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Increasing the level of fitness of female students with the help of sports and recreational tourism

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Podwyższenie poziomu kondycji fizycznej studentek w oparciu o wykorzystanie środków turystyki sportowo-rekreacyjnej

Streszczenie

Celem badania było opracowanie i aprobata programu wychowania fizycznego dla studentek w wieku 20 i 21 lat Uniwersytetu Narodowego w Zaporozżu i Chersońskiego Uniwersytetu Państwowego, w celu poprawy ich kondycji fizycznej, z wykorzystaniem środków turystyki sportowo-rekreacyjnej. *Znaczenie badań* polegało na eksperymentalnej aprobacie i późniejszej praktycznej implementacji opracowanego programu z wykorzystaniem środków turystyki sportowej i rekreacyjnej w procesie wychowania fizycznego dla wykształcenia wyższego. Badania zostały tematycznie ukierunkowane na różne aspekty wychowania fizycznego, sportu i zdrowia studentek. W wyniku tego uwzględniany jest aktualny poziom kondycji fizycznej studentek i kładzie się nacisk na jej poprawę. *Wyniki badania* wykazały znaczną optymalizację poziomu przygotowania układu krwionośnego studentek uczęszczających na zajęcia kultury fizycznej z wykorzystaniem środków turystyki sportowo-rekreacyjnej, z uwzględnieniem różnych rodzajów treningu (od techniczno-taktycznego po specjalny trening fizyczny). Została przeprowadzona ocena dynamiki integralnych wskaźników układu krwionośnego studentek w procesie wychowania fizycznego, m.in. za pomocą środków turystyki sportowo-rekreacyjnej. Wnioskowano o podniesienie poziomu koherencji układu krwionośnego i oddechowego. Zaobserwowano podniesienie wydolności tlenowej i mieszanej oraz normalizację czynności serca, co obserwuje się podczas przejścia do normotonicznego typu regulacji czynności serca.

Słowa kluczowe: turystyka, układ krążeniowo-oddechowy, układ oddechowy, trening fizyczny, specjalny trening fizyczny.

Abstract

The aim of the research was to develop and test Physical Education program for 20- and 21-year-old female students of Zaporizhzhia National University and Kherson State University using means of sports recreational tourism to improve their fitness. *The relevance of the research* is experimental approbation and further practical implementation of the aforementioned PE program featuring sports recreational tourism, into the Physical Education process for higher education. The research focuses on different aspects concerning PE, sports and students health. *The results of the research* have shown a significant optimization of cardiovascular system fitness level of students who attended Physical Education classes with the use of sports recreational tourism and were exposed to different types of training (from technical and tactical to special physical training). The researchers evaluated the dynamics of the integral indices of the cardiovascular system among the female students of the higher educational institutions during the course of Physical Education activities taking advantage of sports recreational tourism. It was concluded that the coherence level of the cardiovascular and respiratory systems has increased. Aerobic and mixed performance increase and cardiac activity normalization that can be seen when changing to a normotonic regulation of cardiac performance were observed.

Keywords: tourism; cardiorespiratory system; respiratory system; physical fitness; special physical training.

Introduction

One of the most important issues of modern society is significant deterioration of health among different categories of population, especially among student youth [25]. Young people as carriers of intellectual, creative potential, reproductive and labor resources, should have reserves of physical health [3, 7]. According to the expert investigations in the field of sports and physical education, students' health development is characterized by an unsatisfactory level of physical training, functional decline of the main physiological organ systems, physical and mental health problems among students [4, 9]. There is a lot of research dealing with the issue of physical condition improvement for students of different age, gender and level of physical fitness. It has been proved that different types of fitness [26, 28], sports games [16, 17], martial arts [24], athletic gymnastics [15], swimming [10] etc. are popular among students.

However, many specialists believe that using sports recreational tourism in the system of Physical Education for students is underestimated. It is a popular and affordable way of physical training and it has been rapidly developing in Ukraine over the past few years. The majority of studies focusing on health promotion and longevity concentrated on adults [5, 8, 27]. Only in recent years have specialists shown a particular interest in the health of children, adolescents and students [1, 7]. According to specialists, the main reason for the deterioration of health indicators is the lack of regular physical activity among modern youth [13, 14, 22].

The analysis of the program and methodological documents that regulate the process of physical education at universities, together with the content and methods of conducting physical education classes, allows us to conclude that they are mainly focused on the formation of appropriate motor skills and abilities of students and to a lesser extent have an impact on the systems and functions of their bodies and health. At the same time, there is a lack of positive motivation for physical education, leading to the deterioration of students' health. This contradiction determines the relevance of the undertaken research.

Methods

To solve the tasks set in the research, interdependent and complementary research methods have been used: theoretical analysis and generalization of data from scientific and methodological literature, pedagogical research methods (pedagogical observation and pedagogical experiment), physiological methods (assessment of the level of physical fitness of the cardiorespiratory system and physical health); sociological research methods (conversation, sociological survey, questioning), methods of mathematical statistics.

The analysis of scientific and methodical literature has been carried out with the aim of theoretical substantiation of the object of the research and generalization of scientific approaches to the sports recreational tourism motor activity of young people. These theoretical methods of the research, the generalization of modern practical experience, made it possible to substantiate the relevance of the research, to identify and specify the goal, objectives and direction of the pedagogical experiment, to develop the content of the research program.

Pedagogical observations have been used as the means of orientation and familiarization with the studied phenomena, in order to identify the main aspects that affect the involvement of young people in the sports and recreational tourism motor activity, which made it possible to clarify the special issues on which the motor activity analysis should be based. The data obtained by the “non-participant observation” method were supplemented by the results of studies using the “conversation” method, conducted in conditions of frank communication with the participants of the research. When preparing the observation, the purpose was specified, as well as methods and ways of processing the data obtained.

One of the main research methods was a *pedagogical experiment*, the structure of which assumed the implementation of ascertaining and transformative procedures. The ascertaining experiment has been carried out in order to obtain initial data on the quality of life of young people. The purpose of the transformative experiment was introduction and testing of the effectiveness of introducing sports recreational tourism in the physical culture curriculum of Zaporizhzhia National University and Kherson State University. Physical education was carried out according to the experimental program developed by us using the means of sports recreational tourism, focused on the means of special physical training. In addition, the study included certain ratios of general and special physical, technical and tactical training of female students and the optimal modes of the pulse scale developed by us in accordance with the current physical condition of female students. The monitoring of the heart rate value during the special program of physical education was carried out using a wristwatch “Polar” [6]. The program of the pedagogical experiment included an assessment of the physical condition of female students at the beginning (September 2020) and the end (May 2021) of the academic year.

Physiological methods (assessment of the level of physical fitness of the cardiorespiratory system and physical health) calculated the quantitative value of the level of fitness of the cardiovascular system (CVFL, points) and respiratory system fitness level (RSFL, points), the values of heart rate (HR, beats per minute⁻¹), systolic (BPs, mm Hg), diastolic (BPd, mm Hg) blood pressure, vital capacity (VC, ml), timed inspiratory capacity (TIC, s), timed expiratory capacity (TEC, s) end-systolic volume (ESV, ml), cardiac output (CO, L/min), hypoxia index (HI,

r. u.), Skibinskiy index (SI, r. u.), cardiac index (CI, L/min/m²), systemic vascular resistance (SVR, dynxs × sm^{-0,5}), which are defined by the traditional method preliminarily.

The obtained quantitative values of CVFL and RSFL are formatted in the following qualitative functional levels: at CVFL and RSFL ≤ 33.1 points the cardiovascular fitness level or respiratory system fitness level is “low”; at CVFL and RSFL ≤ 49.6 the cardiovascular fitness level or respiratory system fitness level is “below average”; at CVFL and RSFL ≤ 66.1 the cardiovascular fitness level or respiratory system fitness level is “average”; at CVFL and RSFL ≤ 82.6 the cardiovascular fitness level or respiratory system fitness level is “above average”; and finally at CVFL and RSFL > 82.6 the cardiovascular fitness level or respiratory system fitness level is “high”.

CVFL was calculated as a cumulative of points on every parameter that characterizes cardiovascular system activity (ESV, CO, SVR, BPs, BPd, CI) divided by the total number of parameters (in our case, it is 6).

RSFL was calculated as a cumulative of points on every parameter that characterizes respiratory system activity (values of VC, HI, SI, TIC, TEC), divided by the total number of parameters (in our case it is 5).

$$\text{RSFL} = \frac{\text{VC} + \text{HI} + \text{SI} + \text{TIC} + \text{TEC}}{5}$$

Sociological research methods have been used to collect primary information by asking respondents questions. The source of information in the questionnaire was the written opinions, i.e. answers of female students involved in sports and recreational tourism activities collected to assess their opinions regarding motives and interests in various conditions.

In the course of research results processing, traditional *methods of mathematical statistics* have been used. With the help of these methods the following criteria were determined: the main statistical characteristics – arithmetic mean (\bar{x}); standard deviation (δ), standard error of mean (S); the credibility of difference between arithmetic means was determined by the Student’s t-test. The credibility was considered substantial even with the 5% level of significance ($p < 0,05$) that was regarded as fairly reliable when conducting pedagogical experiment.

However, to improve the objectivity of the achieved results, the levels of significance 1% ($p < 0,01$) and 0,1% ($p < 0,001$) were considered additionally. The calculations of the Student’s t-test for a normal distribution were conducted using the formula:

$$t = \frac{|\bar{x} - \bar{y}|}{\sqrt{S_x^2 + S_y^2}}$$

where \bar{x} , \bar{y} – arithmetic means of samples under study; S_x , S_y – corresponding standard errors of mean.

Purpose and Procedure

The purpose of the research – to develop and test Physical Education program for 20- and 21-year-old female students of Zaporizhzhia National University and Kherson State University using means of sports recreational tourism to improve their physical state level.

The object of the research is Physical Education process in higher education institutions.

The list of means of *general physical training* for female students included cross run, swimming in the pool, step aerobics; *means of technical and tactical training* – herringbone, half-herringbone, rail lift, traverse, rail descent, support descent, abseiling, pendulum traverse, pole fording, group fording, rail fording, log fording, air fording, stepping stone fording; *means of special physical training* – log walking, stone stepping, tourist exercises on grass and talus slopes (to develop special dexterity), rope climbing, pole climbing, slope climbing, weight squats, goblet exercises, stuffed ball exercises, chin-ups to develop special strength), tourist exercises for all-round competition (putting up a tent against the clock, knotting, work with special tourist equipment, etc.) (to develop special speed), weight training on grass and talus slopes and cliffs (to develop special stamina).

To assess the level of fitness of the female students who did sports recreational tourism during the academic year, such forms as a day off camping trip and competitions in orienteering and tourism technical skills were used. Apart from that, the process of technical and tactical training for the experimental group of female students was implemented gradually – from the easiest means (techniques and tactics of grass slopes climbing) to the hardest (techniques and tactics of rock terrain climbing).

The research objectives:

1. To investigate the issue of the female students' current physical state with the use of sports recreational tourism means.
2. To develop and test the efficiency of the experimental Physical Education program for 20- and 21-year-old female students with the use of sports recreational tourism means.

Participants

The research was carried out from 2020 to 2021 in Zaporizhzhia National University and Kherson State University with the participation of 45 third-year female students aged from 20 to 21 of Zaporizhzhia National University and Kherson State University. All of them volunteered to participate in the research. Prior to the testing, the procedures were explained to all of them, including possible involvement risks, and, after the explanation, an informed consent form was signed. The participants were involved in the research after providing their written informed consent. The research was approved by the Institutional Ethics Committee, complied with all relevant national regulations and institutional policies, followed the tenets of the declaration of Helsinki, and was approved by the authors' institutional review committee. Exclusion criteria were a history of injury or disease that would prevent participants from safely performing the research protocol. All participants were asked to refrain from alcohol and physical exercises 24 hours prior to participation and abstain from food intake and beverages that contain caffeine 2 h prior to participation.

Results

Taking into account the recent data that show a low level of students' physical state, it was considered to introduce new, popular and available among the youth physical exercises taking advantage of sports recreational tourism into the Physical Education program [14].

These physical exercises are popular among students and have been rapidly developing in Ukraine over the past few years. Thus, they can attract more students to a healthy lifestyle, sport, prepare them better for future professional activities, expand their scientific and cognitive potential, and assure long-term health and capability to work. Therefore, the experimental approbation of physical culture and further practical implementation of sports recreational tourism in the process of physical education of universities takes into account the current level of physical condition of students and is aimed at improving it, which determined the relevance of this research.

Heart rate monitoring is a useful tool for assessing individual cardiovascular activity and evaluating intensity [27]. Moreover, it is widely used for recreational purposes [23]. In addition, it is specifically used by coaches to assess individual capacity and exercise intensity, hence accurate measures of HR. At the end of the experiment the values of heart rate (to 64 ± 1.07 bpm⁻¹), all types of blood pressure, circulatory efficiency coefficient (to 3115.29 ± 120.90 r. u. or to the average level), Robinson index (to 71.09 ± 1.52 r. u. or to above average level) were

reliably decreased and the cardiovascular fitness level (CVFL) was reliably increased (to 82.11 ± 2.75 points or to above average level) (Table 1).

Table 1. Cardiovascular and respiratory systems' parameters of female students at the end of the experiment

Parameters	Beginning of experiment	End of experiment
HR, bpm ⁻¹	71.2±1.08	64±1.07***
BPs, mm Hg.	123.67±3.03	111.07±1.45***
BPd, mm Hg.	69.33±2.38	62.43±1.64**
BPr, mm Hg.	54.33±3	48.64±1.71
BPavg., mm Hg.	88.35±2.2	79.45±1.34***
ESV, ml	81.02±2.83 high	81.43±2.47 high
CO, L/min	5.77±0.21 above average	5.21±0.18* above average
CI, L/min/m ⁻²	3.15±0.12 average	2.87±0.09 hypodynamic
SVR, dynxsxsm ^{-0.5}	1241.28±68.66 below average	1231.45±59.54 below average
CVFL, points	64.50±3.43 average	82.11±2.75*** above average
VC, ml	4420±90.08	4907.14±83.34***
TIC, s	78.07±8.6	85.36±7.95
TEC, dec	36.33±4.42	46.93±4.44
HI, r.u.	0.51±0.06 average	0.74±0.07** high
SI, r.u.	2251.69±271.37 below average	3595.93±331.60** above average
RSFL, points	65.33±4.31 average	76.41±4.73* above average
PFL, points	46.47±1.78 below average	59.16±2.35*** average

NB: * – $p < 0.05$; ** – $p < 0.01$; *** – $p < 0.001$ comparing with the beginning of experiment

Source: own research.

At the end of the experiment, there were also positive changes of factors characterizing the current respiratory system fitness level and physical fitness level. According to the information received at the end of the experiment, there was a reliable increase among female students in values of VC (to 4907.14 ± 83.34 ml), hypoxia index (to 0.74 ± 0.07 r. u. or to high level), Skibinskiy index (to 3595.93 ± 331.60 r. u. or above average level), respiratory system fitness level (to

76.41±4.73 point or above average level) and physical fitness level (to 59.16±2.35 points or to average level). The female students had a high value of general physical working capacity (by 40.18±0.21%) and aerobic performance (by 17.66±1.85%). At the end of the research there were higher values of the cardiovascular system fitness level (by 19.40±1.51%), respiratory system fitness level (by 12.15±1.56) and physical fitness level (by 25.79±1.74%).

The results of the research have shown a significant optimization of the cardiovascular system fitness level of the female students who attended Physical Education classes that used sports recreational tourism means and included different types of training (from technical and tactical to special physical training).

Coherence in the work of the diaphragm and the cardiovascular system was revealed, which, in the form of a Valsalva wave, increased the efficiency of blood oxygen saturation and detoxification. The research showed a beneficial effect on the entire body as a whole, improving not only its respiratory function and blood circulation, but also the activity of the peripheral nervous system and the brain. Within the framework of the experimental program, a scale of optimal pulse modes was created for female students aged 20 and 21 with different levels of physical fitness during the implementation of the aforesaid special program of physical education (Fig. 1, 2).

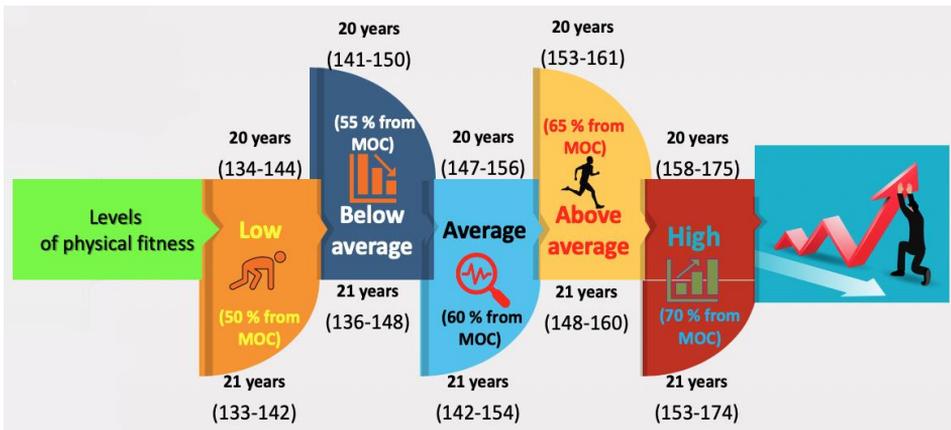


Figure 1. Optimal heart rate values (bpm^{-1}) for female students with different level of physical fitness while participating in the special Physical Education program

Source: own research.

One study [20] emphasizes the importance of the complex use of test batteries to assess the functional state. They must comply with the principles of measurement theory; reflect the course of physiological processes. The informativeness and validity of tests were singled out as the main principles. The

same conclusion was made in this article when studying the problems of organization of children's, teenage, student physical culture [21].

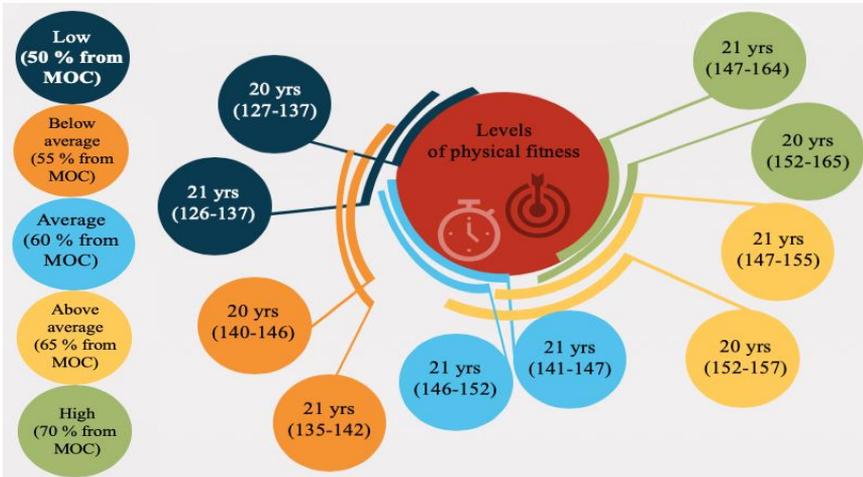


Figure 2. Optimal heart rate values (bpm^{-1}) for female students with different level of physical fitness while participating in special Physical Education program

Source: own research.

The development of the scale of optimal pulse modes was based on the analysis of the results of experimental studies concerning the morphological and functional characteristics of female students over the past 5 years. This takes into account known methods for calculating the optimal value of heart rate (HR) and bibliographic data on the relationship between the level of physical fitness and the value of maximum oxygen consumption (MOC) [18].

For instance, it has been demonstrated that:

- there is the following relation between maximal oxygen consumption value (MOC, ml/min) and maximal physical working capacity (aPWC_{170} , kgm/min):

$$\text{aMOC} = 1.7 \times \text{aPWC}_{170}(\text{max}) + 1240, \text{ or } \text{aPWC}_{170}(\text{max}) = (\text{aMOC} - 1240) / 1.7$$

the most favorable activity is 60–75% from MOC or maximal values of PWC_{170} .

Activities of such intensity cause normal circulatory system intensification, which corresponds with a given activity intensity and later signs of tiredness.

- to calculate the optimal heart rate value when performing physical activities, a formula suggested:

$$\text{HR}_{\text{OPT}} = \text{COF}_1 + \text{COF}_2 \times N - \text{COF}_3 \times A^2 \times \text{BW},$$

where HR_{OPT} – optimal heart rate value when performing physical activities, bpm; $\text{COF}_1(82,81)$; $\text{COF}_2(1,19)$; $\text{COF}_3(0,001)$ – constant coefficients; A – age, years; BW – body weight, kg; N – load power (% from MOC or $\text{aPWC}_{170}(\text{max})$).

In view of the foregoing, we suggested to calculate optimal heart rate volumes using such formulas:

$$\text{HRmin} = 88.2 + 1.19 \times N - 0,001 \times A^2 \times \text{BWmin}$$

$$\text{HRmax} = 88.2 + 1.19 \times N - 0,001 \times A^2 \times \text{BWmax},$$

where HRmin – minimal heart rate value, bpm^{-1} ; HRmax – maximal heart rate value, bpm^{-1} ; BWmin – minimal body weight value in the group examined, kg; BWmax – maximal body weight value in the group examined, kg; A – age, years; N – load power in % from MOC; 88.2; 1.19; 0.001 – constant coefficients.

Discussion

Each generation has its own characteristics and, consequently, needs. To encourage today's youth to any activity, you need to take into account their characteristics and speak the same language to them. Here it is necessary to use one's ingenuity and constantly experiment, even if we are talking about ordinary physical education lessons. Some innovative educators manage to find the key to their students' motivation, however, unfortunately, so far this remains a pleasant exception. In order to globalize the love of students for sports and for attending physical education classes, caring organizations introduce special programs.

If we are talking about a teacher, then this should be a professional and creative person who is not afraid of change and does not act according to a pattern. They must leave their comfort zone, find new approaches to present the material in an interesting and modern way, be an example and authority for students, constantly engage in self-education and improve their professional level. The authority of the teacher should come first. We must try to find an approach to each pupil. An interesting teacher – an interesting lesson – a sincere and grateful student!

Weak dialogization, lack of creative tasks are also the problems of modern physical culture lessons. Students quite often play the role of passive executors of the teacher's instructions. Unfortunately, a vast majority of them have low motivation, do not know how / do not want to come up with and implement new ideas. And very often we can "lose a child" behind programs and standards, without giving them any opportunity to fall in love with sports and enjoy physical activity.

Today, the main obstacle to conduct high-quality physical education lessons is a weak material and technical base – insufficient modern sports equipment and equipment inconsistent with age standards. In Ukraine, there are educational institutions with no gyms at all, and students are forced to study in corridors and converted rooms in the winter. It is worth paying attention to the congestion of sports halls. In the cities of Ukraine, one can often observe a picture

when two, and sometimes three courses of different ages are exercising in one gym at the same time. In such conditions it is very difficult to provide a high level of physical education lessons and even more so to motivate and encourage students to go in for sports.

An urgent task is to stimulate the independent motor activity of young Ukrainians, the search for innovative technologies, means, forms to preserve and increase their health potential [13]. Experts recommend to modernize the process of physical education at universities. In practice of physical education, it is customary to declare: the fight against obesity, the increase in cardiorespiratory endurance, the development of strength and flexibility of the joints of the body. In particular, a number of authors note a wide variety of sports and health options (physical education, health, rehabilitation, etc.), which significantly increases the prospects for their use as one of the most effective ways to improve the physical condition of students [20]. Also, experts point out that physical activity can improve some human functions [2], and recreational activities can improve their physiological functions, as well as can lead to an improvement in cognitive functions and psychosocial characteristics [1]. Powerful stabilizing results will also affect emotional harmonization, a sustainable healing effect that extends to all systems and organs. This is due to the work of the nervous system which is maintained by the transition of nervous activity to a state of parasympathetic activity, and this is an exceptional condition for the absorption of nutrients and recovery at the cellular level.

With the rising concerns about population health, the tourism has received considerable attention and has become an integral part of students' life. There is a lack of scientifically-based data concerning the use of different means of sports recreational tourism in Physical Education for students; it is chiefly fragmentary [11, 12, 19].

This approach involves the use of relatively low physical activity, which contributes to the choice of such means and forms of sports recreational tourism, which provide leisure time for female students and have a positive effect on sports and health tourism.

The analysis has revealed only some facts of evaluation of sports and health-improving means in the system of physical education of female students, affecting the issues of the influence of these physical exercises on individual components of the physical fitness of students of different ages and gender. The lack of extreme physical activity and its intensity, the relative ease of mastering the basic methods of physical culture and health tourism, the high emotional dynamics of classes, especially in the conditions of a tourist trip, distinguish physical culture and health tourism from other types of physical activity and types of tourism and make it appropriate for use in various age groups.

We hope the scrutiny will guide the dynamic process of sustainability in health. Thus, experimental approbation and further practical implementation of sports and health tourism means in the Physical Education process for higher education regards the current level of female students' physical state and focuses on its improvement.

Conclusion

1. Based on the previous studies and discussion in academia, one could notice how physical activity contributes to the functionality and effectiveness of health promotion. The analysis of the scientific literature has revealed only several facts regarding the assessment of sport and health efficiency means in the system of Physical Education for students, dealing with the issues of influence of these physical exercises on particular physical fitness components for students of different age and gender.
2. The results of the research have shown a significant optimization of the cardiovascular system fitness level of female students who attended Physical Education classes with the use of sport and health tourism means, including different types of training (from technical and tactical to special physical training). The coherence level of the cardiovascular and respiratory systems was increased. Aerobic and mixed performance increase, and cardiac activity normalization can be seen when changing to a normotonic type of regulation of cardiac performance.

At the end of the research, the female students had higher reduction values of heart rate (by 3%), systolic blood pressure (by 7%), diastolic blood pressure (by 9%), circulatory efficiency coefficient (by 7%), Robinson index (by 10%), timed inspiratory capacity (by 7%), timed expiratory capacity (by 28%), hypoxia index (by 14%), Skibinskiy index (by 33%), cardiovascular fitness level (by 19% accordingly), respiratory system fitness level (by 12%) and physical fitness level (by 26%).

References

- [1] Dale L.P., Vanderloo L., Moore S., Faulkner G. (2018): *Physical activity and depression, anxiety, and self-esteem in children and youth: an umbrella systematic review*. *Mental Health and Physical Activity*, vol. 16, pp. 66–79. <https://doi.org/10.1016/j.mhpa.2018.12.001>.
- [2] D'Isanto T. (2016): *Pedagogical value of the body and physical activity in childhood*. *Sport Science*, 9(2), pp. 13–18.

- [3] De Lion A., Neville R., Armour K. (2017): *The role of fitness professionals in public health: A review of the literature*. *Quest*, 69(3), pp. 313–330. <https://doi.org/10.1080/00336297.2016.1224193>.
- [4] Denisenko I. (2013): *The peculiarities of functional state changes of cardiovascular system of girls at the age 18–19 years in the process of practicing sport and health tourism*. *Physical Education of Students*, 17(5), pp. 32–36.
- [5] Dunets A.N., Yankovskaya V., Plisova A.B., Mikhailova M.V., Vakhrushev I.B., Aleshko R.A. (2020): *Health tourism in low mountains: A case study*. *Entrepreneurship and Sustainability Issues*, 7 (3), pp. 2213–2227. [http://doi.org/10.9770/jesi.2020.7.3\(50\)](http://doi.org/10.9770/jesi.2020.7.3(50)).
- [6] Engström E., Ottosson E., Wohlfart B., Grundström N., Wisén A. (2012): *Comparison of heart rate measured by Polar RS400 and ECG, validity and repeatability*. *Advances in Physiotherapy*, 14 (3), pp. 115–122. <https://doi.org/10.3109/14038196.2012.694118>.
- [7] Gafiatulina N.Kh., Kosinov S.S., Samygin S.I. (2018): *Sports movement as an effective means of developing the social health of Russian youth*. *Humanities, Socio-Economic and Social Sciences*, 3.
- [8] Gibson H.J. (1998): *Sport tourism: a critical analysis of research*. *Sport Management Review*, 1 (1), pp. 45–76. [https://doi.org/10.1016/S1441-3523\(98\)70099-3](https://doi.org/10.1016/S1441-3523(98)70099-3).
- [9] Iermakov S., Cieslicka M., Muszkieta R. (2015): *Physical culture in life of Eastern-European region students: modern state and prospects of development*. *Physical Education of Students*, 6, pp. 16–30. <https://doi.org/10.15561/20755279.2015.0603>.
- [10] Ivanenko S., Tyshchenko V., Pityn M., Hlukhov I., Drobot K., Dyadechko I., Zhuravlov I., Omelianenko H., Sokolova O. (2020): *Analysis of the Indicators of Athletes of Leading Sports Schools in Swimming*. *Journal of Physical Education and Sport (JPES)*, vol. 20 (4), art 233, pp. 1721–1726. <http://doi.org/10.7752/jpes.2020.04233>.
- [11] Karvunis Y.A., Kapilevich L.V. (2016): *Basics of sports and health tourism: optional school course efficiency rating*. *Theory and Practice of Physical Culture*, (12), pp. 18–19.
- [12] Kashuba V.O., Goncharova N.N., Butenko H.O. (2016): *Effectiveness of health tourism application as the basis of health related recreational technology in primary school pupils' physical education*. *Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports*, 20 (2), pp. 19–25. <https://doi.org/10.15561/18189172.2016.0203>.
- [13] Kasyanov V.V., Ponomarev I.E., Gluzman I.V., Zagutin D.S., Kosinov S.S., Tolstokora O.N., Beletova J.B. (2019): *Sport and health-saving technologies in the structure of state youth policy*. *International Journal of Applied Exercise Physiology*, 8 (3), pp. 129–137. <http://doi.org/10.26655/IJAEP.2019.9.16>.

- [14] Kolokoltsev M., Jagiello W. (2020): *Physical activity of the university's senior students*. *Physical Education of Students*, 24 (1): pp. 31–39. <https://doi.org/10.15561/20755279.2020.0104>.
- [15] Kurmaeva E.V. (2013): *Fitness-programs as mean of forming of personality physical culture of students*. *Physical Education of Students*, 17 (1), pp. 37–39.
- [16] Lisenchuk G., Zhigadlo G., Tyshchenko V., Odynets T., Omelianenko H., Pipytk P., Bessarabova O., Galchenko L., Dyadachko I. (2019): *Assess psychomotor, sensory-perceptual functions in sport games*. *Journal of Physical Education and Sport*, 19 (2), art 175, pp. 1205–1212. <http://doi.org/10.7752/jpes.2019.02175>.
- [17] MacDonald L.A., Minahan C.L. (2016): *Indices of cognitive function measured in rugby union players using a computer-based test battery*. *Journal of Sports Sciences*, 34 (17), pp. 1669–1674. <https://doi.org/10.1080/02640414.2015.1132003>.
- [18] Malikov M., Tyshchenko V., Boichenko K., Bogdanovska N., Savchenko V., Moskalenko N. (2019): *Modern and methodic approaches to express-assessment of functional preparation of highly qualified athletes*. *Journal of Physical Education and Sport*, vol. 19 (3), art. 219, pp. 1513–1518. <http://doi.org/10.7752/jpes.2019.03219>.
- [19] Plowman S.A. (2014): *Top 10 Research Questions Related to Musculoskeletal Physical Fitness Testing in Children and Adolescents*. *Research Quarterly for Exercise and Sport*, 85 (2), pp. 174–187. <http://doi.org/10.1080/02701367.2014.899857>.
- [20] Prontenko K., Griban G., Dovgan N., Loiko O., Andreychuk V., Tkachenko P., Bloschynskiy I. (2019): *Students' health and its interrelation with physical fitness level*. *Sport Mont*, 17(3), pp. 41–46. <http://doi.org/10.26773/smj.191018>.
- [21] Radziminska A., Weber-Rajek M., Lulinska-Kuklik E., Kazmierczak U., Moska W. (2016): *Academic youth's health behavior*. *Physical Education of Students*, 20 (6), pp. 55–62. <https://doi.org/10.15561/20755279.2016.0607>.
- [22] Rocamora I., González-Víllora S., Fernández-Río J., Arias-Palencia N.M. (2019): *Physical activity levels, game performance and friendship goals using two different pedagogical models: Sport Education and Direct Instruction*. *Physical Education and Sport Pedagogy*, 24 (1), pp. 87–102. <https://doi.org/10.1080/17408989.2018.1561839>.
- [23] Thomson E.A., Nuss K., Comstock A., Reinwald S., Blake S., Pimentel R.E., Li K. (2019): *Heart rate measures from the Apple Watch, Fitbit Charge HR 2, and electrocardiogram across different exercise intensities*. *Journal of Sports Sciences*, 37 (12), pp. 1411–1419. <https://doi.org/10.1080/02640414.2018.1560644>.

- [24] Tyshchenko V., Prytula O., Piptyk P., Sinyugina M., Galchenko L., Bessarabova O., Sydoruk H. (2018): *The effect of Ukrainian self-defense Spas on the fitness level of middle school students*. Journal of Physical Education and Sport, 18(4), art. 284, pp. 1927–1933. <http://doi.org/10.7752/jpes.2018.s4284>.
- [25] Uher I., Bukova A. (2018): *Interrelationship between exercise and diseases in young people: Review study*. Physical Activity Review, 6, pp. 203–212. <http://doi.org/10.16926/par.2018.06.25>.
- [26] Weippert M., Behrens M., Mau-Moeller A., Bruhn S., Behrens K. (2018): *Relationship between morning heart rate variability and creatine kinase response during intensified training in recreational endurance athletes*. Frontiers in Physiology, 9, pp. 1–7. <https://doi.org/10.3389/fphys.2018.01267>.
- [27] Wise N., Harris J. (2017): *Transforming Brazil: Sporting mega-events, tourism, geography and the need for sustainable regeneration in host cities*. Sport, Events, Tourism and Regeneration, pp. 24–39.
- [28] Zhamardiy V., Shkola O., Tolchieva H., Saienko V. (2020): *Fitness technologies in the system of physical qualities development by young students*. Wiadomości Lekarskie, 73 (2), pp. 332–341. <http://doi.org/10.36740/WLek202002125>.

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