/2223-2524.2020.3.27>
12. Sarah Cowley. Health-as-process: a health visiting perspective. <https://onlinelibrary.wiley.com/doi/abs/10.1046/j.1365-2648.1995.22030433>.
13. Grande A., Keogh J., Silva V., Scott A.M. Exercise versus no exercise for the occurrence, severity, and duration of acute respiratory infections. *Cochrane Database Syst Rev.* 2020;4(4):CD010596. <https://doi.org/10.1002/14651858.cd010596.pub3>
14. Wong C.K., Lam C.W., Wu A.K., Ip W.K., Lee N.L., Chan I.H., et al. Plasma inflammatory cytokines and chemokines in severe acute respiratory syndrome. *Clin Exp Immunol.* 2004;136(1):95-103. <https://doi.org/10.1111/j.13652249.2004.02415.x>
15. Pascoe A.R., Fiatarone Singh M.A., Edwards K.M. The effects of exercise on vaccination responses: a review of chronic and acute exercise interventions in humans. *Brain Behav Immun.* 2014;39:33–41. <https://doi.org/10.1016/j.bbi.2013.10.003>
16. Sallis J.F., Adlakha D., Oyeyemi A., Salvo D. An international physical activity and public health research agenda to inform coronavirus disease19 policies and practices. *J Sport Health Sci.* 2020;9(4):328–334. <https://doi.org/10.1016/j.jshs.2020.05.005>
17. Varlamova L.P., Nabiev T.E. "A computer program for screening of physical health and physical fitness of students." Intellectual Property Agency of the Republic of Uzbekistan. Certificate of official registration of the program for electronic computers № 02360. Tashkent 2011.
18. Nabiev T.E., The importance of Exercise in maximum Oxygen Consumption.// Proceedings of the 1st International Scientific and Practical Conference «Science, Education, Innovation: Topical Issues and Modern Aspects». Tallinn, Estonia.16-18.12.2020, -pp. 1352-1359.
19. Apanasenko G.L. The evolution of bioenergy and human health. St. Petersburg MGP "Petropolis" 1992. 68p.
20. Nabiev T.E., Varlamova L.P. Methodical guidelines "Guidelines for the organization and conduct of monitoring studies of physical health and motor fitness of students." National University of Uzbekistan named after MirzoUlugbek. Tashkent 2011 32 p.
21. Varlamova L.P., Nabiev T.E Quantitative Assessment Of Students physical Health.// International Journal of Recent Technology and Engineering (TM) Exploring Innovation, 2019. pp. 5568-5571. / ISSN:2277-78 (Online)/Reg.No.:C/819981 Published By BEIESP/Impact factor 5.92<http://www.ijrte.org/download/volume-8-issue-3/>.

22. NabievTimurE., Varlamova Lyudmila P. Organism Rehabilitation after Covid-19 with general physical Training Methods. iJournals: International Journal of Social Relevance & Concern (IJSRC) ISSN-2347-9698. Volume 9 Issue 2 February 2021.DOI: 10.26821/IJSRC.9.2.2021.9216. –pp. 89-96. <https://ijournals.in/ijsrc-volume-9-issue-2/>
23. Pulse and oxygen saturation measurement protocols. Saturation\_Woman. [https://docs.google.com/document/d/1CP0Pqjtsb7doQQtQGrp-WIGwKd4Cj\\_dwLTn3Aq3ViA/edit?ts=6064c632](https://docs.google.com/document/d/1CP0Pqjtsb7doQQtQGrp-WIGwKd4Cj_dwLTn3Aq3ViA/edit?ts=6064c632)
24. Baevsky R.M., Berseneva A.P. Pre-nosological diagnostics in assessing the state of health // Valeology: diagnostics, means and practice of ensuring health. SPb., 1993. Pp.33-48.
25. Daniel Bressington, Jolene Mui, Sabina Hulbert, Eric Cheung, Stephen Bradford, and Richard Gray. Enhanced physical health screening for people with severe mental illness in Hong Kong: results from a one-year prospective case series study. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3939815/>
26. Program-methodical maintenance of the University students independent physical training/ <https://cyberleninka.ru/article/n/program-methodical-maintenance-of-the-university-students-independent-physical-training>
27. Sarah Cowley. Health-as-process: a health visiting perspective.<https://onlinelibrary.wiley.com/doi/abs/10.1046/j.13652648.1995.22030433.x>.
28. Nabiev T.E. Organization of the training process in sections for group sports // Young scientist. 2018. №17. Pp. 304-306. URL <https://moluch.ru/archive/203/49844/>
29. Nabiev T.E., Varlamova L.P. Using computer technologies in the health program students// Abstracts of Uzbek-Israel joint International conference “Science- Technology – Education – Mathematics – Medicine” STEM. Tashkent 2019, May 13-17, p.110.
30. Recovering From Coronavirus: What to Expect During and After Your Recovery. <https://www.houstonmethodist.org/blog/articles/2020/apr/recovering-from-coronavirus-what-to-expect-during-and-after-your-recovery/>
31. Post COVID-19 Care: 6 Things You Need To Do After Recovering From Coronavirus. <https://www.ndtv.com/health/post-covid-19-care-6-things-you-need-to-do-after-recovering-from-coronavirus-2302135>
32. Recovery after Covid-19. <https://www.nhsinform.scot/illnesses-and-conditions/infections-and-poisoning/coronavirus-covid-19>

### Ethical Statement

The analysis is based on primary data from the study of oxygen saturation and pulse rate of teachers of the National University of Uzbekistan

### Declaration of Competing Interest

We declare no conflicts of interest.

