

# PHYSICAL EDUCATION SPORTS AND HUMAN HEALTH

ISSUE  
16



2020



# BULLETIN

## OF KAMIANETS-PODILSKYI NATIONAL IVAN OHIIENKO UNIVERSITY

### PHYSICAL EDUCATION, SPORTS AND HUMAN HEALTH

COLLECTION OF SCIENTIFIC WORKS

ISSUE 16, 2020

*Editor-in-Chief:*

**Iedyak G.**, Full professor PhD of Physical Education and Sports Sciences, Kamianets-Podilskyi National Ivan Ohienko University, Ukraine

*Assistant Editor:*

**Chistyakova M.**, PhD of Physical Education and Sports Sciences, Kamianets-Podilskyi National Ivan Ohienko University, Ukraine

*Editorial Board:*

**Blavt O.**, Doctor of Pedagogical Sciences, Associate Professor, Lviv Polytechnic National University, Ukraine

**Bosenko A.**, Doctor of Pedagogical Sciences, Professor, South Ukrainian National K.D. Ushynsky Pedagogical University, Ukraine

**Vasylenko M.**, Doctor of Pedagogical Sciences, Associate Professor, National University of Physical Education and Sports of Ukraine

**Galamanzhuk L.**, Doctor of Pedagogical Sciences, Professor, Kamianets-Podilskyi National Ivan Ohienko University, Ukraine

**Marzec A.**, Full professor PhD, Jan Dlugosz University in Czestochowa, Poland

**Popovich A.**, Doctor of Pedagogical Sciences, Associate Professor, Kamianets-Podilskyi National Ivan Ohienko University, Ukraine

**Prontenko K.**, Doctor of Pedagogical Sciences, Associate Professor, Zhytomyr Military S.P. Korolev Institute, Ukraine

**Putrov S.**, Full professor PhD of Philosophy Sciences, National M.P. Dragomanov University, Ukraine

**Sushchenko L.**, Full professor PhD of Pedagogical Sciences, National M.P. Dragomanov University, Ukraine

**Aliexsieiev O.**, PhD of Pedagogical Sciences, Kamianets-Podilskyi National Ivan Ohienko University, Ukraine

**Bodnar A.**, PhD of Pedagogical Sciences, Kamianets-Podilskyi National Ivan Ohienko University, Ukraine

**Dutchak M.**, Full professor PhD of Physical Education and Sports Sciences, National University of Physical Education and Sports of Ukraine

**Koryahin V.**, Doctor of Physical Education and Sports Sciences, Professor, Lviv Polytechnic National University, Ukraine

**Nesterchuk N.**, Doctor of Physical Education and Sports Sciences, Associate Professor, National University Of Water And Environmental Engineering, Ukraine

**Olkhovyi O.**, Full professor PhD of Physical Education and Sports Sciences, Petro Mohyla Black Sea National University, Ukraine

**Pszybysz-Zaremba M.**, Doctor of Pedagogical Sciences, Associate Professor, State Higher Vocational School in Skierniewice, Poland

**Romanchuk S.**, Full professor PhD of Physical Education and Sports Sciences, National Army Academy Hetman Petro Sahaidachny, Ukraine

**Klyus O.**, PhD of Physical Education and Sports Sciences, Kamianets-Podilskyi National Ivan Ohienko University, Ukraine

**Mazur V.**, PhD of Physical Education and Sports Sciences, Kamianets-Podilskyi National Ivan Ohienko University, Ukraine

**Prozar M.**, PhD of Physical Education and Sports Sciences, Kamianets-Podilskyi National Ivan Ohienko University, Ukraine

**Stasiuk I.**, PhD of Physical Education and Sports Sciences, Dean of Faculty of Physical Education, Kamianets-Podilskyi National Ivan Ohienko University, Ukraine

**Yurchyshyn Yu.**, PhD of Physical Education and Sports Sciences, Associate Professor, Kamianets-Podilskyi National Ivan Ohienko University, Ukraine

**Scientific-metric database:**

Vernadsky National Library of Ukraine

Google Scholar

Index Copernicus

CEJSH

OAJI

Certificate to registration:

**KB N 20175-9975 PR of 05.07.2013.**

The publication is approved by the decision of the Scientific Board of Kamianets-Podilskyi National Ivan Ohienko University (protocol № 2 of 27.02.2020)

Four issues per year.

Established in 2013.

**B 53** This bulletin of the Kamianets-Podilskyi National Ivan Ohienko University. Physical education, Sport and Human Health / [ed.: G. Iedyak (Editor-in-Chief) and others]. Kamianets-Podilskyi: Publisher Alla Pankova. 2020. Issue 16. 114 p.

**ISSN 2309-8082**

The bulletin covers the results of the scientific investigations of the current problems connected with educational aspects of the physical training of different social classes, valeology, ergotherapy, preparing sportsmen and management in physical education.

The material is published in author's edition. This material is recommended to scientific, scientific-educational assistants, teachers of PE, health basics, sports coaches, physical therapy specialists, doctoral candidates and Ph.D. students.

**УДК 796:613**

*Editorial Address:*

st. Ivan Ohienko 61

Kamianets-Podilskyi,

Ukraine

<http://visnyk-sport.kpnu.edu.ua/>

E-mail: 1876543@i.ua

DOI: 10.32626/2309-8082.2020-16

## CONTENTS

<b>Aloshyna A. Demyanchuk O.</b>	Factor structure of physical condition and technical preparedness of children aged 15–16 years who are engaged in sports tourism ..... 5
<b>Bondarenko I. Twelina A. Andryushchenko M. Konoplyanik O. Mayer V.</b>	Research of the results of the Ukrainian Championship in rowing on ergometers as a stage of selection for the national team ..... 11
<b>Bondarenko I. Gorban G. Kurasa G. Andryushchenko M. Konoplyanik O. Mayer V. Bondarenko O.</b>	Construction and use of a database in the system of physical education of students ..... 18
<b>Klyus O. Kuzhel M. Skavronsky O. Guska M.</b>	Prerequisites for the formation of students' value attitudes to the development of physical preparation ..... 27
<b>Koval O.</b>	Formation of motivations of development of physical activity in students of establishment of higher education ..... 32
<b>Liashenko V. Gatsko O., Gnutova N. Petrova N.</b>	Means of improvement of physical and technical preparation of american volleyball followers 18–21 years in the educational and training process ..... 37
<b>Omelchenko O. Sidak M.</b>	Features of indicators of highly qualified rowers during the passage of the competitive distance on the simulator "Concept-2" ..... 42
<b>Pankevych Ya. Lesko O. Afonin V. Kuznetsov M. Romaniv I. Demkiv A. Roljuk O.</b>	Professionally important qualities of future engineering units officers of Ukraine ..... 47
<b>Piven O. Gorbenko M.</b>	The role of "universal education" in the formation and development of physical culture in Ukraine (1917–1923 years) ..... 54
<b>Pidgaina V.</b>	Changes in indicators of physical preparation of young people 16–17 years under the impact of physical and health activities classes with the use of facilities aquarecreation..... 59
<b>Polyakova A. Mykytchuk O. Konakova O.</b>	Organization of motor activity of early preschool children in preschool educational establishments of various types ..... 64

<b>Prontenko K.</b>	Structure of physical fitness of gyro-athletes at the stages of long-term training .....	74
<b>Romanchuk S.</b>		
<b>Andreychuk V.</b>		
<b>Lesko O.</b>		
<b>Romanov I.</b>		
<b>Leshchinskii O.</b>		
<b>Barashevsky S.</b>		
<b>Muzyka N.</b>		
<b>Romanchuk S.</b>	Formation of the basics of the methodical component of physical education in	
<b>Lesko O.</b>	future officers training in leadership courses .....	79
<b>Kuznetsov M.</b>		
<b>Fedak S.</b>		
<b>Loiko O.</b>		
<b>Romanov I.</b>		
<b>Demkiv A.</b>		
<b>Bobko Yu.</b>		
<b>Savliuk S.</b>	From the experience of using Pilates in correctional and wellness technologies with	
<b>Vakoliuk A.</b>	people of mature age .....	86
<b>Panchuk I.</b>		
<b>Butenko T.</b>		
<b>Fotyryuk V.</b>	Comparative analysis of studies of physical fitness levels of WHO first-year youth	
	students according to state testing results .....	91
<b>Chaliy L.</b>	Structural Emphasis on Physical Education Teachers' Readiness	
<b>Mamchur S.</b>	for Extracurricular .....	96
<b>Chistyakova M.</b>	The construction of the training process in micro and mesocycles of elite	
<b>Shishkin O.</b>	judo athletes.....	102
<b>Yurchyshyn Yu.</b>	Technological approach efficiency of attracting students to healthy	
<b>Mysiv V.</b>	motor activity .....	107
<b>Pogrebnyak T.</b>		
<b>Potapchuk S.</b>		

# FACTOR STRUCTURE OF PHYSICAL CONDITION AND TECHNICAL PREPAREDNESS OF CHILDREN AGED 15–16 YEARS ENGAGED IN SPORTS TOURISM

A. Aloshyna, O. Demyanchuk

Lesya Ukrainka Eastern European National University, Lutsk, Ukraine

corresponding author – A. Aloshyna: aleshina1012@gmail.com

doi: 10.32626/2309-8082.2020-16.5-10

The objective of the study is to identify and analyze the factor structure of physical condition and technical preparedness of children aged 15–16 years engaged in sports tourism. *Materials and methods of the research.* The study involved 56 boys and 26 girls aged 15–16 years. The results of the study were processed using correlation and factor analysis. *The results.* The results of the study show that during the factor analysis of indicators of physical condition and technical preparedness of students aged 15 years, two factors were identified, describing 34.66 % of the total dispersion in boys and three factors with 48.54 % contribution to the total dispersion in girls. So, in guys aged 15 years the general first factor “Speed-power and power qualities” has a load of 19.4 %, the second factor “Physical development, functional state, speed and agility” with a load of 15.26 %. The factor structure of girls aged 15 years revealed that the main first factor “Physical fitness” has a load of 21.26 %, and it is bipolar. The second factor “Physical development and technical preparedness” with a load of 14.05 % is unipolar. The third factor, with a contribution of 13.23 % to the total dispersion, indicates that weight gain is a risk factor for the increase of heart rate in girls, which negatively affects their speed-

power and strength. Factor analysis of indicators of physical condition and technical readiness of children aged 16 years, showed three factors which by 50.74 % in boys and 71.30 % in girls describe the total dispersion. The main factor in children aged 16 years “Physical preparedness” has a “weight” of 29.56 %, the second factor is “Respiratory system” with a contribution of 11.36 %, the third “Technical preparedness” with a load of 9.82 %. In girls aged 16 years of age, the first general factor “Physical fitness” with a load of 33.7 %, the second factor “Physical development, respiratory system and technical readiness” with a load of 20.13 %, the third factor “Physical development, functional status and speed-power qualities” with a load of 17.47 %. *Conclusions.* The factor structure of physical condition of children aged 15–16 years has its peculiarities depending on gender and age. Generalization of the results of the factor analysis of indicators of physical condition and technical preparedness of students aged 15–16 years gives grounds to state that by means of sports tourism it is possible to correct their physical condition.

**Key words:** physical development, physical fitness, technical readiness, factor analysis, boys, girls.

## Introduction

The current stage of development of society is characterized by difficult conditions of socio-economic development. That is why students, along with mastering the knowledge, skills and abilities provided by the basic program of physical culture, must have a high level of physical condition and be harmoniously developed and ready for fruitful creative work [1; 4].

The program of the subject «Physical Culture» is built on a modular system and contains invariant and variable modules. The latter are represented by various sports, including tourism [5]. In recent years, tourism, in particular sports, is becoming increasingly popular. Sports tourism is an integral part of the system of physical culture and sports in Ukraine, patriotic and spiritual education of youth, health promotion, development of physical, moral and intellectual qualities of the individual by involving him in sports trips and competitions in sports tourism [1; 5].

The level of physical condition of schoolchildren in recent years is of concern, as experts note the trend of persistent deviations in the state of health of schoolchildren, due to increased workload and a simultaneous decrease in physical activity [3; 4].

At the present stage, a large number of studies of the physical condition of schoolchildren. At the same time, it should be noted that there is no research on the factor structure of the physical condition of children aged 15–16 who are engaged in sports tourism, which testifies to the relevance of the study.

The research was conducted on the topic of the Consolidated Research Plan in the field of physical culture and sports for 2011–2015 of the Ministry of Family, Youth and Sports of Ukraine 3.7 «Improvement of biomechanical technologies in physical education and rehabilitation taking into account individual characteristics of human motility» (state registration number 0111U001734) and Research Plans of the Lesia Ukrainka East European National University for 2015–2017 on the topic «Socio-pedagogical and medical-biological bases of physical activity of different population groups» (state registration number 0115U002344) and for 2018–2023 on the topic «Modern technologies for the formation and preservation of health of various groups of the population by means of health-improving motor activity» (state registration number 0118U004196).

### Materials and methods of research

The study was aimed at identifying and analyzing the factor structure of physical condition and technical fitness of girls and boys aged 15–16, who are engaged in sports tourism after school hours. The study involved 45 schoolchildren aged 15 years (31 boys and 14 girls) and 37 children aged 16 years (25 boys and 11 girls). All participants received informed consent to participate in this experiment. In the process of research, we determined the indicators that carried information about the physical condition of children and their technical readiness.

Indicators that characterize physical development were determined using conventional methods of anthropometry [3; 6]. Indicators of physical fitness were determined by testing physical qualities according to the requirements of the school program. Technical readiness was assessed using tests used in sports tourism and a variable module «Tourism» of the school program [1; 5]. The results of the study were processed using the methods of mathematical statistics: correlation analysis and factor analysis, in particular using the method of rotation of the varimax axes [2; 6].

**Table 1 – Factor structure of the physical condition of schoolchildren 15 years old engaged in sports tourism**

Researched parameters	Boys, n=31		Girls, n=14		
	Factor 1	Factor 2	Factor 1	Factor 2	Factor 3
<b>Physical condition</b>					
Body weigh, kg	0,206	-0,298	-0,015	0,149	<b>0,784</b>
Body length, sm	0,025	-0,449	0,199	0,601	0,315
HR, beats/min <sup>-1</sup>	-0,164	0,381	0,014	0,127	<b>0,785</b>
OGK, sm	0,362	-0,108	-0,175	<b>0,845</b>	0,033
VL, мл	0,019	<b>0,728</b>	0,402	0,448	-0,076
Stange test, s	-0,326	-0,115	0,315	0,766	0,091
Genchi's test, s	-0,057	-0,203	0,418	-0,067	-0,125
Dynamometry of the right hand, kg	0,033	<b>0,916</b>	0,076	-0,509	0,760
Dynamometry of the left hand, kg	0,213	-0,170	0,602	-0,219	0,455
D SAT, Mm Hg	0,437	-0,384	0,691	0,425	0,149
D DAT, Mm Hg	-0,266	0,049	0,399	0,471	-0,267
<b>Physical preparedness</b>					
Speed abilities (6ir 60 m, s)	-0,017	<b>-0,874</b>	<b>0,826</b>	0,346	-0,014
Agility (shuttle run 4x9 m, s)	0,068	<b>-0,830</b>	<b>0,847</b>	0,268	0,092
Flexibility (lean forward from a sitting position, см)	-0,010	0,674	<b>-0,716</b>	-0,229	-0,490
Speed and power qualities (long jump, sm)	<b>0,821</b>	0,187	-0,128	-0,100	<b>-0,951</b>
Speed and power qualities (high jump, sm)	<b>0,862</b>	-0,050	<b>-0,798</b>	-0,050	-0,532
Strength (bending of arms in an emphasis lying down, times)	<b>0,753</b>	0,160	-0,362	-0,231	-0,365
Strength (lifting in the saddle for 1 min, times)	<b>0,790</b>	0,010	-0,927	-0,218	0,022
Силові якості (pulling up, разів)	<b>0,855</b>	0,007	0,097	-0,023	<b>-0,855</b>
Speed qualities (run 1500, 2000 м, min)	-0,345	-0,079	<b>0,919</b>	-0,043	0,091
Static equilibrium (Bondarevsky's samples with closed eyes, s)	-0,583	0,033	<b>-0,874</b>	0,365	0,209
Static equilibrium (Bondarevsky's samples with open eyes, s)	-0,484	-0,023	<b>-0,798</b>	0,399	-0,341
<b>Technical preparedness</b>					
Ascent-traverse-descent, min.	-0,234	0,055	0,441	0,658	-0,442
Knitting knots, min.	0,526	-0,104	-0,189	<b>0,854</b>	0,227
Climbing free climbing, min.	-0,441	0,085	0,090	<b>0,958</b>	0,020
Determination of distance, m	0,133	0,423	-0,270	-0,612	-0,648
Motion in a given azimuth, m	0,443	0,217	-0,278	0,697	0,205
Movement along the line, m	0,191	-0,057	-0,533	-0,570	0,145

## Research results

The study examined the factor structure of physical condition and technical preparedness of girls and boys aged 15–16. Using the varimax rotation method, two factors were identified that describe 34.66 % of the total variance in 15-year-old boys and three factors with 48.54 % contribution to the total variance in 15-year-old girls (Table 1).

Investigating the generalized characteristics of the structure of the physical condition of 15-year-old boys on the basis of the established correlations of physical condition indicators, we found that in the general factor I «Speed and power qualities» with a load of 19.40 % combine individual indicators of their physical preparedness. Thus, this factor has a direct correlation with the following indicators of physical fitness: with indicators that characterize the speed and strength qualities, for example, long jump ( $r=0.821$ ;  $p<0.05$ ) and high jump ( $r=0.862$ ;  $p<0.05$ ), indicators of strength qualities, in particular in terms of pull-up ( $r=0.855$ ;  $p<0.05$ ), strength of the upper extremities and shoulder girdle, in terms of flexion and extension of the arms in a supine position – ( $r=0.753$ ;  $p<0.05$ ), torso strength, according to the rate of lifting to the side for 1 min ( $r=0.790$ ;  $p<0.05$ ). The resulting set of indicators indicates a deep relationship between the established indicators and indicates an increase in speed and strength qualities of the guys, along with an increase in their strength qualities.

The second factor «Physical development, functional status, speed and agility» with a «weight» of 15.26 % directly correlates with VL ( $r=0.728$ ;  $p<0.05$ ) and dynamometry of the right hand ( $r=0.916$ ;  $p<0.05$ ) and vice versa – with indicators of speed abilities ( $r=-0.874$ ;  $p<0.05$ ) and agility ( $r=-0.830$ ;  $p<0.05$ ), which indicates a decrease in the time of overcoming control distances with increasing functional state of the respiratory system their body and against the background of increasing hand strength.

In the factor structure of indicators of physical condition and technical preparedness of girls of 15 years certain features are revealed. In the main factor 1 «Physical fitness» with a load of 21.26 %, which was bipolar, at one pole were indicators of speed ( $r=0.826$ ;  $p<0.05$ ), agility ( $r=0.847$ ;  $p<0.05$ ) and endurance ( $r=0.919$ ;  $p<0.05$ ), and on the other – flexibility ( $r=-0.716$ ;  $p<0.05$ ), speed and power qualities, high jump ( $r=-0.798$ ;  $p<0.05$ ), as well as indicators of static equilibrium, determined in

Bondarevsky's samples with closed ( $r=-0.874$ ;  $p<0.05$ ) and open eyes ( $r=-0.798$ ;  $p<0.05$ ). Thus, it can be argued that increasing the time of fixation of static posture, which indicates the improvement of static balance of girls, is accompanied by an increase in jumping height, as well as improving their flexibility, speed and agility, increasing forward tilt results and reducing control distances.

The second, unipolar factor «Physical development and technical fitness» with a load of 14.05 % contains OGK ( $r=0.845$ ;  $p<0.05$ ), free climbing ( $r=0.958$ ;  $p<0.05$ ) and knitting knots ( $r=0.854$ ;  $p<0.05$ ). Obviously, physical development determines the improvement of technical fitness of 15-year-old girls engaged in sports tourism.

The third factor with a contribution of 13.23 % to the total variance, directly correlates with body weight ( $r=0.784$ ;  $p<0.05$ ) and heart rate (HR) ( $r=0.785$ ;  $p<0.05$ ) and has an inverse correlation with the velocity – force qualities set by long jump ( $r=-0.951$ ;  $p<0.05$ ) and the strength index defined in the test exercise for girls «Pulling up on a low crossbar» ( $r=-0.855$ ;  $p<0.05$ ). As you can see, weight gain is a risk factor for heart rate increase in girls, which negatively affects their speed and strength and power qualities. That is, unlike boys, body weight is an important indicator in the factor structure of their physical condition.

As a result of factoring the indicators of physical condition and technical preparedness of 16-year-old children engaged in sports tourism, three factors were identified, which by 50.74 % for boys and 71.30 % for girls describe the total variance.

The main factor in boys aged 16 «Physical preparedness» with a «weight» of 29.56 %, as in boys 15 years, contains indicators of physical fitness, but for boys of this age, their list is significantly expanded. Thus, indicators of flexibility, speed and static equilibrium were added to the indicators characterizing speed-power and power qualities. It turned out that at one pole were concentrated indicators of strength by pulling on the crossbar ( $r=0.802$ ;  $p<0.05$ ), bending and unbending of the arms in the supine position ( $r=0.791$ ;  $p<0.05$ ), lifting in the saddle for 1 min ( $r=0.708$ ;  $p<0.05$ ), indicators of speed and power qualities in terms of long jump ( $r=0.878$ ;  $p<0.05$ ) and height ( $r=0.916$ ;  $p<0.05$ ), indicators of flexibility ( $r=0.914$ ;  $p<0.05$ ) and static equilibrium according to the results of Bondarevsky's tests with closed ( $r=0.772$ ;  $p<0.05$ ) and open eyes ( $r=0.855$ ;  $p<0.05$ ), and on others – speed qualities ( $r=-0.831$ ;  $p<0.05$ ) (Tab. 2).

Table 2 – Factor structure of the physical condition of schoolchildren 16 years old who are engaged in sports tourism

Researched parameters	Boys, n=25			Girls, n=12		
	Factor 1	Factor 2	Factor 1	Factor 2	Factor 1	Factor 2
<b>Physical condition</b>						
Body weigh, kg	0,068	-0,293	-0,384	-0,015	0,149	<b>0,784</b>
Body length, sm	0,175	-0,692	0,318	0,199	0,601	0,315
HR, beats/min <sup>-1</sup>	-0,173	-0,083	0,628	0,014	0,127	<b>0,785</b>
OGK, sm	-0,078	0,156	-0,206	-0,175	<b>0,845</b>	0,033
VL, мл	-0,243	<b>0,773</b>	-0,181	0,402	0,448	-0,076
Stange test, s	-0,138	0,267	0,033	0,315	<b>0,766</b>	0,091
Genchi's test, s	-0,094	<b>0,709</b>	0,252	0,418	-0,067	-0,125
Dynamometry of the right hand, kg	0,048	0,512	0,387	0,076	-0,509	<b>0,760</b>
Dynamometry of the left hand, kg	0,174	0,551	-0,029	0,602	-0,219	0,455
D SAT, Mm Hg	-0,017	0,476	0,203	0,691	0,425	0,149
D DAT, Mm Hg	-0,025	0,171	-0,654	0,399	0,471	-0,267
<b>Physical preparedness</b>						
Speed abilities (bir 60 m, s)	<b>-0,764</b>	-0,073	0,336	<b>0,826</b>	0,346	-0,014
Agility (shuttle run 4x9 m, s)	<b>-0,835</b>	0,045	0,303	<b>0,847</b>	0,268	0,092
Flexibility (lean forward from a sitting position, см)	<b>0,914</b>	-0,085	-0,018	<b>-0,716</b>	-0,229	-0,490
Speed and power qualities (long jump, sm)	<b>0,878</b>	-0,160	0,017	-0,128	-0,100	<b>-0,951</b>
Speed and power qualities (high jump, sm)	<b>0,916</b>	0,024	0,092	<b>-0,798</b>	-0,050	-0,532
Strength (bending of arms in an emphasis lying down, times)	<b>0,791</b>	-0,156	-0,060	-0,362	-0,231	-0,365
Strength (lifting in the saddle for 1 min, times)	<b>0,708</b>	0,269	0,069	<b>-0,927</b>	-0,218	0,022
Силлові якості (pulling up, разів)	<b>0,802</b>	-0,357	0,079	0,097	-0,023	<b>-0,855</b>
Speed qualities (run 1500, 2000 м, min)	<b>-0,831</b>	0,241	-0,113	<b>0,919</b>	-0,043	0,091
Static equilibrium (Bondarevsky's samples with closed eyes, s)	<b>0,772</b>	-0,283	-0,108	<b>-0,874</b>	0,365	0,209
Static equilibrium (Bondarevsky's samples with open eyes, s)	<b>0,855</b>	-0,026	-0,193	<b>-0,798</b>	0,399	-0,341
<b>Technical preparedness</b>						
Ascent-traverse-descent, min.	-0,022	0,424	-0,070	0,441	0,658	-0,442
Knitting knots, min.	-0,119	0,422	0,163	-0,189	<b>0,854</b>	0,227
Climbing free climbing, min.	-0,052	0,148	0,439	0,090	<b>0,958</b>	0,020
Determination of distance, m	0,001	-0,268	-0,662	-0,270	-0,612	-0,648
Motion in a given azimuth, m	0,314	-0,280	0,104	-0,278	0,697	0,205
Movement along the line, m	0,075	-0,014	<b>-0,702</b>	-0,533	-0,570	0,145

Obviously, the growth of speed-power and power qualities, flexibility and static balance causes a decrease in travel time, and, consequently, an increase in speed, agility and endurance of the guys.

The second factor «Respiratory system» with a contribution of 11.36 % to the factor structure of physical condition and technical fitness of boys 16 years

old contains the index of VL ( $r=0.773$ ;  $p<0.05$ ) and the Genchi test ( $r=0.709$ ;  $p<0.05$ ), and the third – «Technical preparedness» with a load of 9.82 % includes movement along the line ( $r=-0.702$ ;  $p<0.05$ ).

Analysis of the factor structure of the studied indicators of 16-year-old girls showed that the general factor I «Physical preparedness» with a load of 33.70 %

combines indicators of physical fitness, including speed ( $r=0.826$ ;  $p<0.05$ ), agility ( $r=0.847$ ;  $p<0.05$ ), endurance ( $r=0.919$ ;  $p<0.05$ ), which have a negative correlation with static equilibrium in the Bondarevsky sample with closed ( $r=-0.874$ ;  $p<0.05$ ) and open eyes ( $r=-0.798$ ;  $p<0.05$ ), flexibility ( $r=-0.716$ ;  $p<0.05$ ), indicators of speed and power qualities, on the example of high jump ( $r=-0.787$ ;  $p<0.05$ ) and strength qualities, for example, lifting into the saddle for 1 min ( $r=-0.927$ ;  $p<0.05$ ).

As you can see, with a decrease in speed, time to overcome distances of 100 m, and agility, time to overcome distances 4x9 m shuttle run, you can predict an increase in static balance in girls, time in a static position, increasing strength, including increasing the number of times in sit for 1 min, increase flexibility, increase the results of tilting the torso forward from a sitting position.

With a load of 20.13 % in factor 2 «Physical condition, respiratory system and technical preparedness» the following indicators were distinguished: OGK ( $r=0.845$ ;  $p<0.05$ ), Stange test ( $r=0.766$ ;  $p<0.05$ ), as well as indicators of technical readiness: knitting

knots ( $r=0.854$ ;  $p<0.05$ ) and lifting free climbing ( $r=0.958$ ;  $p<0.05$ ), which indicates the «internal» relationship between the established indicators.

The third factor «Physical condition, functional state and speed and strength qualities» with a load of 17.47 % with a direct correlation contains body weight ( $r=0.784$ ;  $p<0.05$ ), heart rate ( $r=0.785$ ;  $p<0.05$ ), dynamometry of the right hand ( $r=0.760$ ;  $p<0.05$ ) and with the inverse – speed and power qualities, on the example of a long jump from a place ( $r=-0.951$ ;  $p<0.05$ ) and pull-up  $r=-0.855$ ;  $p<0.05$ ).

As in the case of 15-year-old girls, 16-year-old girls have more body weight and functional status in the factor structure of physical condition and technical preparedness compared to boys.

The generalization of the results of the factor analysis of indicators of physical condition and technical preparedness of schoolchildren aged 15–16 gives grounds to assert that by means of sports tourism it is possible to correct their physical condition (Table 3).

**Table 3 – Generalized factor structure of physical condition and technical fitness of schoolchildren aged 15-16 engaged in sports tourism**

Factors	Factor load / investigated parameters			
	boys		girls	
	15 aged	16 aged	15 aged	16 aged
<b>Factor 1</b>	<b>19,40 %</b> (speed and power qualities)	<b>29,56 %</b> (speed-power and power qualities, flexibility, speed, static balance)	<b>21,26 %</b> (speed, agility, endurance, flexibility, static balance)	<b>33,70 %</b> (physical preparedness)
<b>Factor 2</b>	<b>15.26%</b> (respiratory system, hand strength, speed, agility)	<b>11.36 %</b> (respiratory system)	<b>14,05 %</b> (OGK, technical preparedness)	<b>20,13 %</b> (respiratory system, technical preparedness)
<b>Factor 3</b>	-	<b>9,82 %</b> (technical preparedness)	<b>13,23 %</b> (body weight, HR, speed and strength, hand, arm and shoulder girdle strength)	<b>17,47 %</b> (physical condition, speed and power qualities)
<b>Total, %</b>	<b>34,66</b>	<b>50,74</b>	<b>48,54</b>	<b>71,30</b>

### Discussion

Physical condition is characterized as a set of morphological, physical and functional indicators of development and condition of the human body, its physical qualities and abilities, which are due to internal factors of adaptation to living conditions [1; 4]. In determining

the physical condition of children engaged in sports tourism, we used a significant number of indicators. When processing the results, we used correlation and factor analysis. The purpose of factor analysis is to reduce the number of variables and determine the structure of relationships between variables.

Methods of factor analysis solve three main groups of problems:

- search for presumed implicit patterns determined by the influence of external or internal factors on the process under study;
- identifying and studying the statistical relationship of traits to factors or major components;
- compression of information by presenting the process using generalized factors or main components, the number of which is less than the number of initially selected features (parameters), but sufficient to ensure the reproduction of the correlation matrix with the required accuracy.

The application of these methods made it possible to identify among the studied indicators the factors that have the greatest load in the total variance. In particular, the relationship we have identified is particularly important for 16-year-old schoolchildren, where technical readiness was singled out in the third factor in boys and in the second in girls. Thus, taking the received

loads for 100 %, it can be argued that in the process of developing programs to improve the physical condition of schoolchildren by means of sports tourism about 30 % (27.3 % for boys and 28.23 % for girls) the load should fall on the development of their technical training .

### Conclusions

The factor structure of the physical condition of children 15–16 years has its own characteristics depending on gender and age. The generalization of the results of the factor analysis of the indicators of physical condition and technical readiness of schoolchildren aged 15–16 gives grounds to assert that their physical condition can be corrected by means of sports tourism.

We see prospects for further research in the substantiation and development of technology for the correction of the physical condition of children aged 15–16 by means of sports tourism.

*Conflict of interest.* The authors state no conflict of interest.

### References

1. Борисов П. С. Технология спортивного туризма : учеб. пособие. Кемерово : КузГТУ, 2012. 219 с.  
Borisov, P. (2012). *Tekhnologiya sportivnogo turizma* [Technology of sports tourism]. KuzGTU. Kemerovo. 219 p. [in Russian].
2. Денисова Л. В., Хмельницкая И. В., Харченко Л. А. Измерения и методы математической статистики в физическом воспитании и спорте: навч. посібник. Київ : Олімп. л-ра, 2008. 127 с.  
Denisova, L., Khmelniatskaia, I., Kharchenko, L. (2008). *Measurements and methods of mathematical statistics in physical education and sport* [Izmereniya i metody matematicheskoy statistiki v fizicheskom vospitanii i sporte]. Olimpiyskaya literatura. Kyiv. 127 p. [in Russian].
3. Круцевич Т. Ю., Воробийов М. І., Безверхня Г. В. Контроль у фізичному вихованні дітей, підлітків та молоді : навч. посібник. Київ : Олімп. літ., 2011. 224 с.  
Krutsevych, T., Vorobyov, M., & Bezverkhnia, H. (2011). *Kontrol u fizychnomu vykhovanni ditey, pidlitkiv ta molodi* [Control in physical education of children, adolescents and young people]. Olimpiyska literatura. Kyiv. 224 p. [in Ukraine].
4. Теорія и методика фізичного виховання / За ред. Т. Ю. Круцевич. Київ : Олімп. літ. 2017. Т. 1. 424 с.  
Krutsevych, T. (2017). *Teoriya i metodyka fizychnoho vykhovannia* [Theory and methodology of physical education]. Olimpiyskaya literature. Kyiv. Vol. 1. 424 p. [in Ukraine].
5. Фізична культура в школі: 5–11 класи : метод. посібник / упоряд. С. М. Дятленко. Київ : Літера ЛТД, 2013. 368 с.  
Dyatlenko, S. (2013). *Fizychna kultura v shkoli: 5-11 klasy* [Physical education at school: 5-11 grades]. Litera LTD. Kyiv. 368 p. [in Ukraine].
6. Шиян Б. М., Єдинак Г. А., Петришин Ю. В. Наукові дослідження у фізичному вихованні та спорті: навч. посібник. Кам'янець-Подільський: ТОВ «Друкарня «Рута», 2012. 280 с.  
Shiyan, B. M., Iedynak, G. A., Petryshyn, Yu. V. (2012). *Naukovi doslidzhennya u fizychnomu vykhovanni ta sporti* [Scientific research in physical education and sports], PE Oyum Publishing House, Kamianets-Podilsky. 280 p. [in Ukraine].

Received for publication 14.01.2020

# RESEARCH OF THE RESULTS OF THE UKRAINIAN CHAMPIONSHIP IN ROWING ON ERGOMETERS AS A STAGE OF SELECTION FOR THE NATIONAL TEAM

I. Bondarenko, A. Twelina, M. Andryushchenko, O. Konoplyanik, V. Mayer

Petro Mohyla Black Sea National University, Mykolaiv, Ukraine

corresponding author – I. Bondarenko: bondarenko.oleg.13.68@gmail.com

doi: 10.32626/2309-8082.2020-16.11-17

As a result of studies, it was found a positive relationship between the time taken for a distance of 2000 m on an ergometer and the results of competitions on water (2000 m) for highly skilled athletes in rowing ( $r_{xy} = 0.51-0.78$ ) (P. Mikulic, 2009). *Objective:* research of the results of competitions in rowing on ergometers among highly qualified rowers with the further identification of factors influencing the time taken to cover a distance of 2000 m. *Material & methods:* the study analyzed the performance of Ukrainian Championship participants: 11 athletes – Honored Masters of Sports of Ukraine, 14 – Masters of Sports of Ukraine of International Class, 53 – Masters of Sports of Ukraine, 30 – Candidates for Masters of Sports of Ukraine, 2 athletes – with 1 category, 1 – without category. The following methods were used: analysis of scientific sources and protocols of technical results of the Ukrainian Championship in rowing on ergometers. The methods of mathematical statistics that were applied are: Kolmogorov-Smirnov test, determination of the mean and standard deviation, correlation analysis. SPSS package was used for calculations. *Results.* For athletes of the open category average rowing time on ergometers, determined at a distance of 2000 m, was: for men – 376.71 s, for women – 437.50 s. Among lightweight athletes it was observed

the following results: 401.12 s for men, 465.03 s for women. It was determined that the age of athletes correlates with the time for covering a distance of 2000 m: men - ( $r = -0.633$ ;  $p < 0.01$ ), light-weight men - ( $r = -0.677$ ;  $p < 0.05$ ), women - ( $r = -0.554$ ;  $p < 0.01$ ), lightweight women ( $r = -0.618$ ;  $p < 0.05$ ). It was determined the correlation between the body weight of men in the open category and time to overcome the distance of 2000 m and 5000 m: ( $r = -0.317$ ;  $p < 0.05$ ) and ( $r = -0.388$ ;  $p < 0.01$ ). The close relationships between the time of overcoming the distance of 2000 m and the distance of 5000 m were found in all groups of athletes: the open category for men ( $r = 0.928$ ,  $p < 0.01$ ) and women ( $r = 0.963$ ,  $p < 0.01$ ); lightweight men ( $r = 0.975$ ,  $p < 0.01$ ) and lightweight women ( $r = 0.978$ ,  $p < 0.01$ ). *Conclusions.* Thus, the age of the athlete and sports experience affect the results of competitions on ergometers. It has not been identified any significant effect of body weight on the result of competitions on rowing ergometers, except for male athletes of the open category. The formula of the regression equation is determined, which will allow predicting the time of passing the distance of 2000 m based on the result of the distance of 5000 m.

**Keywords:** Ergometer Concept2, correlation, 2000 m distance, 5000 m distance, body weight.

## Introduction

Today, Concept 2 rowing ergometers are used in the training of high-class athletes in academic rowing in most countries of the world. Ergometers are currently used in testing various aspects of special physical and functional training of rowers. Given the correlation between the results of testing on water and ergometers, athletes, coaches are given the opportunity to analyze the components of the training load, track the number of strokes, power of motor action, time and other parameters. With the help of modeling, rowing ergometers are becoming increasingly common.

In the last decade, there is a lag in the results of Ukrainian rowers from the world elite, due to the inefficiency of the system of long-term training of athletes, in particular, the content and methods of motor skills, a set of physical qualities to obtain maximum sports results [14].

The importance of training and testing of rowers with the help of ergometers is evidenced by numerous competitions held both in Ukraine and in other countries. Thus, the system of selection and staffing of crews of the

Ukrainian academic rowing team in 2020 to participate in the world and European championships among youth under 23 and the world championship in non-Olympic boat classes included 3 stages, the first of which is the Ukrainian ergometer championship (Kyiv 29-31.01.2020) [4]. These competitions are also the first stage of selection of athletes to the national team of Ukraine in academic rowing to participate in international competitions and the Olympic Games [5].

Thus, the problem of performances of Ukrainian rowers in the international arena requires the search for new training programs, types of models, tests, including rowing ergometer.

As a result of research it is determined that highly qualified athletes have positive relationship between the time of the distance of 2000 m on the ergometer and the results of competitions on the water (2000 m), the correlation coefficient is in the range – 0.51-0.78, which indicates the possibility the use of indicators on ergometers at a distance of 2000 m to predict the performances of rowers on the water [10].

It is known that ergometers are widely used in the preparation and evaluation of the impact of training tools for rowers 13-15 years in the winter [1]. Competitions on ergometers «Autumn Starts» were qualifying for athletes to be included in the national team among men, women, junior boys and junior girls under 23 (4.10.2018). It is noted that only 3 athletes covered a distance of 2000 m on a Concept 2 ergometer faster than 7 minutes and 4 athletes - faster than 6 minutes [3]. For the technical training of rowers-academics of mass categories in the off-season, a methodical approach to the use of feedback in improving the characteristics of movements using ergometers [2].

The survey of highly qualified rowers from 59 countries, provided information on age, sex, height and body weight, rowing experience, crew, officially registered results of performances at major world competitions (rankings achieved at the World Rowing Championships. The time of overcoming the distance of 2000 m on the rowing ergometer Concept2 was also found out. The relationship between the results obtained on rowing ergometers and the indicators on the water at a distance of 2000 m was studied. It was determined that the time of testing on ergometers (2000 m) was positively correlated ( $p \leq 0.049$ ) with the final rating of the World Rowing Championship. The highest Pearson correlation coefficients were observed in male rowers «singles» of light weight ( $r = 0.78$ ;  $p = 0.005$ ), men of open category ( $r = 0.72$ ;  $p = 0.004$ ), men of light weight from «doubles» ( $r = 0.72$ ;  $p < 0.001$ ). Among women, the relationship was observed in the indicators of «singles» ( $r = 0.75$ ;  $p = 0.002$ ) and in lightweight athletes with «doubles» ( $r = 0.69$ ;  $p = 0.001$ ) [10].

The results of conducted studies showed a high level of correlation between anthropometric indicators of student rowers ( $n = 38$ ) and the time, during which they covered a distance of 2000 m on a rowing ergometer. The distance was significantly related to body length ( $r = -0.801$ ), body weight ( $r = -0.812$ ), muscle mass ( $r = -0.822$ ) and sitting body length ( $r = -0.687$ ). In addition, anthropometric indicators influenced the result of the distance of 2000 m: girth of the forearm ( $r = -0.615$ ), shoulder ( $r = -0.629$ ), biceps ( $r = -0.655$ ), thighs ( $r = -0.694$ ). Significant relationships were also found with the width of the bones – the femur ( $r = -0.678$ ), the humerus ( $r = -0.665$ ), the length of the limbs: arms ( $r = -0.701$ ) and legs ( $r = -0.703$ ). The time of the distance was influenced by the indicators of anaerobic support (power on the rowing ergometer in the Wingate test): maximum ( $r = -0.756$ ), minimum power ( $r = -0.778$ );

force parameters: leg press ( $r = -0.755$ ), bench press ( $r = -0.749$ ). Based on the obtained results, forecasting models were created in order to predict the results of competitions on the water and search for talented athletes [7].

Similar studies were conducted among elite Indian rowers, including 139 lightweight athletes and 60 open rowers. The rowing time on the ergometer 2000 m significantly correlated with age ( $r = -0.459$ ), length ( $r = -0.340$ ) and body weight ( $r = -0.50$ ), back muscle strength ( $r = -0.458$ ) and limb strength: right hand ( $r = -0.311$ ), left hand ( $r = -0.333$ ) ( $p < 0.001$ ). Indicators of the percentage of body fat ( $r = 0.191$ ) and the characteristics of the mesomorphic somatotype ( $r = -0.223$ ) correlated with the result of rowing on an ergometer at a distance of 2000 m ( $p < 0.05$ ). Multiple regression analysis allowed to determine the age, length and weight of the body, the percentage of body fat as significant factors for predicting the effectiveness of rowing on ergometers 2000 m ( $r = 0.730$ ) [8].

As a result of studies of correlations between the test result on the ergometer 2000 m and indicators of physical and functional fitness of Sri Lankan rowers of the army unit, it was found that in men ( $n = 33$ ) the time of overcoming 2000 m was negatively correlated with anaerobic parameters ( $r = -0.81$ ,  $p < 0.01$ ), muscle mass ( $r = -0.42$ ,  $p < 0.05$ ) and flexibility ( $r = -0.41$ ,  $p < 0.05$ ), in at the same time, female rowers ( $n = 14$ ) did not have a significant correlation with any indicators other than body weight ( $r = -0.95$ ,  $p < 0.05$ ). It is noted that the physical training of Sri Lankan rowers did not meet international standards, so the study will be a step towards achieving competitive success in the sport in the future [13].

As a result of studies conducted among highly qualified rowers ( $n = 11$  men;  $n = 11$  women) it was found that productivity and efficiency in the test on rowing ergometers Concept 2 correlates with anthropometric characteristics: body length ( $r = 0.873$ ;  $r = 0.815$ ), weight ( $r = 0.894$ ;  $r = 0.703$ ), muscle mass ( $r = 0.973$ ;  $r = 0.829$ ) and the content of free fatty acids in the body ( $r = -0.705$ ;  $r = -0.856$ ) [12].

The results of studies in which Ukrainian rowers participated show a close relationship between the maximum force and the efficiency of the distance of 2000 m on the ergometer: traction lying down ( $r = -0.689$ ), horizontal traction in the block simulator «Dyba» ( $r = -0.778$ ), maximum acceleration ( $r = 0.754$ ). In the course of research, a correlation was found between the

maximum acceleration on the ergometer and force tests: traction lying down ( $r = -0.643$ ), traction on the Dyba ( $r = -0.844$ ) [14].

It should be noted that Italian scientists, studying the kinematic characteristics of movements, muscle electromyography, drew conclusions about the differences between rowing in a boat and the distance on the ergometer Concept 2. The load was applied the same: 2 times for 2 minutes at 20 and 32 strokes per minute.

It was determined that the electromyography of the muscles differed: rowing on a boat showed greater activity of the pectoralis major muscle, the widest back muscle, the biceps femoris. Considering these results, during the period when athletes use an ergometer, they should also add a load to the training program on those muscles that are not properly activated on the simulator. Cross-graphs of knee and elbow flexion depending on muscle activity and arm strength showed different coordination models comparing rowing on water and ergometers, suggesting possible more careful study and application of ergometers during training periods immediately before competitions to avoid negative changes in movement techniques. Scientists point out that the results of the study suggest that tests on the ergometer should be used more to predict functionality (MSC, PANO) than to assess the technique of rowing [9].

The article is a fragment of the research of the Faculty of Physical Education and Sports of the Petro Mohyla Chornomorsk National University, «Development and implementation of innovative technologies for assessment and correction of the functional state of man during exercise in sports and rehabilitation», state registration № 0117U007145.

#### Material and methods of research

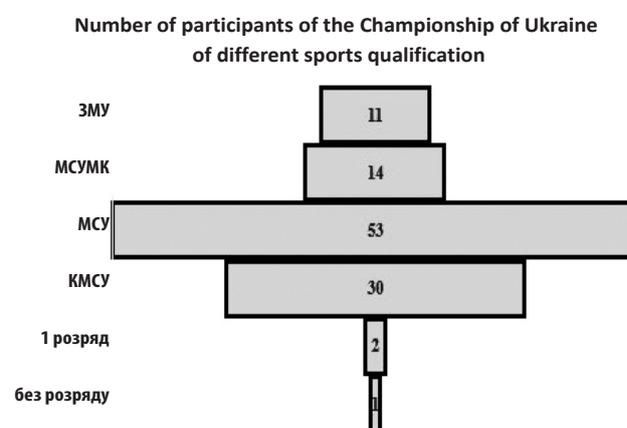
The purpose of the study is to study the results of the struggle for ergometry among highly qualified rowers with academic service with further analysis and identification of factors affecting the distance of 2000 m. Tasks: 1. To determine statistical indicators of physical development, physical fitness of rowers in academic communication on service on ergometers. 2. Change the abolition of the degree of correlation of users during the time of origin of distances of 2000 m for service ergometry and indicators of physical fitness, anthropometric and other sports equipment that may affect the test results.

When analyzing the results of the Championship of Ukraine on ergometers (Kyiv, 29-31.01.2020), we took into

account the performance of 111 athletes in rowing [6]. The participants of the open category included 91 athletes ( $n = 59$ , men;  $n = 32$ , women), the lightweight category – 20 athletes ( $n = 13$ , men;  $n = 7$ , women).

The competitions among women of the open category were attended by 7 athletes – Honored Masters of Sports of Ukraine (HMSU), 4 – Masters of Sports of Ukraine of international class (MSUIC), 10 athletes with sports qualifications – Masters of Sports of Ukraine (MSU) and candidates for Masters of Sports of Ukraine (KMSU), 1 sportswoman with 1 category.

Thus, as a result of research the indicators of participants of the Championship of Ukraine on ergometers ( $n = 111$ ) were analyzed, from them men – 72, women – 39 athletes. Most of the participants were rowers - masters of sports of Ukraine in rowing (Fig. 1).



**Fig. 1 Number and sports qualification of participants of the Championship of Ukraine on rowing on ergometers (Kyiv, 29-31.01.2020)**

The average age of athletes in the open category was 24 years for men, 25.38 years for women, lightweight athletes – 23.62 years for men, and 23.57 years for women.

Competitions were held to determine the level of general fitness, physical capabilities and psycho-emotional state of athletes in the base period of training.

We used methods: analysis of scientific sources, analysis of protocols of technical results of the Championship of Ukraine on ergometers Concept 2, which provided information on body weight of athletes, age, sports qualifications, results of the distance 2000 m and 5000 m, distribution of places in two types of competitions [6].

Methods of mathematical statistics were used: verification of conformity of sampling normality (Kolmogorov-Smirnov criterion), determination of standard and standard deviation, correlation analysis. All data were analyzed using the SPSS package. All samples by age and

the sample «time of overcoming the distance of 2000 m, women» did not obey the normal law of distribution of variables, so Spearman's correlation coefficient was used, for the rest of the samples Pearson's correlation coefficient was used.

### Results of the research

As a result of the analysis of the data of the protocol of the Championship of Ukraine on ergometers (2020), we found out that almost all samples are homogeneous. The best result for 2000 m on the ergometer for men – 352.3 s, for women – 392.7 s (Table 1).

**Table 1 - Statistical characteristics of the participants of the Championship of Ukraine on ergometers**

Participants		Statistical characteristics of the studied indicators					
sex	n	Body weight, kg		Time at 5000 m, s		Time at 2000 m, s	
		$\bar{X}\bar{X}\pm S$	v, %	$\bar{X}\bar{X}\pm S$	v, %	$\bar{X}\bar{X}\pm S$	v, %
<b>Light weight</b>							
men	59	92,24±7,54	8,17	1007,84±43,75	4,34	376,71±14,36	3,81
women	32	76,64±7,98	10,41	1146,81±54,77	4,78	437,50±28,20	6,45
<b>Light weight</b>							
men	13	71,23±2,21	3,10	1063,25±39,13	3,68	401,12±13,94	3,48
women	7	57,59±1,89	3,28	1217,73±43,79	3,59	465,03±16,53	3,55

Analyzing the correlations between age and the results of testing the distance of 2000 m and 5000 m, it can be noted that there are statistically significant relationships.

Thus, older athletes with significant experience in international competitions show better results when tested on an ergometer (Table 2).

**Table 2 – Correlations between age and indicators that were studied among participants in rowing competitions on ergometers**

Participants	Body weight, kg		Time at 2000 m, s		Time at 5000 m, s	
	$r_{xy}$	p	$r_{xy}$	p	$r_{xy}$	p
Age, men	0,274*	0,036	-0,633**	0,000	-0,662**	0,000
Age, men light weight	0,262	0,388	-0,677*	0,011	-0,783**	0,002
Age, women	-0,009	0,963	-0,554**	0,001	-0,611**	0,000
Age, women light weight	-0,346	0,448	-0,618	0,139	-0,655	0,111

\* Correlation is significant at the level 0,05 (bilateral)

\*\* Correlation is significant at the level 0,01 (bilateral)

**Table 3 – Correlations between body weight of athletes and time of overcoming 2000 m and 5000 m distance on ergometers Concept 2**

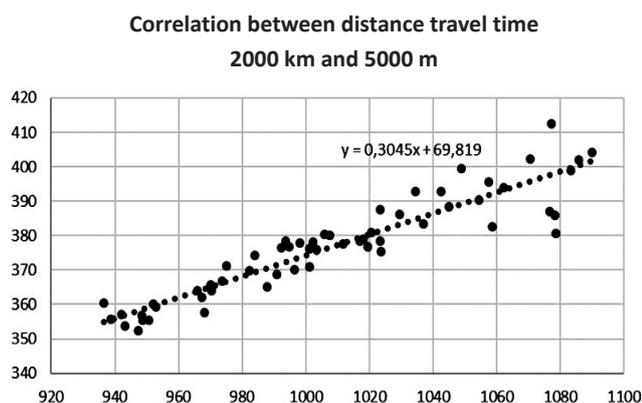
Athletes` body weight	$r_{xy}$	p
<b>Time at 2000 m, s</b>		
Body weight, kg men	-0,317*	0,014
Body weight, kg men lightweight	-0,436	0,137
Body weight, kg women	-0,317	0,077
Body weight, kg women lightweight	0,451	0,310
<b>Time at 5000 m, s</b>		
Body weight, kg men	-0,388**	0,002
Body weight, kg men lightweight	-0,394	0,182
Body weight, kg women	-0,269	0,136
Body weight, kg women lightweight	0,354	0,436

\* Correlation is significant at the level 0,05 (bilateral)

\*\* Correlation is significant at the level 0,01 (bilateral)

It can be noted that statistically significant relationships between the weight of the athlete and the time of overcoming 2000 m and 5000 m distances is observed only in male athletes of the open category ( $p < 0,05$ ). Thus, the body weight of female and lightweight athletes did not affect the results of competitions on rowing ergometers ( $p > 0,05$ ) (Table 3).

The closest relationships were found between the time of overcoming the distance of 2000 m and the distance of 5000 m. The figure shows the formula of the regression equation, which allows to predict the result at a distance of 2000 m, where y is the result (s) of the distance of 2000 m, and x is the result (s) of the distance of 5000 m (Fig. 2).



**Fig. 2** The relationship between the time of the distance of 2000 m and 5000 m on the ergometer Concept 2 among men in the open category

A high level of correlation was found between the time of rowing on ergometers at distances of 2000 m and 5000 m among athletes of the open category: men ( $r = 0.928$ ,  $p < 0.01$ ), women of the open category ( $r = 0.963$ ,  $p < 0.01$ ); in male athletes of light weight ( $r = 0.975$ ,  $p < 0.01$ ) and women of light weight ( $r = 0.978$ ,  $p < 0.01$ ).

Thus, it is possible to predict the result of passing the distance of 2000 m based on the results of rowing on an ergometer at a distance of 5000 m.

### Discussion

When analyzing the results of the Championship of Ukraine in rowing on ergometers, we can draw conclusions about the difference between the average men and women. In athletes of the open category the difference is – 13.9 %, in lightweight – 16.7 %. If you compare the best results of individual athletes, the difference is 10.3 %. According to scientists, the average time of the distance of 2000 m on the ergometer for the open category of male rowers is 364 s, for women – 416 s. This 13 % difference is also observed among the group of junior rowers and corresponds to the differences in the world record distances of 2000 m. The difference in testing of lightweight rowers was 12 % (383 s – men, 437 s – women). It is noted that the time of rowing on water (2000 m) in women is about 10-11% longer than in men. This gap in sports performance between women and men is observed in other sports, but every year this difference decreases, due to increased competition among women [10]. Thus, the analysis of the protocols of rowing competitions on ergometers confirmed the difference between the average indicators of the distance overcoming of 2000 m for men and women (13.9 %), but there is a much larger gap between the indicators of light weight athletes (401.12 s and 465.03 s), which indicates a significant lag behind the world models.

Attention is drawn to the results of research in which scientists note that the rowing ergometer simulates the conditions of competition on the water better for athletes who perform «alone». It is noted that in crews rowers must coordinate and synchronize their individual motor characteristics. These factors cannot be assessed on a rowing ergometer when the overall performance is based solely on the work of an individual athlete [10].

The developed test with submaximal loading which is capable to predict time of passing of distance of 2000 m on the ergometer attracts attention. It is noted that the SmRT test can be used weekly as a standardized warm-up. The total duration of the test was 17 minutes. The load is performed for 6 minutes at 70 % heart ratemax, 6 minutes at 80 % heart ratemax, 3 minutes at 90% heart ratemax and given 2 minutes of rest [11].

Researchers are drawing attention to the importance of ergometer testing and the relationship between the factors that influence the outcome of a 2000-meter distance to find talented athletes. The results of the study suggested that the strength parameters, anaerobic power of rowing, anthropometric indicators are important characteristics that need to pay attention to coaches, athletes in order to optimize the distance of 2000 m on the ergometer. Attention is paid to the expediency of taking into account anthropometric data at the first stages of sports selection [7].

As a result of researches of physical fitness of high-class rowers ( $n = 15$ ) the average indicators of passing of distance of 2000 m on the ergometer – 361,9 s (the best result – 349,2 s) were established. It is noted that the high level of development of the maximum force may indicate the possibility of predicting high results of rowing on an ergometer at a distance of 2000 m. Analyzing the indicators of strength abilities of rowers in academic rowing, scientists found that in accordance with the standards of the national team of Ukraine in physical training, most athletes showed relatively high levels of strength training [14].

Due to the outbreak of coronavirus, with a rapidly growing number of patients, the Olympic and Paralympic qualifying regattas have already been canceled: regattas to be held in Rio de Janeiro (April 2-5, 2020); final Olympic qualifying regatta in Lucerne (Switzerland, May 17-19, 2020); continental Olympic qualifying regattas of Asia (Oceania) and Europe. The World Rowing Cup (Stage III) in Lucerne (May 22-24, 2020) is also canceled. The International Rowing Federation draws attention to the

significant disruption of the preparation of athletes and crews to perform at the Olympic Games (2020) [15]. Given the effects of the global pandemic situation, indoor rowing may become more important in the training of high-class athletes.

### Conclusions

As a result of researches, indicators of participants of the Championship of Ukraine on ergometers from which 11 athletes – Honored masters of sports of Ukraine, 14 – masters of sports of Ukraine of international class, 53 – masters of sports of Ukraine, 30 – candidates for masters of sports of Ukraine, 2 athletes – with 1 category, 1 participant – without sports category were analyzed.

The average time of testing on ergometers at a distance of 2000 m for athletes of the open category: for men – 376.71 s, for women – 437.50 s. Among lightweight athletes, there were results: for men – 401.12 s, for women – 465.03 s.

It was determined that the age of athletes correlates with the results of the distance of 2000 m: men ( $r = -0.633$ ;  $p < 0.01$ ), men of lightweight ( $r = -0.677$ ;  $p < 0.05$ ), women ( $r = -0.554$ ;  $p < 0.01$ ), lightweight women ( $r = -0.618$ ;  $p > 0.05$ ), which indicates the importance of sports experience and the acquired level of training of older athletes.

The correlation between the body weight of male athletes of the open category and the time of overcoming

the distance of 2000 m and 5000 m was determined: ( $r = -0.317$ ;  $p < 0.05$ ;  $r = -0.388$ ;  $p < 0.01$ ). Among other categories of athletes, there was no statistically significant effect of body weight on the results of competitions on rowing ergometers.

Were found out the presence of close relationships between the time of overcoming the distance of 2000 m and the distance of 5000 m in all groups of athletes: open category men ( $r = 0.928$ ,  $p < 0.01$ ) and women ( $r = 0.963$ ,  $p < 0.01$ ). ; men of light weight ( $r = 0.975$ ,  $p < 0.01$ ) and women of light weight ( $r = 0.978$ ,  $p < 0.01$ ).

The regression level formula is defined, which allows to predict the time of passing the distances of 2000 m based on the results of the distances of 5000 m.

Promising areas for further research may be:

- establishment of correlations between anthropometric, functional indicators and the results of the 2000 m distance of Ukrainian rowers;
- the use of correlations to create individual models of competitive activities, taking into account global trends in rowing;
- further study of the factors influencing the time of the distance on the ergometer Concept2 and on the water in order to improve the selection of promising athletes;

*Conflict of interest.* The authors declare no conflict of interest.

### References

1. Гайнуллин А. А., Святова Н. В., Косов А. В. Направленность тренировок гребцов-академистов 13–15 лет в зимний период подготовки. Фундаментальные исследования. 2014, № 11 (4). С. 890-894.  
Gajnullin, A. A., Svyatova, N. V., Kosov, A. V. (2014). "Napravlennost' trenirovok grebcov-akademistov 13–15 let v zimnij period podgotovki" [The focus of training rowers-academics 13–15 years in the winter training]. *Fundamental'nye issledovaniya*. No. 11 (4). pp. 890-894. [in Russia].
2. Иванников Г. Ю. Совершенствование элементов техники гребцов-академистов с использованием компьютеризированных тренажерных комплексов : автореф ... дис. канд. пед. наук : 13.00.04 РГУФКСМиТ. Москва, 2006. 26 с.  
Ivannikov, G. Ju. (2006), "Sovershenstvovanie jelementov tehniky grebcov-akademistov s ispol'zovaniem komp'yuterizirovannyh trenazhernyh kompleksov" [Improving the technical elements of rowing academics using computerized training complexes]: avtoref ... dis. kand. ped. nauk : 13.00.04 RGUFKSMiT. Moskva. 26 p. [in Russia].
3. Попович Н. А., Набатов А. А. Факторы, преимущественно определяющие и лимитирующие спортивный результат на гребном эргометре. Наука и спорт: современные тенденции. 2019. Вып. 22. № 1. С. 67–74.  
Popovich, N.A., Nabatov, A.A. (2019). "Faktory, preimushchestvenno opredelyayushchie i limitiruyushchie sportivnyj rezul'tat na grebnom ergometre" [Factors that primarily determine and limit sports performance on a rowing ergometer]. *Nauka i sport: sovremennye tendencii*. Issue. 22. No. 1. pp. 67–74. [in Russia].
4. Положення Федерації академічного веслування України (ФАВУ) «Система відбору та комплектування екіпажів збірної команди України з веслування академічного у 2020 році для участі у чемпіонатах світу та Європи серед молоді до 23 років та чемпіонаті світу з неолімпійських класів човнів», від 23.01.2020 р. № 28/16 2/20. [Електронний ресурс]. – режим доступу: [http://www.rowingukraine.org/assets/files/2020/docs/systema\\_vidboru\\_U23\\_2020.pdf](http://www.rowingukraine.org/assets/files/2020/docs/systema_vidboru_U23_2020.pdf)  
Polozhennja Federaciji akademichnogho vesluvannja Ukrajiny (FAVU) "Systema vidboru ta kompletuvannja ekipazhiv zbirnoji komandy Ukrajiny z vesluvannja akademichnogho u 2020 roci dlja uchasti u chempionatakh svitu ta Jevropy sered molodi do 23 rokiv ta chempionati svitu z neolimpijskykh klasiv chovniv" [Regulations of the Federation of rowing of Ukraine (FARU) "System for the selection and manning of the Ukrainian national rowing team in 2020 for participation in the World and European Championships among youth under 23 years old and the World Championship in non-Olympic boat classes"] (2020), January 23. – [http://www.rowingukraine.org/assets/files/2020/docs/systema\\_vidboru\\_U23\\_2020.pdf](http://www.rowingukraine.org/assets/files/2020/docs/systema_vidboru_U23_2020.pdf) [in Ukraine].

5. Положення Федерації академічного веслування України (ФАВУ) «Система відбору та комплектування екіпажів національної збірної команди України з веслування академічного у 2020 році для участі у міжнародних змаганнях та олімпійських Іграх» від 28.12.2019. № 137/4.2./19 2/20. [Електронний ресурс]. – режим доступу: [http://www.rowingukraine.org/assets/files/2020/docs/systema\\_vidboru\\_dorosli\\_2020.pdf](http://www.rowingukraine.org/assets/files/2020/docs/systema_vidboru_dorosli_2020.pdf)  
*Polozhennja Federaciji akademichnogho vesluvannja Ukrainy (FAVU) "Systema vidboru ta komplektuvannja ekipazhiv nacionaljnoj zbirnoj komandy Ukrainy z vesluvannja akademichnogho u 2020 roci dlja uchasti u mizhnarodnykh zmagannjakh ta olimpijsjkykh Igrakh"* [Regulations of the Federation of rowing of Ukraine (FARU) Federation "System for the selection and manning of the national team of Ukraine on rowing in 2020 for participation in international competitions and the Olympic Games] (2019), December 28. – [http://www.rowingukraine.org/assets/files/2020/docs/systema\\_vidboru\\_dorosli\\_2020.pdf](http://www.rowingukraine.org/assets/files/2020/docs/systema_vidboru_dorosli_2020.pdf) [in Ukraine].
6. Технічна документація Федерації академічного веслування України (ФАВУ) «Технічні результати Чемпіонату України з веслування на ергометрах, 29-31.01.2020 р.»: [Електронний ресурс]. – режим доступу: : [http://www.rowingukraine.org/assets/files/2020/results/chukr\\_concept\\_2020.pdf](http://www.rowingukraine.org/assets/files/2020/results/chukr_concept_2020.pdf)  
*Tekhnichna dokumentacija Federaciji akademichnogho vesluvannja Ukrainy (FAVU) "Tekhnichni rezultaty Chempionatu Ukrainy z vesluvannja na erghometrakh, 29–31.01.2020 r."* [Technical documentation of the Ukrainian Rowing Federation of Ukraine (FARU) "Technical results of the Ukrainian Rowing Championship on ergometers, 01–31.01.2020"] (2020), January 29–31.01.2020. – [http://www.rowingukraine.org/assets/files/2020/results/chukr\\_concept\\_2020.pdf](http://www.rowingukraine.org/assets/files/2020/results/chukr_concept_2020.pdf) [in Ukraine].
7. Akça, F. (2014). "Prediction of rowing ergometer performance from functional anaerobic power, strength and anthropometric components". *Journal of human kinetics*, 41, 133–142. <https://doi.org/10.2478/hukin-2014-0041>
8. Majumdar, P., Das A. & Mandal, M. (2017). "Physical and strength variables as a predictor of 2000m rowing ergometer performance in elite rowers". *Journal of Physical Education and Sport*, 17(4), 2502–2507. DOI:10.7752/jpes.2017.04281
9. Marcolin, G., Lentola, A., Paoli, A., & Petrone, N. (2015). "Rowing on a boat versus rowing on an ergo-meter: a biomechanical and electromyographical preliminary study". *Procedia Engineering*, 112, 461–466. <https://doi.org/10.1016/j.proeng.2015.07.225>
10. Mikulic, P., Smolianovic, T., Bojanic, I., Hannafin, JO A., & Matkovic, Branka R. (2009). "Relationship between 2000-m rowing ergometer performance times and World Rowing Championships rankings in elite-standard rowers". *Journal of Sports Sciences*, 27(9), 907–913. DOI: 10.1080/02640410902911950
11. Otter, Ruby T.A., Brink, Michel S., Lamberts, Robert P., & Lemmink, Koen A.P.M. (2015). "A New Submaximal Rowing Test to Predict 2,000-m Rowing Ergometer Performance". *The Journal of Strength & Conditioning Research*, 29 (9), 2426-2433. DOI: 10.1519/JSC.0000000000000902
12. Penichet-Tomás, A., & Pueo, B. (2017). Performance conditional factors in rowing. *Retos*, 32, 238–240.
13. Perera, D., & Ariyasinghe, A. (2016). "Relationship between Physical Fitness, Performance and Injury Prevalence in Sri Lankan Rowers". *International Journal of Scientific and Research Publications*, 6 (5), 141–146.
14. Strykalenko Yv., Shalar O., Huzar V., Andrieva R., Zhosan I., & Bazyljev S. (2019). Influence of the maximum force indicators on the efficiency of passing the distance in academic rowing. *Journal of Physical Education and Sport*, 19 (3), 1507-1512. DOI:10.7752/jpes.2019.03218
15. FISA (the international rowing federation). Joint Decisions related to the impact of the Novel Coronavirus (COVID-19) on remaining Olympic and Paralympic qualification events (2020). – <http://www.worldrowing.com/news/joint-decisions-related-the-impact-the-novel-coronavirus-covid-remaining-olympic-and-paralympic-qualification-events>.

Received for publication 14.01.2020

# CONSTRUCTION AND USE OF A DATABASE IN THE SYSTEM OF PHYSICAL EDUCATION OF STUDENTS

I. Bondarenko, G. Gorban, G. Kurasa, M. Andryushchenko,  
O. Konoplyanik, V. Mayer, O. Bondarenko

Petro Mohyla Black Sea National University, Mykolaiv, Ukraine

corresponding author – I. Bondarenko: bondarenko.oleg.13.68@gmail.com

doi: 10.32626/2309-8082.2020-16.18-26

Today, the computerization of higher education is aimed at the formation and improvement of the forms and content of the educational process. The implementation of computer-based teaching methods and processing of test results will help to optimize students' physical education. *Objective:* building a database based on the results of student testing and using it in physical education, followed by saving and simplifying data analysis. *Material & Methods:* The study involved students of Petro Mohyla Black Sea National University (n = 195 persons) using the protocols of the previous studies (I. Bondarenko, 2020). *The methods used were:* analysis of scientific sources, pedagogical testing (6 minutes of rowing on the ergometer; anthropometry (length and body weight), testing of functional capabilities (heart rate before and heart rate after exercise), method of constructing a database language (SQL language). *Conclusions:* Using the SQL programming language and based on the results of testing of students, a database that contained 8 tables was built. The main table "Students" contains data: last name, first name, middle name, gender, citizenship, age. The table "DateOfTest" specifies the date, time of passing the test, and the

number of the simulator. The table "WeightHeight" includes length and body weight, the table "HeartRate" determines indicators of heart rate. All data from the ergometer monitors was entered in 4 tables, which contained the characteristics of passing distance: the distance in meters, the number of strokes, the time for which students covered the distance of 500 meters; calories burned and power. *Results:* Using SQL queries, you can determine:

- students with the best or worst test results;
- average values of the distance on the ergometer with regard to gender, age, citizenship;
- body mass index indicators; dependence of changes of heart rate after testing on body mass index
- the ratio of the distance that was covered in the first 2 minutes, in 3–4 minutes, in 5–6 minutes to the total distance that students covered in 6 minutes.

**Keywords:** computerization, higher education, testing, SQL programming language, Ergometer Concept2.

## Introduction

Today, the informatization of higher education is aimed at forming and developing the intellectual potential of the nation, improving the forms and content of the educational process, the implementation of computer methods of teaching and testing, which will make it possible to solve the educational problems based on world experience. It is noted that the informatization of education is based on the use of information systems, networks, resources and technologies. Databases, data banks, and knowledge, information technology of various levels, production of technical means of informatization, are components of the national information infrastructure and the main factors that ensure the development of the state [5].

The importance of informatization of all spheres of public life in Ukraine, in particular, physical culture and sports, is confirmed by many normative documents of educational, branch and informatization directions. In connection with the need for computerization of physical culture and sports in the regulations paid attention to the insufficient level of informatization of teaching aids, low level of computer literacy of users, low efficiency of material and financial resources aimed at the implementation of computer technology [13]. At the same time, other countries, including China, are rapidly developing and computerizing almost all areas of physical

education. The concept of «technological Olympiad» is currently being considered. The researchers noted that the computerized organization of the competition influenced the success of the 2008 Olympic Games in Beijing: data processing using computer devices with high-speed computing capabilities, analysis of multifunctional databases (office automation systems, communications for event management, information release systems, etc.). It is noted that an important role was played by related data: online registration of athletes, information that was automatically collected on the results of competitions [21]. In order to increase the efficiency of methods of collecting and analyzing the indicators of physical fitness of students, Chinese scientists have suggested a system of «smart bracelet», which collects physiological indicators that are downloaded to the database server via a mobile phone connected via Bluetooth. The results of the experiments show that the obtained assessments of physical fitness are similar to those determined by traditional tests. It should be noted that the developments were sponsored by the Beijing Advanced Innovation Center for Education «Research and development in the field of big data in education and their application», which indicates the importance of computerized systems in education [19].

Thus, there are contradictions between the need to increase the role of modern computer technology

in the field of physical culture and the current state of implementation of components of information technology in sports, in the system of physical education in Ukraine.

Analyzing the scientific sources in which the use of computer technology, in particular, databases, it can be noted that in the field of sports, various options for their construction and use are considered. A database is defined as a collection of interconnected data according to a database schema so that the user can work with them. It is determined that the database model includes components: data structure and valid operations on it, the availability of tools that protect and preserve the integrity of the database [11].

A number of scientists have proposed the creation of databases in the system of training athletes. An information database of complex control data in the process of training qualified wrestlers was developed, in which the following components were identified: qualification characteristics of the athlete, parameters of training and competitive activities, indicators of fitness and functional status of athletes, integrated information on control results [4]. Scientists have proposed a database «Athlete», which provided for the collection, storage and systematization of information on anthropometric and myometric indicators of highly qualified bodybuilders. The database consisted of 6 tables and contained 12 queries. It is noted that the improvement of the coach's work is associated with the creation of databases: databases of indicators of highly qualified athletes in sports; bases of training exercises; training load bases [16]. For beginner bodybuilders SA Khoroshilov based on computer technology: programming languages: PHP 5.4.2, JavaScript; markup languages: CSS 2.0.0, HTML 4.0; database storage: MySQL 5.0 database. Muscle Training Systems was developed. The principles of building the training process of athletes were taken into account: progression of loads, «pyramid», separate training, «supersets» [17].

P. K. Petrov proposed the creation of a database of competitive situations, combinations and gymnastic elements to improve the curriculum according to the rules and refereeing in gymnastics. In the block «Analysis of combinations» the combinations performed by different gymnasts at different times were collected, the elements of performance were indicated, to which group of special requirements and group of difficulties they belong, for which elements the point allowance is accrued. The basic assessment was also determined, the factors of reduction of points for the technique of execution were substantiated, the combinations were finally evaluated [12]. R. S. Cherepyakin developed an information database of special training of decathletes, which included 8 groups of indicators: competitive results in some types, indicators of special physical, technical

and tactical training, indicators of models of competitive activities and others. In the database in the automated mode, the comparison of current parameters of special training of sportsmen with the planned individual model was carried out. Based on special exercises, corrective training programs were formed, which led to the reprogramming of the training process [18].

Italian scientists have proposed a database «Sports». Cardiorespiratory parameters were obtained through the chest tape BioHarness 3.0 (from Zephyr), other data were found in the survey (gender, age, weight, height, smoking habits, alcohol consumption, weekly training frequency). Data were analyzed using CaRiSMA software. The database included 126 cardiorespiratory data indicators (CRD). In the study, participants (n = 81) performed motor activities in 10 different sports. It is noted that the database «Sport» can be useful in studies of adaptation of the cardiorespiratory system to different types of exercise, in the development of automatic algorithms for monitoring the health of athletes in real time, with an increased risk of sudden death associated with sports [20].

In the process of analysis of scientific research, it was found that currently in the field of fitness there are several areas of computerization: training of fitness and recreation professionals; computer support of exercise machines, fitness centers; automation of systems of diagnostics and control of a physical condition, development of motor qualities; programming of health-improving classes and creation of personal fitness programs [6]. The analysis of computer technologies used in fitness also identified shortcomings: the inability to provide a differentiated load taking into account the goals, physical condition and health of program participants, limited contingent, lack of feedback [10].

As a result of a study conducted by Yu. Tomilina (2016) using the objective-oriented programming language Microsoft Visual Basic 6.0, the computer program «Pilates» was developed, which served to increase the motivation of women to independent training. The computer program contained information, calculation, sports and program blocks with 10 control buttons, which activated the program [14]. The project of the personal information system that is based on use of complexes of exercises of the directed influence and is based on technology of databases – a package of programs of a database management system (DBMS) Microsoft Access 2000 is offered. The database «Fitness for Women» was developed using a set of exercises of directed influence with musical accompaniment, taking into account the age, level of physical condition of women, the results of pedagogical observations of the coach. Using the program allows you to obtain information about test results, adjust the database [8].

Based on the DBMS (database management system) MS Access, a database «Training Calendar» was developed, the main purpose of which is to collect and analyze information about men of the first mature age who visit the gym «Energy-Sport». This database consists of a screen saver, the main form and tables: «Training Calendar», «Load Options», «Exercise List», «Surname», «Anthropometric Indicators» and provides for adding and editing data, analysis of information for a certain period [15].

In the field of sports science, the importance of creating information databases of dissertation research is noted. Informatization of the sports industry contributes to the creation of a holistic system of collection, storage of information in the field of scientific research. To date, arrays of scientific texts are already used to identify the most important areas of research, technology and development [2].

The generalization of the data of scientific sources on the use of computer technologies shows that the solution of the problem of using databases in the system of physical culture is of great interest to scientists, specialists in the field of physical culture. Various options for building databases are proposed. In connection with the above, the informatization of physical culture, in particular, the system of physical education in higher education is an urgent task that will individualize learning, take into account the psycho-physiological characteristics of students, to organize systematic control of physical fitness.

In this regard, there is a need for research on the construction and implementation of databases on physical education, information technology at various levels in the educational process at universities.

The purpose of the study: to increase the efficiency of the physical education system at Petro Mohyla Chornomorsk National University by building and using in the educational process of physical education a database of physical fitness, physical development, functionality of students with further preservation and simplification of data analysis (with possible detection of hidden patterns and languages).

#### **Research objectives**

1. To determine the indicators of physical fitness, physical development, functionality of students of Petro Mohyla Chornomorsk National University.

2. To build and substantiate the need to introduce into the educational process a database based on the results of testing students of Petro Mohyla Chornomorsk National University.

Connection of research with scientific programs, plans, topics. The study was conducted according to the plan of R&D of Petro Mohyla Chornomorsk National

University «Optimization of the process of physical education with health and recreational facilities and their impact on the dynamics of indicators of the functional state of the body of student youth», state registration № 0115U000589 from 01.01.2015).

#### **Material and research methods**

In a previous exploration to study the possibilities of using 6-minute rowing on a Concept2 ergometer to assess the level of endurance in students ( $n = 200$ ), we determined that we plan to develop a database using computerized rowing ergometers, which will allow not only store but also qualitatively process information, simplifying the analysis of the dynamics of endurance development, strength qualities of students. We used the protocols of the previous study and all indicators were used exclusively to build a database [3].

In the study, the indicators of 195 students of Petro Mohyla Chornomorsk National University were transferred to the database ( $n = 74$ , foreign students;  $n = 121$ , students from Ukraine). All students were introduced to the technique of rowing on ergometers, for health reasons were referred to the main department. The average age of students was  $19.31 \pm 1.12$  years.

A distance test was performed on an ergometer for 6 minutes. Testing was conducted from 2 to 13 December 2019.

It should be noted that we used ergometers for testing numbers 5, 6, and 8, from which it is possible to copy the information reflected in the protocol. The test results were taken from ergometer monitors using computer media and transferred to files.

We used the following methods: analysis of scientific sources, pedagogical testing (rowing on a Concept2 ergometer to determine the distance covered by students in 6 minutes); anthropometry (length and body weight of students), testing of functional capabilities (heart rate before and heart rate after exercise); database construction method (SQL language).

#### **Results of the research**

The passing of the test by each student was recorded in the protocol by the teacher, and after completing the test from the monitors PM5 rowing ergometers Concept 2 all students were taken the relevant data. As a result, the obtained data together with the protocol data became a prerequisite for the design of the database, the main purpose of which is long-term storage of data for further analysis with the detection of hidden patterns, as well as further filling the database with new data. In this case, it is possible to analyze the time data representing the results of the test passed by students, with subsequent prediction of the results of the next test.

As mentioned above, the database consists of both protocol data generated by teachers of the Department of Theory and Methods of Physical Education manually,

and data from rowing ergometer monitors. The database is designed in Microsoft Access 2016, which is part of Microsoft Office 2016, and contains 8 tables (Fig. 1).

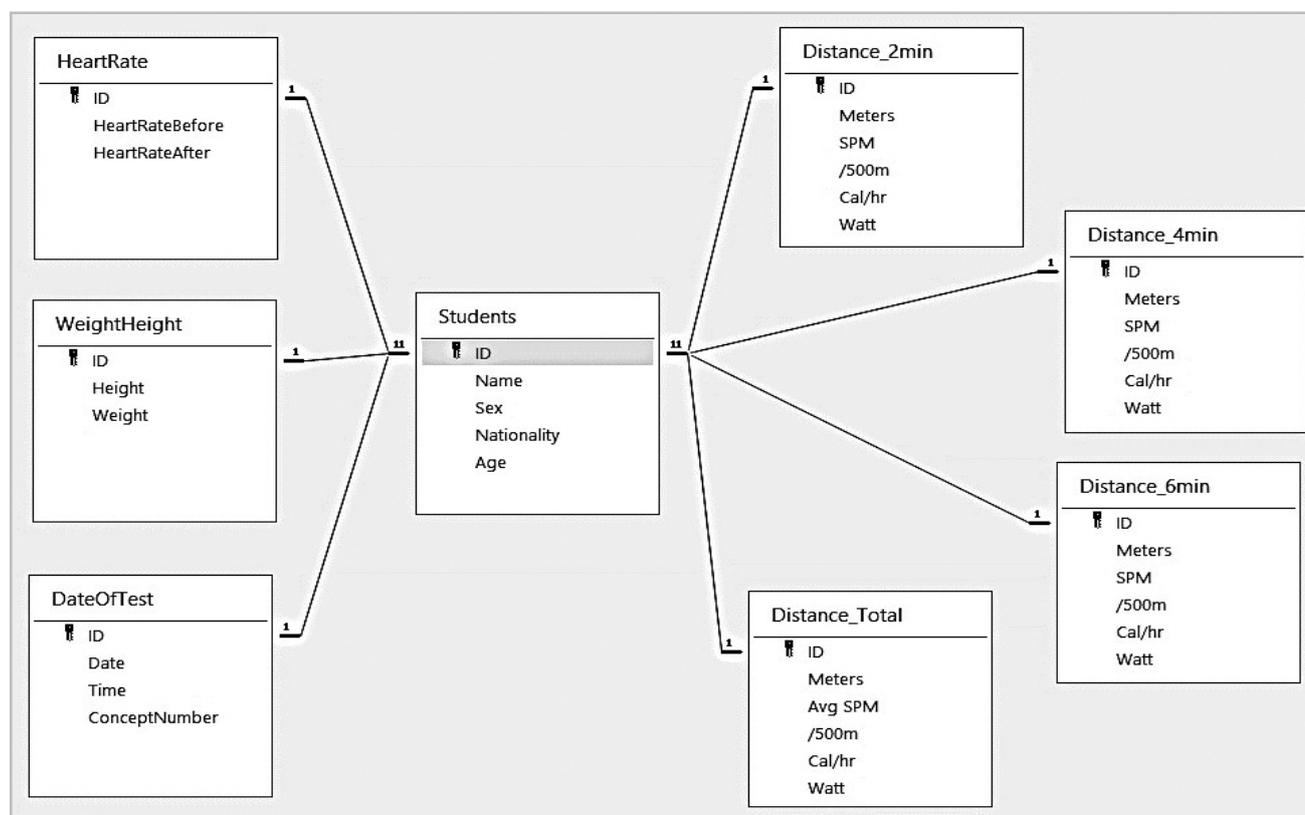


Fig. 1 Database schema

The main table in the database is the «Students» table, which contains basic information about students: last name, first name, patronymic, gender, citizenship and age. All other tables are related to this table in one way or another.

Conditionally on the left on the presented data scheme (fig. 1) the tables containing data of the protocol are specified. The «DateOfTest» table contains the date and exact time of the test by a certain student, as well as the number of the simulator on the rowing base. In turn, the table «WeightHeight» contains data on height and body weight of students who were entered in the protocol. Also before and after the test, students' heart rate was measured. Relevant data were entered in the HeartRate table in the HeartRateBefore and HeartRateAfter columns.

To the right of the data diagram are the tables in which the data from the monitors of the simulators were entered. There are four such tables: «Distance\_Total», «Distance\_2min», «Distance\_4min» and «Distance\_6min». All tables are of the same type, as they show the distance in meters, the number of strokes made; the time for which the student makes 500 meters; number of calories burned and power. However, each table shows the specified data for a certain period: for the first 2 minutes, the next 2 minutes, the last 2 minutes and the entire time period.

Microsoft Access is a representative of relational database management systems. Its main features are the construction of tables, queries, screen forms and reports that can be printed. In turn, queries can be built using SQL (structured query language), which is also supported in Access. SQL is primarily designed to describe, modify, and retrieve data stored in relational databases.

Consider what information can be extracted from the database of results of students taking a rowing test using SQL-queries. First, you can determine the students with the best or worst results by the distance covered in 6 minutes. In this case, it can be determined both in terms of all students who took the test, and in terms of gender, citizenship and age, as well as their totality. Thus, the following SQL-query code allows you to determine 5 Ukrainian students (boys) with the best distance made relatively to others in 6 minutes:

```

SELECT TOP 5 Students.Name, Distance_
Total.Meters FROM Distance_Total INNER JOIN
Students ON Distance_Total.ID = Students.ID
WHERE (((Students.Sex)='ч') AND ((Students.
Nationality)='Ukrainian')) ORDER BY Distance_
Total.Meters DESC;
  
```

The presented query allows you to get the result shown in Fig. 2.

Name	Meters
Кал-за Микита	1690
Ер-рт Едуард	1598
Пал-чук Дмитро	1578
Ж-ан Даниил	1572
Чу-ко Богдан	1563

Fig. 2 Result of 5 students with the best test results

In the same way, you can determine the best boys among foreign students and the best girls from both Ukraine and India, it is only necessary to specify the necessary condition.

The query can also be made parametric by asking the user to enter the required condition. Thus, the following query displays summary information about the average distance made by boys and girls separately depending on their citizenship and age, with the appropriate age set by the user:

```
SELECT Students.Sex, Students.Nationality,
Students.Age, Avg(Distance_Total.Meters) AS
AvgOfMeters FROM Distance_Total INNER JOIN
Students ON Distance_Total.ID = Students.ID
GROUP BY Students.Sex, Students.Nationality,
Students.Age HAVING ((Students.Age)=[Задайте
вік]);
```

When executing such a query, you will first be prompted to enter the appropriate value for the student's age (Fig. 3).

Fig. 3 Window for entering the age of students

After entering the value of the required age, the corresponding result will be obtained (Fig. 4).

Sex	Nationality	Age	AvgOfMeters
ж	Indian	20	990,80
ж	Ukrainian	20	1145,60
ч	Indian	20	1186,18
ч	Ukrainian	20	1415,55

Fig. 4 The result of the query to calculate the average value of the distance covered by 20-year-old students in 6 minutes

With the help of queries, you can also determine which of the students is overweight and vice versa, who does not have enough. To answer this question, it is necessary to calculate the body mass index, which is represented by the following formula [9]:

$$I = \frac{m}{h^2},$$

where m is body weight (in kg), h is height (in m).

The following query in SQL allows you to calculate the body mass index for each student whose information is stored in the database:

```
SELECT WeightHeight.ID, [WeightHeight].[Weight] /
([WeightHeight].[Height]*[WeightHeight].[Height])/10000) AS [Index] FROM WeightHeight INNER
JOIN Students ON WeightHeight.ID = Students.ID;
```

However, this request is only intermediate. Based on its results, other queries can be generated that can answer whether the student is overweight (body mass index exceeds 30) or has a weight deficit (body mass index does not exceed 18.5). As an example, the following is a query code that identifies overweight students:

```
SELECT Students.Name, Students.Sex, Students.
Nationality, Students.Age, WeightIndex.
Index FROM Students INNER JOIN WeightIndex
ON Students.ID = WeightIndex.ID WHERE
((WeightIndex.Index)>30);
```

Name	Sex	Nationality	Age	Index
Коз-ий Едуард	ч	Ukrainian	19	36.63
Коч-ко Ігор	ч	Ukrainian	19	31.31
С-ол Ольга	ж	Ukrainian	18	34.48
Стр-ля	ж	Ukrainian	20	36.72
Сок-ой	ж	Ukrainian	18	33.61
Вл-ко	ж	Ukrainian	18	32.56
Ра-ан Рад-пур	ч	Indian	19	34.14
Ар-ан	ч	Indian	19	33.03
Ар-ім П-н	ч	Indian	20	32.65

Fig. 5 List of overweight students

It is possible to imagine finding the ratio of the heart rate of an individual student after performing the test on the simulator to the heart rate before performance. This ratio allows you to calculate the following query:

```
SELECT Students.Name, [HeartRate]![HeartRate
After] / [HeartRate]![HeartRateBefore] AS
RatioAfterByBefore FROM Students INNER JOIN
HeartRate ON Students.ID = HeartRate.ID;
```

A fragment of the result of the above query is shown in Fig. 6.

Name	RatioAfterByBefore
Ар-ко Ярослав	1.50
Коз-ий Эдуард	1.46
Че-ев Денис	1.90
Кал-за Микита	2.25
Ма-юк Андрій	1.54
Фр-ук Юлія	1.91
Ду-ко Анастасія	1.73
Гай-ич Марія	1.45
Ко-ук Вікторія	1.70
Пу-іт Ігор	1.50
Кир-ін Володимир	2.38
Дю-ер Ірина	1.60
Н-ік Ірина	2.00

Fig. 6 Fragment of the result of calculating the ratio of heart rate after and heart rate before the test

The data obtained together with the body mass index data play a rather important role for their further analysis in order to obtain the dependence of the change in heart rate after testing on whether the student is overweight or not.

After an in-depth analysis of such data, it will be possible to adjust the training load for each student individually.

The last query considered in the article is a query to calculate the ratio of the distance made in the first 2 minutes to the total distance made. The query is represented by the following code in SQL:

```
SELECT Students.Name, [Distance_2min]![
Meters] / [Distance_Total]![Meters] AS
RatioDistance2minsByTotal FROM (Distance_
Total INNER JOIN Students ON Distance_Total.
ID = Students.ID) INNER JOIN Distance_2min ON
Students.ID = Distance_2min.ID;
```

This query at execution gives the following result, a fragment of which is shown in Fig. 7.

Name	RatioDistanc
Ар-ко Ярослав	0.37
Коз-ий Эдуард	0.32
Че-ев Денис	0.37
Кал-за Микита	0.37
Ма-юк Андрій	0.37
Фр-ук Юлія	0.33
Ду-ко Анастасія	0.35
Гай-ич Марія	0.32
Ко-ук Вікторія	0.30
Пу-іт Ігор	0.36
Кир-ін Володимир	0.35
Дю-ер Ірина	0.33

Fig. 7 Fragment of the result of calculating the ratio of the distance for the first 2 minutes to the total distance covered by students in 6 minutes

You can also calculate the ratio between the distances traveled from 3 to 4 minutes and from 5 to 6 minutes to the total distance. When comparing these relations, it is possible to determine at what time a certain student has traveled a greater distance. You can also compare the calories burned and the number of strokes. With a deeper analysis of the results, you can try to find the relationship between distance, calories burned, number of strokes, heart rate and body mass index.

### Discussion

We confirm that with the creation of the database, there is a streamlining of indicators of physical fitness and physical development of students. According to scientists, the creation of an information database allowed to build rationally the entire system of information management of the training process, which increased the objectivity and validity of management decisions in the planning and correction of the training process [4].

On the example of 195 students, we confirmed the convenience of processing databases. Chinese scientists note that taking into account the large number of students at the Qingdao Institute (China) (27,543 people) and a significant number of indicators (9 test tasks), testing takes 5 weeks. It is noted that the health of students has deteriorated in recent years. Test results, assessments, time and place, as well as information about staff, reporting are registered. Given the above, a service management platform that increases the effectiveness of physical education management has been proposed [22]. In Ukraine, a program was developed with a database for students of I-IV courses SMG (776 people), which included indicators of physical development and functional status

of students. The database was presented in two tables: student data (institute, group, surname) and physiological indicators. The created program allowed calculating health indicators [7]. Thus, databases facilitate the analysis of a significant number of student indicators.

We agree that an important factor in building databases is ease of use. According to scientists, the database should be characterized by a user-friendly interface, automatic calculation of load parameters, and the ability to supplement its data, create and print reports [15]. The database presented by us is characterized by accessibility, possibility of adjustment of educational process.

Typically, databases are presented in the form of modules, tables or blocks (data sets). Thus, scientists have developed a computer program «Physical Education», which allows you to model sets of physical exercises depending on the individual characteristics of the physical condition of students and pupils aged 15-17. The program consisted of modules: physical development, physical fitness, functional indicators, psychophysiological and psychological indicators [1].

### Conclusions

Because of generalization of data of scientific literature, normative documents on the use of databases in the system of physical education in higher educational institutions, in sports, we have noted a significant attention of scientists to the need for computer technology in the field of physical culture.

As a result of testing, the indicators of physical fitness, physical development, functional capabilities of students of the Petro Mohyla Chornomorsk National University were determined. All data were entered into the protocols by teachers, and then also taken from ergometer monitors.

Our database contains 8 tables, the main of which is «Students», it contains information about students: last name, first name, patronymic, gender, citizenship, age. In the table «DateOfTest» - date, time of the test, the number of the simulator. In the table «WeightHeight» – indicators of physical development of students: height and body weight of students.

The HeartRate table lists the heart rate before and after loading. All data from the coaches' monitors were entered in 4 tables, which provided a description of the origin of the distance: the distance in meters that the students made, the number of strokes, the time for which the students arrived a distance of 500 meters; number of calories burned and power: «Distance\_Total» (general information about starting the distance in 6 minutes), «Distance\_2min» – distance in the first

2 minutes, «Distance\_4min» – distance in 3 and 4 minutes, «Distance\_6min» - distance in 5 and 6 minutes.

Thus, with the help of SQL-queries you can determine:

- Students with the best or worst test results;
- The average value of the distance covered by boys and girls, depending on their citizenship and age;
- Body mass index indicators for each student whose information is stored in the database (you can also generate other queries for excess or insufficient body weight);
- Further analysis of body mass index data can determine the dependence of heart rate changes after testing on whether a student is overweight or not; after a more in-depth analysis of such data, it will be possible to adjust the training load for each student individually;
- The ratio of the distance covered by the students in the first 2 minutes to the total distance covered; the ratio between the distance traveled from 3 to 4 minutes and from 5 to 6 minutes to the total distance; when comparing these relations, it is possible to determine at what time a certain student has traveled a greater distance.

It is noted that the database should serve not only as a repository for long-term data storage, but also to simplify data processing with the possible detection of hidden patterns and relationships.

By combining the efforts of specialists in the field of physical education and computer technology, it is possible to help optimize the system of physical education, in particular, the implementation of elements of computer technology, databases in the educational process.

### Prospects for further research in this direction:

- Building a database using rowing ergometers to compare calories burned and the number of strokes; in a deeper analysis of the results try to find the relationship between distance, calories burned, number of strokes, heart rate and body mass index.
- Construction of a database of physical fitness of bachelor students of Petro Mohyla Chornomorsk National University in order to preserve and simplify the analysis of the dynamics of the level of physical fitness of students, including the results of the annual assessment of physical fitness of students.
- Improving the control system in student sports at Petro Mohyla Chornomorsk National University: creating a database of physical and functional fitness of students who are members of national teams in sports games, hand-to-hand combat, rowing.

*Conflict of interest.* The authors declare no conflict of interest.

## References

1. Ашанин, В. С., Філенко, Л. В., Філенко, І. Ю., Полторацька, Г. С. Оптимізація засобів фізичного виховання при підготовці учнів та студентів 15–17 років з використанням інформаційних технологій. *Вісник Чернігівського національного педагогічного університету. Серія: Педагогічні науки*. 2017. № 143, С.3–7.  
Ashanin, V. S., Filenko, L. V., Filenko, I. Yu., & Poltoratska, H. S. (2017). Optymizatsiia zasobiv fizychnoho vykhovannia pry pidhotovtsi uchniv ta studentiv 15–17 rokov z vykorystanniam informatsiinykh tekhnolohii. *Visnyk Chernihivskoho natsionalnoho pedahohichnoho universytetu. Serii: Pedahohichni nauky*, (143), 3–7.
2. Баранов В. Н., Курашвили В. А., Шустин Б. Н. Разработка информационной базы данных диссертационных советов в сфере физической культуры и спорта. *Вестник спортивной науки*. 2016. № 3, С. 52–55.  
Baranov, V. N., Kurashvili V. A., & Shustin B. N. (2016), Razrabotka informatsionnoy bazy danykh dissertatsionnykh sovetov v sfere fizicheskoy kultury i sporta, *Vestnik sportivnoy nauki*, 3, 52–55.
3. Бондаренко, І. Г., Мінц, М. О., Сергієнко, Ю. М., Головаченко, І. В., Бондаренко, О. В., Кураса Г. О. Дослідження можливостей використання 6-хвилинного веслування на ергометрі Concept2 для оцінки рівня витривалості у студентів. *Слобожанський науково-спортивний вісник*. 2020. №1 (75), С. 41–48. doi: 10.15391/sns.v.2020-1.007  
Bondarenko, I. H., Mints, M. O., Serhiienko, Yu. M., Holovachenko, I. V., Bondarenko, O. V., & Kurasa H. O. (2020). Doslidzhennia mozhlyvostei vykorystannia 6-khvylynnoho vesluvannia na erhometri Concept2 dlia otsinky rivnia vytrivalosti u studentiv. *Slobozhanskyi naukovosporyvnyi visnyk*, 1 (75), 41–48. doi: 10.15391/sns.v.2020-1.007.
4. Дрюков В. О., Павленко Ю. О., Щербашин Я. С. Информационная база данных комплексного контроля в олимпийских видах спортивной борьбы. *Актуальные проблемы физической культуры и спорта*. 2004. №2, С.35–38.  
Driukov, V. O., Pavlenko, Yu. O., & Shcherbashyn Ya. S. (2004). Informatsiina baza danykh kompleksnoho kontroliu v olimpiiskyykh vyдах sportyvnoi borotby. *Aktualni problemy fizychnoi kultury i sportu*, 2, 35–38.
5. «Про Концепцію Національної програми інформатизації»: Закон України від 4 лютого 1998 р. № 75/98-ВР. Відомості Верховної Ради України. 1998 р. № 27. Ст. 182.  
Verkhovna Rada Ukrainy (1998). Zakon Ukrainy vid 4 liutoho 1998 r. № 75/98-VR. Pro Kontseptsiiu Natsionalnoi prohramy informatyzatsii. *Vidomosti Verkhovnoi Rady Ukrainy*. 1998 r. № 27. St. 182.
6. Кашуба В. А., Дудко М. В., Мартынюк О. А. Использование информационно-коммуникационного вектора в процессе занятий оздоровительным фитнесом. *Молодий вчений*. 2017. № 3.1 (43.1). С.151–154.  
Kashuba, V. A., Dudko, M. V., & Martyniuk, O. A. (2017). Ispolzovanie informatsionno-kommunikatsionnogo vektora v protsesse zanyatiy ozdorovitelnyim fitnessom. *Molodiy vcheniy*, 3.1 (43.1), 151–154.
7. Кузнецова О. Т. Методичні рекомендації до використання у процесі фізичного виховання інформаційної бази даних рівнів соматичного здоров'я студентів денної форми навчання: метод. рекомендації. Рівне: НУВГП, 2016. 26 с.  
Kuznietsova, O. T. (2016). Metodichni rekomendatsii do vykorystannia u protsesi fizychnoho vykhovannia informatsiinoi bazy danykh rivniv somatychnoho zdorovia studentiv dennoi formy navchannia: metod. rekomendatsii. Rivne: NUVHP, 2016. 26 s.
8. Луценко Д. Ю. Разработка компьютерной версии программы занятий в фитнесе на основе технологии баз данных. *Физическое воспитание студентов творческих специальностей*. 2003. № 7, С. 96–109.  
Lutsenko, D.Yu. (2003). Razrabotka kompyuternoy versii programmy zanyatiy v fitnesse na osnove tehnologii baz danykh, *Fizicheskoe vospitanie studentov tvorcheskikh spetsialnostey*, 7, 96–109.
9. Про затвердження тестів і нормативів для осіб, щорічне оцінювання фізичної підготовленості яких проводиться на добровільних засадах, Інструкції про організацію його проведення та форми Звіту про результати його проведення: наказ М-ва молоді та спорту України від 04.10.2018 р. №4607.Офіційний вісник України. 2018. № 87. Ст. 2899. С. 87.  
Ministerstvo molodi ta sportu Ukrainy (2018). Nakaz Ministerstva molodi ta sportu Ukrainy vid 04.10.2018 r. № 4607. Pro zatverdzhennia testiv i normatyviv dlia osib, shchorichne otsiniuvannia fizychnoi pidhotovlenosti yakykh provodytsia na dobrovilnykh zasadakh, Instruksii pro orhanizatsiiu yoho provedennia ta formy Zvitu pro rezultaty yoho provedennia. *Ofitsiinyi visnyk Ukrainy*. № 87. St. 2899. S. 87.
10. Нагорна А., Андреева О. Використання інформаційних технологій у процесі проектування профілактично-оздоровчих занять жінок зрілого віку. *Теорія і методика фізичного виховання і спорту*. 2018. № 2, С.78–82, DOI: <https://doi.org/10.32652/tmfvs.2018.2.78-82>  
Nahorna, A., & Andrieva, O. (2018). Vykorystannia informatsiinykh tekhnolohii u protsesi proektuvannia profilaktychno-ozdorovchykh zaniat zhinok zriloho viku, *Teoriia i metodyka fizychnoho vykhovannia i sportu*, 2, 78–82. DOI: <https://doi.org/10.32652/tmfvs.2018.2.78-82>. [in Ukraine].
11. Нужный Е.М., Клименко І.В., Акімов О.О. Инструментальні засоби електронного офісу: навч. посібник. К.: «Центр учбової літератури», 2016. 296 с.  
Nuzhnyi, Ye.M., Klymenko I.V., & Akimov O.O. Instrumentalni zasoby elektronnoho ofisu: navch. posibnyk. K.: «Tsentr uchbovoi literatury», 2016. 296 s.
12. Петров П. К. Возможности и перспективы использования современных информационных технологий в системе подготовки специалистов по физической культуре и спорту. *Прикладная информатика*. 2009. № 4(22), С. 14–21.  
Petrov, P. K. (2009). Vozmojnosti i perspektivy ispolzovaniya sovremennykh informatsionnykh tehnologiy v sisteme podgotovki spetsialistov po fizicheskoy kulture i sportu. *Prikladnaya informatika*, 4(22), 14–21.
13. Пітин М. П. Нормативно-правове забезпечення інформатизації фізичної культури і спорту. *Молода спортивна наука України*. 2012. Т.1. С. 209–215.  
Pityn, M. P. (2012). Normatyvno-pravove zabezpechennia informatyzatsii fizychnoi kultury i sportu. *Moloda sportyvna nauka Ukrainy*, T.1. 209–215.
14. Томіліна Ю. Застосування комп'ютерних технологій у фізичному вихованні жінок першого зрілого віку. *Слобожанський науково-спортивний вісник*. 2016. № 4(54), С. 106–110, doi:10.15391/sns.v.2016-4.019  
Tomilina, Yu. (2016). Zastosuvannia kompiuternykh tekhnolohii u fizychnomu vykhovanni zhinok pershoho zriloho viku. *Slobozhanskyi naukovosporyvnyi visnyk*, 4(54). 106–110. doi:10.15391/sns.v.2016-4.019. [in Ukraine].

15. Усиченко В. В. Застосування технологій баз даних у фізичному вихованні чоловіків першого зрілого віку. *Молодіжний науковий вісник Східноєвропейського національного університету імені Лесі Українки. Фізичне виховання і спорт*. Східноєвроп. нац. ун-т ім. Лесі Українки. 2015. Вип. 17. С.117–121.  
Usychenko, V. V. (2015). Zastosuvannya tekhnolohii baz danykh u fizychnomu vykhovanni cholovikiv pershoho zriloho viku. *Molodizhnyi naukovyi visnyk Skhidnoevropeiskoho natsionalnoho universytetu imeni Lesi Ukrainky. Fizychnе vykhovannia i sport: zhurnal / uklad. A.V.Tsos, A. I. Aloshyna, Lutsk : Skhidnoevrop. nats. un-t im.Lesi Ukrainky, Vyr. 17, 117–121.*
16. Усыченко В. В., Бышевец Н. Г. Анализ использования технологии баз данных в физическом воспитании и спорте. *Педагогика, психология и медико-биологические проблемы физического воспитания и спорта*. 2010. №3. С. 121–123.  
Usyichenko, V. V., & Byishevets, N. G. (2010), "Analiz ispolzovaniya tehnologii baz dannykh v fizicheskom vospitanii i sporte", *Pedagogika, psihologiya i mediko-biologicheskie problemy fizicheskogo vospitaniya i sporta*, №3, S. 121–123.
17. Хорошилов С. А. Применение компьютерных технологий на начальном этапе подготовки бодибилдеров : автореф. дис. на соискание учен. степени канд. пед. наук : 13.00.04. Санкт-Петербург, 2015. 24 с.  
Horoshilov, S. A. (2015). *Primenenie kompyuternykh tehnologiy na nachalnom etape podgotovki bodibilderov, (Master's thesis), Voennyiy institut (fizicheskoy kulturyi) FGBVOU VPO «Voenno-meditsinskaya akademiya imeni S.M. Kirova», Sankt-Peterburg.*
18. Черепякин Р.С. Управление подготовкой высококвалифицированных десятиборцев в годичном цикле на основе информационной базы данных : дис. ... канд. пед. наук : 13.00.04 / Московский гор. пед. ун-т. Москва, 2014. 162 с.  
Cherepyakin, R. S. (2014). *Upravlenie podgotovkoy vyisokokvalifitsirovannykh desyatibortsev v godichnom tsikle na osnove informatsionnoy bazy dannykh : dis. ... kand. ped. nauk : 13.00.04 / Moskovskiy gorod. ped. un-t. Moskva, 2014. 162 s.*
19. Dai, Y., Guo, J., Yang, L., You, W. A new approach of intelligent physical health evaluation based on GRNN and BPNN by using a wearable smart bracelet system. *Procedia computer science*, 2019. №. 147, P. 519–527, <https://doi.org/10.1016/j.procs.2019.01.235>  
Dai, Y., Guo, J., Yang, L. & You, W., (2019). A new approach of intelligent physical health evaluation based on GRNN and BPNN by using a wearable smart bracelet system. *Procedia computer science*, 147, pp.519–527, <https://doi.org/10.1016/j.procs.2019.01.235>
20. Sbröllini, A., Morettini, M., Maranesi, E., Marcantoni, I., Nasim, A., Bevilacqua, R., Riccardi, G. R., Burattini, L. Sport Database: Cardiorespiratory data acquired through wearable sensors while practicing sports. *Data in brief*, 2019. № 27, <https://doi.org/10.1016/j.dib.2019.104793>  
Sbröllini, A., Morettini, M., Maranesi, E., Marcantoni, I., Nasim, A., Bevilacqua, R., Riccardi, G. R., & Burattini, L. (2019). Sport Database: Cardiorespiratory data acquired through wearable sensors while practicing sports. *Data in brief*, 27, 104793. <https://doi.org/10.1016/j.dib.2019.104793>
21. Han Can, Ma Lu, Luying Gan. The Research on Application of Information Technology in sports Stadiums, *Physics Procedia*, 2011. № 22, P. 604–609. <https://doi.org/10.1016/j.phpro.2011.11.093>.  
Han Can, Ma Lu, Luying Gan (2011). The Research on Application of Information Technology in sports Stadiums, *Physics Procedia* 22, pp. 604–609, <https://doi.org/10.1016/j.phpro.2011.11.093>.
22. Chu Xiao-dong. Research on the Data Collection and Management Model of College Students' Physical Fitness Test in Qingdao, *Asian Social Science*, 2018. Vol. 14, № 5, P. 29–32. doi:10.5539/ass.v14n5p29  
Chu Xiao-dong (2018). Research on the Data Collection and Management Model of College Students' Physical Fitness Test in Qingdao, *Asian Social Science*; Vol. 14, No. 5, pp. 29–32, doi:10.5539/ass.v14n5p29

Received for publication 10.02.2020

# PREREQUISITES FOR THE FORMATION OF STUDENTS' VALUE ATTITUDES TO THE DEVELOPMENT OF PHYSICAL PREPARATION

O. Klyus, M. Kuzhel, O. Skavronsky, M. Guska

Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine

corresponding author – O. Klyus: alenakamp@gmail.com

doi: 10.32626/2309-8082.2020-16.27-31

Physical preparedness plays an important value in the process of providing of maintenance and improvement of health and to the high capacity of students that is why to this day it remains actual. This research is addition of data of conducted with the students of the first course of the masculine article. *Research aim*: to learn attitude and awareness of students toward development of the physical qualities. *Research methods*. During an experiment drew on the complex of methods, analysis, questionnaire questioning, pedagogical supervision, mathematical statistics. Investigated were 72 students of higher establishment of education during first year of their studies. *Results*. The questionnaire educed, the students of first year of studies in establishment of higher education were positive attitude toward a necessity to promote the physical preparedness and consider it important 97%. Educud that 83% students are estimated by the physical development status as average, 6% – as low, and 11% – as high. In the content of physical education, is most interesting physical exercises that students like to execute in the structure of

physical education there are «sport games» – 50%, «track-and-field exercises» – 41,6%, «movable games» – 31%, «certain variety rhythmic gymnastics» – 11%, «athletics gymnastics» – 2,7%. They found that students believe that during practical training they receive enough attention to the development of physical qualities (92%), but are unwilling to participate in competitions, and the main reason is the lack of time – 15%, and lack of interest – 13%. They also found that the respondents were not sufficiently oriented in the theoretical and methodological questions on physical education required in the case of physical activity, and also noted that the teachers provided sufficient information on the technique of performing motor actions, but not enough informed about the development of their physical qualities and their physical capabilities. The information obtained should be taken into account when forming the motivation of the boys to purposely develop their physical qualities.

**Keywords:** health, physical activity, students, physical qualities.

## Introduction

The Law of Ukraine «On Higher Education» states that physical education is one of the main components of education, which provides a high level of moral and volitional qualities, which allows to be able to work and competitive in the professional market. In the process of state development in the system of higher education there have been changes – the priority is the need for the development of mental activity [16]. The problem that has arisen in this regard is the lack of motivation in society for independent physical activity, because the reduction of physical activity is one of the factors that affect human health [6; 15]. To correct this trend at the state level, a strategy for the development of student health was adopted, which is reflected in recent legislation [17; 18; 19]. However, the problem with student health is still relevant today, as the analysis of annual tests of physical fitness showed that the number of students with medium and low levels of physical fitness does not decrease, but rather increases [12; 14; 16; 19]. We attribute the reason for this to the lack of proper responsibility placed on managers at all levels for creating conditions for the formation of public health by involving them in a healthy lifestyle, as well as creating appropriate conditions and opportunities to assess their level of physical fitness [17]. Analysis of the state of the outlined problem, as well as research [1], allowed to establish the need to supplement knowledge about the interest of first-

year students to the level of their physical fitness and awareness of their level in order to form a value attitude towards it.

## Research methods

*Goal*. To study the attitude of students to the development of their physical qualities and to establish the level of their awareness.

To achieve this goal during our study used a set of research methods. General scientific: analysis, generalization, systematization – used in the study of literary sources. Among the sociological methods used a written survey on the developed questionnaire, which met the established requirements [16]. The obtained data were processed with the help of adequate methods of mathematical statistics and licensed software SPSS-version 21. The study involved 72 students (male) who studied at Kamyanets-Podilsky National University named after Ivan Ohienko in the first year of the following faculties: pedagogical (n = 10), historical (n = 25), physical and mathematical (n = 25), correctional and social pedagogy and psychology (n = 12). The study was organized and implemented in accordance with the Declaration of Helsinki on the Ethical Principles of Human-Based Medical Research; The research protocol was approved by the ethics commission of Kamyanets-Podilsky National University named after Ivan Ohienko. The study was conducted on the basis of Kamianets-Podilsky Ivan Ohienko National University.

### Research results

Physical fitness is an important characteristic of health and an integral indicator of physical activity of students [5; 6; 14; 16]. Determining the topic of the study, we were guided by the idea that the formation of a positive attitude to physical fitness can be established by applying during physical education informative characteristics of the individual capabilities of physical fitness of students. Based on this, they found the need to conduct a detailed analysis of pedagogical testing, namely to determine the state of awareness and interest of students in the development of physical qualities [5].

As a result of our survey, it was found that the importance of their level of physical fitness is important for boys. This is confirmed by the answer to the question: «Is the level of physical fitness important for you?»: «Yes» answered – 97 % of respondents. In addition, students who chose a positive answer were able to justify it: «if you have good physical fitness, you can feel strong and protected», «to keep fit» – 18 % «,» health depends on physical fitness. I people «,» if good physical training, more health «,» it is health prevention «,» sport is health «,» movement is life «-18 %. Did not give any answer «no» – 0 % and «difficult to answer» – 3 %.

To clarify the extent to which students are aware of their level of physical fitness and how much they can assess it, we asked the question: «How do you assess your level of fitness?». The following result was obtained: 83 % of students consider the level of physical fitness to be average; 5.5 % consider their level low; only 11 % – high. To identify the cause of increased physical fitness, a control question was asked: «Why do you need to know your level of physical fitness?».

As a result, the following results were obtained: «for further development of their physical qualities» – 53 %, «for further improvement of their physical health» – 42 %, and – 60 % of respondents could not justify their answers. All other mentioned reasons were quantitatively smaller, in particular: «to master vital motor actions» – 16.6 %, «all the above reasons» indicated – 13.3 % and «to get a high grade in physical culture» – 0 % did not receive any response.

To further identify, namely to specify the awareness of students about the development of their physical qualities, the question was asked: «What physical qualities do you have developed at a high level?». We obtained the following results: 45 % believe that it is general endurance, 39 % –

speed, 36 % – muscle strength, 33 % – speed endurance, 25 % – some types of coordination, 19.4 % – flexibility, the answer «none of these qualities» – 0 %.

Clarifying the information on the effective development of physical qualities, the students were asked during the classes: «Is enough attention paid to the development of physical qualities during physical education classes?». As a result of this survey, the following result was obtained: «yes» – 92 %, to clarify the selected result, students said that during classes they perform «many different exercises to improve all physical qualities» – 16 %, «get good physical development» – 8,3 %. The answer «no» was given by 8.3 % of respondents, but they could not justify it.

To show interest in the content of physical exercises, the question was asked: «What exercises do you like to do the most?». The answer was that the boys like to perform all the above exercises, namely: «sports games» – 50 %, «athletics exercises» – 41.6 %, «moving games» – 30.5 %, «a certain kind of rhythmic gymnastics» – 11 %, «Moving games» – 31 %, «athletic gymnastics» – 3 %. The obtained result indicates a high interest in all the above physical exercises, except for athletic gymnastics.

It was found that only 36 % are interested and willing to participate in sporting events held in higher education institutions. The students justified the reason for this answer: they like to take part in such events because they «like running», «consider it an opportunity to compare their abilities» – 12.5 %, but 64 % of respondents answered that they do not participate in competitions. They explained this by the fact that «they do not have the desire and they are not interested» – 11 %, also pointed to other reasons: «do not have enough free time» – 15 %, «have a low level of physical fitness and do not attend any sections» – 4 %.

To find out to what extent students are aware of the state of their physical fitness, they are asked: «Do they provide you with enough information about the development of your physical qualities during physical education classes?». The following results were obtained: 96 % gave an affirmative answer, justified by only 22 % of respondents as follows: «the teacher helps us and explains during the lesson.» 3 % gave a negative answer, the rest – 2 % of respondents could not decide on the answer and said that it depends on the lesson.

To clarify whether students are interested in receiving information about their development, a control question

was asked: «Do you want to receive information about your level of physical fitness?». Received a positive answer «yes» – 72 %. It was found that the main reasons for this answer are different, in particular: 10 % – curiosity and benefits, 13 % of respondents want to know about their level of physical development to improve it, 4 % – consider it important for health. 28 % of respondents gave a negative answer «no», the reason for this result – «do not want to receive information and lack of need, because they know their level and control it themselves» – 13 %.

Given the positive impact of independent classes, as well as to study the possibility of applying the information provided in the subject classes, we asked students: «Do you want to receive information about how you can develop your physical qualities?». We got the result: most students want to receive this information – «yes» answered 81 % of respondents. They justified their answers: «it is important to exercise effectively on your own», «I want to perform exercises correctly and develop physical qualities» – 32.1 %, «this is useful information to always keep fit» – 12 %. Answered «no» – 17 %; students explained the reason: «I can get this information from the Internet, I already get this information from my coach» – 4 %.

### Discussion

Physical fitness of students in higher education institutions is an urgent problem today, as it is associated with a decrease in this indicator and an increase in the number of diseases among young people [6; 12; 14].

At the state level to avoid this problem, namely to preserve and improve the health of the population, developed and approved a number of laws and regulations [17; 18; 19]. However, these bills are not always effective.

Leading experts believe that the ineffectiveness of the bills is due to their recommendatory nature, entrusted to the heads of higher education institutions, where preference is given to providing the educational process only with priority disciplines related to future specialties of higher education, and physical education, unfortunately, becomes secondary [4; 14; 15].

According to researchers, the main problem in these conditions is the lack of proper implementation of the resolution to increase physical activity of students in higher education [14; 15; 19].

Another statement reveals such a reason as the lack of sufficient positive attitude of students to such an

orientation in the existence of physical culture, as well as the need to form students' need for physical activity, as the effectiveness of such work should not be forced but voluntary and lifelong [3; 4; 10].

Many leading experts note that an effective way to form motivation for physical activity is to take into account during classes the specifics of the future profession [3; 5; 11; 12]. It is also necessary to additionally highlight the positive impact of the assessment of physical fitness as an informative indicator of health and physical development, which can be effectively used as an effective incentive for independent physical activity [4; 5; 11; 12].

Our study to study the attitude of students to physical fitness did not confirm the negative attitude of students [2; 3], as 97 % considered it important for themselves, justifying their answer by the need to be in good physical shape and be able to defend themselves. However, 60 % of respondents, regardless of the positive attitude in the answers, could not justify it.

Such results give us reason to think about the lack of awareness of students in the need to maintain themselves at a high physical level.

In addition, a questionnaire survey, we confirmed the authors' views on the lack of awareness of students in the methods of physical education, namely the basic knowledge of the methods of development of physical qualities [7; 8; 9; 13].

The reason for this statement was the answers to the questionnaire of students: «Do teachers provide enough information during the development of physical qualities?». The answers were related to a significant understanding that «yes» – 92 %. However, only 22 % of respondents were able to justify their answer: «The teacher helps us and explains during the lesson.» In our opinion, teachers provide enough information on the technique of performing motor actions, but not enough information about the development of students' physical qualities and their physical capabilities (this knowledge students could use during independent study in later life), as well as the need to create and provide sufficient number of theoretical and methodological recommendations and instructions, electronic database, useful Internet resources that can be used during independent work.

In addition, the study found that most boys do not want to participate in sports activities of the university – about 64 %, while they have a positive attitude and

a desire to receive information about their physical characteristics and opportunities to develop physical qualities during independent work.

### Conclusions

1. Students of the first year of study in higher education institutions have a positive attitude to the need to improve their physical fitness, this is largely due to the need for higher physical training, the desire to feel «strong, beautiful and protected» and «be healthy» .

2. Self-assessment of physical fitness shows that the average level is 83 %, low – 5.5 % and high – only 11 % of boys, their priorities in the development of physical qualities are primarily «general endurance», «muscle strength». «Speed endurance», «some types of coordination», «flexibility».

3. The most interesting physical exercises that students like to perform in the structure of physical education are «sports games» – 50 %, «athletics exercises» – 41.6 %, «moving games» – 30.5 %, «a certain kind of rhythmic

gymnastics «- 11 %,» moving games «- 31 %,» athletic exercises «- 31 %,» athletic gymnastics «- 3 %.

4. We found insufficient awareness of students of theoretical and methodological knowledge about the development of physical qualities during classes, as well as a small amount of information from the teacher about their individual characteristics and opportunities in terms of physical development.

5. We found out the positive attitude and desire of students to receive such information for the purpose of self-improvement.

Further research should be aimed at developing a program to increase students' motivation for physical activity in their free time, taking into account their individual physical abilities and to test in practice their effectiveness in solving various tasks.

*Conflict of interest.* The authors declare no conflict of interest.

### References

1. Банах В. Персоніфікований підхід до фізичного виховання студентської молоді. *Вісник Кам'янець-Подільського національного університету імені Івана Огієнка: Фізичне виховання, спорт і здоров'я людини*. Кам'янець-Подільський: Аксіома, 2019. № 15. С. 11–37.  
Banach V.(2019), *Personifikovanyj pidchid do fizychnogo vyhovannya student'skoj molodi* [Personalized approach to physical education of student youth]. *Bulletin of Kamyanets-Podilskiy Ivan Ogiyenko National University. Physical Education, Sports and Human Health: Aksioma, Kamyanets-Podilskiy*. No 15. pp. 11–37. [in Ukraine].
2. Бойчук Ю., Єдинак Г., Галаманжук Л., Ключ О., Скворонський О. Дослідження інтересу студенток до розвитку фізичних якостей педагогічними засобами. *Вісник Кам'янець-Подільського національного університету імені Івана Огієнка: Фізичне виховання, спорт і здоров'я людини*. Кам'янець-Подільський: Аксіома, 2019. Вип. 13. С. 29–34.  
Boychuk Y. Yedinak G. Galamandzuk L. Klyus O. Skavronskiy O. (2019), *Doslidzennya interesu studentok do rozvytku fizychnyh yakostey pedagogichnyimi zasobamy* [Research of students' interest in the development of physical qualities by pedagogical means]. *Bulletin of Kamyanets-Podilskiy Ivan Ogiyenko National University. Physical Education, Sports and Human Health: Aksioma, Kamyanets-Podilskiy*. No 13. pp. 29–34. [in Ukraine].  
DOI: 10.32626/2227-6246.2019-13.29-33 ISSN 2309-8082
3. Гринько В. М. Ставлення студентів до фізичного виховання і здорового способу життя та їх самооцінка рівня фізичної підготовленості. *Слобожанський науково-спортивний вісник*. 2015. № 1. С. 55–59. URL: [http://nbuv.gov.ua/UJRN/sns\\_v\\_2015\\_1\\_12](http://nbuv.gov.ua/UJRN/sns_v_2015_1_12).  
Grinko V. M. (2015), *Stavlennya studentiv do fizychnogo vyhovannya i zdorovogo sposobu zuttja ta ich samoocinka rivnja fizychnoi pidgotovlenosti* [Attitude of students to physical education and healthy lifestyle and their self-esteem of the level of physical fitness]. *Slobozanskiy naukovo-sportivnyy visnyk*. pp.55–59. [in Ukraine].
4. Г. П. Грибац, В. П. Краснов, Ф. Г. Опанасюк. Комплексні дослідження модернізації системи фізичного виховання студентів у вищих освітніх закладах України. *Наук. часопис. Сер. 15. Науково-педагогічні проблеми фізичної культури (фізична культура і спорт)*. Нац. пед. ун-т ім. М. П. Драгоманова. 2019. № 5. С. 31–34. <http://ir.znau.edu.ua/handle/123456789/9656>  
Gruban G.P. Krasnov V.P. Opanasyuk V.G. (2019) *Kompleksni doslidzheniya modernizaciyi sistemi fizychnogo viovannya studentiv u vishih osvithnih zakladah Ukrayini* [Comprehensive research on modernization of the system of physical education of students in higher educational establishments of Ukraine] *Nauk. chasopis. Ser. 15. Naukovo-pedagogichni problemi fizychnoyi kulturi (fizychna kultura i sport)*. *Nac. ped. un-t im. M. P. Dragomanova*, Kyiv. No 5. pp. 31–34. [in Ukraine].
5. Гостіщев В. М. Рівень фізичної підготовленості як чинник мотивації студентів до фізичної активності в умовах навчального процесу та у вільний час. *Слобожанський науково-спортивний вісник: наук.-теорет. журнал*. Харків: ХДАФК, 2010, № 1. С. 15–18.  
Gostishev V.M. (2010), *Riven fizychnoi pidgotovlenosti yak chynnyk motyvatsiyi studentiv do fizychnoi aktyvnosti v umovach navchalnogo protsesu ta u vilnyy chas* [The level of physical fitness as a factor of students' motivation for physical activity in the educational process and in their free time]. *Slobozanskiy naukovo-sportivnyy visnyk*. CHDAFK, Kharkiv.No 1. pp. 15–18. [in Ukraine].
6. Дух Т., Лесько О., Рачук Н., Ріпак М. Фізична підготовленість як один із критеріїв ефективності фізичного виховання студентів вищих навчальних закладів. *Спортивна наука України*. 2015. Т. 2. С. 34–39. URL: <http://repository.ldufk.edu.ua/handle/34606048/3050>  
Dukh T., Lesjko O., Rachuk N., Ripak M. (2015), *Fizychna pidghotovlenistj jak odyn iz kryterijiv efektyvnosti fizychnogho vykhovannya studentiv vyshhykh navchalnykh zakladiv. za red. Jevghena Prystupy* [Physical preparedness as one of the criteria of the efficiency of physical education of students of higher educational institutions]. *Sportyvna nauka Ukrayiny*, Vol. 2, pp. 34–39. [in Ukraine].

7. Єдинак Г. А., Мицкан Б. М., Завацька Л. Стан та деякі теоретичні аспекти посилення мотивації студентів до систематичної рухової активності оздоровчого спрямування. *Вісник Прикарпатського у-ту. Фізична культура*. 2012. Вип. 16. С. 44–50.  
ledynak G. A., Mytcan B. M., Zavatska L. (2012), *Stan ta dejaki teoretyčni aspekty posylennja motyvacii studentiv do systematyčnoj ruchovoi aktyvnosti ozdorovčoho sprjamuvannja* [The state and some theoretical aspects of enhancement of students' motivation to systematic motor activity of the well-being direction], *Visnyk Prykarpatskoho universytetu. Fyzyčna kultura*, No 16, pp. 44–50. [in Ukraine].
8. Єдинак Г. А. Деякі теоретико-методичні аспекти посилення мотивації студентів до систематичної фізичної активності оздоровчої спрямованості. *Вісник Чернігівського національного педагогічного університету*. Серія: Педагогічні науки. Фізичне, виховання та спорт. 2014. № 118 (3). С. 109–113.  
ledynak G. A. (2014), *Deyaki teoretyko-metodyčni aspekty posylennja motyvacyi studentiv do systematichnoyi fizychnoyi aktyvnosti ozdorovchoyi spryamovanosti* [Some theoretical and methodical aspects of increasing the motivation of students to systematic physical activity of health-oriented direction], *Visnyk Černihivskoho nacionalnoho pedahohičnoho universytetu. Ser.: Pedahohični nauky. Fyzyčne vychovannja ta sport*. Vol. 118 (3), pp. 109–114. [in Ukraine].
9. Єдинак Г. А., Мисів В. М., Юрчишин Ю. В. Фізична культура у загальноосвітньому навчальному закладі: навч. посіб. Кам'янець-Подільський: ТОВ «Друкарня Рута». 2014. 228 с.  
ledynak G. A., Musiv V.M., Yurchishin Y.V., (2014), *Fyzyčna kultura u zagalnoosvitnomu navchalnomu zakladi* [Physical education in secondary school]. Ruta Printing House. Kamjanets-Podilskij. 228 p. [in Ukraine].
10. Кириченко Т. Г. Здоров'я в системі ціннісних пріоритетів студентів педагогічного закладу вищої освіти. *Вісник Кам'янець-Подільського національного університету імені Івана Огієнка: Фізичне виховання, спорт і здоров'я людини*. Кам'янець-Подільський: Аксіома, 2019. Вип. 12. С. 22–27.  
Kyrichenko T.(2019), *Zdorovja v systemi tsinnistnych priorytetiv studentiv pedagogichnoho zakladu vyshchoi osvity* [Health in the system of value priorities of students of a pedagogical institution of higher education]. *Aksioma. Kamjanets-Podilskij*. No 12. pp. 22–27. [in Ukraine].
11. Коваль О.Г., Гуска М.В. Проблеми оптимізації процесу формування фізкультурно-оздоровчих компетентностей студентів гуманітарних факультетів. *Вісник Кам'янець-Подільського національного університету імені Івана Огієнка. Фізичне виховання, спорт і здоров'я людини: Випуск 15, 2019. doi: 10.32626/2309-8082.2019-15.61–65.*  
Koval O.G., Guska M.V.,(2019), *Problemy` opty'mizaciyi procesu formuvannja fizkul'turno-ozdorovchyx kompetentnostej studentiv gumanitarny'x fakul'tetiv* [Problems of optimization of the process of formation of physical and health competences of students of humanities faculties]. *Bulletin of Kamyanets-Podilskiy Ivan Ogiyenko National University. Physical Education, Sports and Human Health: Issue 15*, pp. 61–65. [in Ukraine].
12. Москаленко Н., Корж Н. Технологія формування ціннісного ставлення у студентів до самостійних занять фізичною культурою. *Спортивний вісник Придніпров'я*. 2016. № 1. С. 201–206.  
Moskalenko N. Korz N.(2016) *Technologiya formuvannja tsinnishogo stavlennja u studentiv do samostijnuch zannyat fizychnoyu kulturoyu*. [Technology of formation of value attitude at students to independent employment by physical culture]. *Sportyvnyj visnyk Pridniprovia* No 1. pp. 201–206. [in Ukraine].
13. Одайник В., Авінов В. Етапи розвитку фізичних якостей студентів закладів вищої освіти засобами баскетболу. *Вісник Кам'янець-Подільського національного університету імені Івана Огієнка: Фізичне виховання, спорт і здоров'я людини*. Кам'янець-Подільський: Аксіома, 2019. Вип. 15. С. 81–84  
Odaynik V., Avinov V.,(2019), *Etapy rozvidky fizychnykh jakostej studentiv zakladiv vyshchoi osvity zasobamy basketbol*. [Stages of development of physical qualities of students of higher education institutions by means of basketbal]. *Aksioma. Bulletin of Kamyanets-Podilskiy Ivan Ogiyenko National University. Physical Education, Sports and Human Health. Aksioma. Kamjanets-Podilskiy* No 15. pp. 81-84. [in Ukraine].
14. Оленів Д. Г., Канишевський С. М. Аналіз рівня фізичної підготовленості студентів закладів вищої освіти. *Науковий часопис Національного педагогічного університету імені М. П. Драгоманова*. Серія 15: Науково-педагогічні проблеми фізичної культури (фізична культура і спорт): зб. наук. праць. Київ: Вид-во НПУ імені М. П. Драгоманова, 2019. Вип. 3К (110). С. 410–413.  
Olenev D., Kanishevskiy S., (2019), *Analiz rivnja fizychnoi pidgotovlenosti studentiv zakladiv vyshchoi osvity* [Analysis of the level of physical fitness of students of higher education institutions]. *NP im. M. P. Dragomanova* Kyiv. pp. 410-413. [in Ukraine].
15. Присяжнюк С. І. Дослідження проблеми відношення студентів до занять з фізичного виховання. *Вісник Чернігівського національного педагогічного університету*. Серія: Педагогічні науки. Фізичне виховання та спорт. 2017. № 147 (2). С. 108–113.  
Prisaznyuk S. (2017), *Doslidzennja problem vidnoshennja studentiv do zanyat z fizychnogo vychovannja* [Research of the problem of attitude of students to physical education classes] *Visnyk Chernigivskogo natsionalnoho pedagogichnoho universytetu. Fyzyčne vychovannja i sport*. No. 147(2), pp. 108–113. [in Ukraine].
16. Шиян Б. М., Єдинак Г. А., Петришин Ю. В. Наукові дослідження у фізичному вихованні та спорті: навч. посіб. Кам'янець-Подільський: ПП Видавництво «Оіюм», 2012. 280 с.  
Shiyan B. M., ledynak G. A., Petryshyn Yu. V. (2012), *Naukovi doslidzhennja u fizychnomu vykhovanni ta sporti* [Scientific research in physical education and sports], PE Oyum Publishing House, Kamianets-Podilsky. 280 p. [in Ukraine].
17. <https://zakon.rada.gov.ua/laws/show/1695-19>
18. <https://www.president.gov.ua/documents/422016-19772>
19. <http://dsmsu.gov.ua/index/ua/material/34953>

Received for publication 13.02.2020

# FORMATION OF MOTIVATIONS OF DEVELOPMENT OF PHYSICAL ACTIVITY IN STUDENTS OF ESTABLISHMENT OF HIGHER EDUCATION

O. Koval

Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine

corresponding author – O. Koval: kovalsasha0033@gmail.com

doi: 10.32626/2309-8082.2020-16.32-36

One of the most important tasks of physical education in an establishment of higher education is to ensure the formation of the necessary level of physical development of the student. The solution of this problem at the present stage can not be sufficiently effective without further improvement of the system of physical education, without studying the problems of motivation to systematic occupations by physical culture. Formation of motivation for the development of physical activity in student youth is a complex and system process that covers many components. *The Purpose of the Study* is to consider the problem of motivation for exercises, to analyze the factors that determine the needs, interests and motives of inclusion of students in physical education activities. *Material and Methods of Research*. The research was attended by students of the first year of the Faculty of Ukrainian Philology and Journalism and students of the first year of the Faculty of Foreign Philology. In order to determine the level of the state of formation of motivation for motor activity, we conducted a questionnaire. The questionnaire included a set of questions that could be used to determine the motives

for physical exercise and the attitude of students to forms of physical activity. *Research Results*. It has been established that motivation plays a leading role in attracting physical activity, and its character forms an appropriate attitude towards a healthy lifestyle. Most students (82 %) understand the importance of physical activity in shaping healthy lifestyles and physical development, 76 % of students attend regular physical education classes. It is substantiated the importance of applying a person-oriented approach for conducting physical education classes, the need to establish a relationship between a teacher and students on a democratic and humane basis. Indicates the need to involve students in independent and specially organized sports at extra-curricular time, in particular in the training sections of sports education from selected sports. This desire was expressed by 58 % of the students surveyed.

**Key words:** physical activity, physical culture, students, establishment of higher education, motivation, healthy lifestyle, physical exercises.

## Introduction

Human physical activity is considered one of the most important natural organizers of a healthy lifestyle. The foundations of physical culture are laid in early childhood, intensively expanded and deepened in adolescence, and, being formed in cultural skills, are consolidated at a young age.

In the institution of higher education due to the optimization of educational material, professional skills of the teacher, intensification of the process of physical education achieves increased motivation for physical self-improvement and the formation of conscious and active attitude of students to exercise. Changes in the purpose of physical education, the essence of which is to form the physical culture of the individual, requires consideration of the interests and needs of students in the field of personal physical and spiritual improvement.

Creating an effective system of physical culture and health activities will help to strengthen the health of students, will compensate for the lack of the necessary amount of daily exercise, necessary for normal physical development. To increase the effectiveness of physical education, it is necessary to focus the pedagogical process on the formation of a healthy lifestyle of students.

Physical education is one of the important means of diverse and harmonious development of student

youth, increasing their physical fitness. Exercise and sports contribute to the formation of a healthy lifestyle in student youth, as well as spiritual and physical development. Exercise has a positive effect on health, increases neuropsychological resistance to emotional stress, maintains high physical and mental performance [5, p. 106-109]. Therefore, the formation of students' active positive motivation to engage in physical culture and sports should become one of the promising areas of higher education.

A significant amount of research on the organization of the process of physical education in higher education indicates the need to find modern tools, new technologies that can increase the motivation of students to exercise, will be aimed at forming a high culture of health, development of physical qualities [2, p. 56–58]. Much attention is paid to the problem of motivation in the choice of means of physical training, which could form a lasting interest in long-term classes. It is noted that the effectiveness of physical culture and sports also depends on various social factors.

To update the motives of physical culture and sports activities of students, physical education teachers are recommended to regularly and carefully study the needs of students in the field of physical culture; increase the number of sports sections of the most

popular sports among students; to optimize the time for physical education and sports within the curriculum [3, p. 52–56]. Taking into account the individual norms of motor activity is one of the essential factors in the formation of motivation for physical education classes for students [1, p. 5].

Modernization of the system of physical education of students on the basis of personality-oriented choice of physical activity helps to increase students' interest in the educational process, improves health, physical fitness, ensures the involvement of students in regular exercise and sports, forms their needs for physical development, helps to increase mental performance and improve learning performance [9, p. 183–186].

For the successful formation of motivation for the development of physical activity of students of higher education institutions it is necessary to apply a set of special tools and methods that correspond to the individual, differentiated and personality-oriented choice of students for further activities. This will form in them a positive attitude to physical culture and sports.

#### **Material and research methods**

The purpose of the article is to establish the leading factors that determine the needs, interests and motives for involving students in physical education; generalization of data of scientific and methodical literature on the formation of motivations for the development of physical activity in student youth and identify ways to optimize this process. The study was conducted on the basis of Kamyanskyi Podilsky National University named after Ivan Ogiienko. It was attended by first-year students of the Faculty of Ukrainian Philology and Journalism ( $n = 35$ ) and first-year students of the Faculty of Foreign Philology ( $n = 35$ ) women. The average age of students is 18-19 years.

When writing the article, the following research methods were used to solve the set tasks: theoretical analysis and generalization of data of scientific and methodological literature, pedagogical observation, sociological method (questionnaire), methods of mathematical statistics.

To study the level of motivation and attitude of students to physical education classes, a questionnaire was conducted using a developed questionnaire, compiled in accordance with the basic provisions and requirements for sociological research. The questionnaire included a set of questions that can be used to determine the level of students' interest in physical education, as well as motives for exercise and attitudes to various forms of physical activity. The obtained results were processed by methods of mathematical statistics.

#### **Research results**

Physical culture and health and sports activity of students largely depends on the formation of their motives. Motive is a person's motivation to be active in an effort to meet certain needs. The set of motives determines the motivation for activity.

The results of the study showed that the vast majority of students (82 %) understand the importance of physical activity in the formation of a healthy lifestyle and physical development, ie the desire to strengthen their health is the main motive for physical culture and sports. 76 % of students attend physical education classes regularly. Development of physical qualities and self-improvement are important for 31 % of respondents, improving the level of sportsmanship – for 18 %, the ability to communicate and make friends – for 12 % of surveyed students.

We also found that 62 % of students exercise only in physical education classes, ie this classroom form of work is leading to the creation of positive motivation of students to physical education and sports. Taking into account the valueological aspect of physical culture, students form the basic skills needed to strengthen not only their health but also the health of students.

But, of course, much attention should be paid to extracurricular activities, including student attendance at educational sections of sports education in selected sports. 58 % of the students we surveyed expressed a desire to study in such sections. We believe that this creates good preconditions for effective educational activities. The main task of such sections is to involve students in regular sports. Coaches-teachers during classes in sections try to promote sports improvement of students in the chosen sport, prepare them to participate in competitions, help to acquire knowledge and skills of instructor work and competition competition.

Also, in one of the questions of the questionnaire, students were asked to choose the most interesting sport for them. When analyzing the answers, it was found that the priority sports are: aerobics (31 %), fitness (25 %), swimming (18 %), sports (12 %). Thus, there is a need to take into account the sporting interests of students in order to increase their motivation for physical education.

It is important, in our opinion, that the majority of students during the survey (86 %) indicated the leading role of the teacher in providing them with assistance in improving health, improving physical fitness, in preparation for a successful test in physical education. The main task of a physical education teacher is to form a positive motive, interest and constant

need for physical exercises. Motivation becomes more effective in combination with stimulation. The stimulus can be both an assessment and a test, gratitude, word award.

### Discussion

Motivation for physical activity – a special state of personality, aimed at achieving the optimal level of physical fitness and efficiency. Systematic training is an important guarantee of normal physical and spiritual development of young people in the conditions of physical activity and professional activity, a prerequisite for the education of priority health orientations, a motivational stimulus to regular independent exercise. The formation of students' belief in the need for regular use of various forms of physical education and sports is of paramount importance. The effectiveness of student motivation is closely related to the competence of the teacher as a leader of the educational process and its appropriate psychological and pedagogical qualifications.

An important role in physical education and self-education of a person is played by the assimilation of the full amount of knowledge necessary for its proper implementation. At the student age the process of the most intensive mastering of bases of physical culture knowledge comes to the end. Boys and girls must have techniques for studying movements and improving key elements of sports equipment, know the techniques of analysis of exercise techniques. The number of known training exercises should be large enough, and the methods of their use are well mastered.

The young man and the young woman should be able to independently make a training program in order to develop the main aspects of their physical potential. It should not be particularly difficult for them to use new, previously unknown simulators after reading the instructions and guidelines. They must be fluent in physical culture and sports terminology, know the current sports life of the city, country, be interested in international sporting events.

The main tasks of the formation of physical activity of student youth are to provide students with knowledge and motivation to follow a healthy lifestyle; to form a stable habit of daily exercise, using various rational forms; to carry out systematic physical trainings with a health or sports orientation; to inform students about the main values of physical culture and sports; to diagnose and correct the formation of motor competencies of students in the process of physical education in higher education

[8, p. 84-87]. Effective solution of these problems is possible in the case of application in the process of physical education differentiated approach, which is due to the different composition of students by interests and motives.

In the theory and practice of physical improvement of students, the main form of physical education of students is physical education classes. All forms of classes are divided into regular and extracurricular. The formal form of classes involves the implementation of the educational process under the direct guidance of the teacher, extracurricular – both with the participation of the teacher and independently (morning, introductory, athletic gymnastics, independent individual lessons, sectional classes, competitions, etc.).

The primary role in the organization of the lesson is given to the multifaceted activities of the teacher, who sets specific tasks for students and creates appropriate conditions for their implementation. In addition, the teacher monitors the activities of students, evaluates and corrects their actions, doses the load by volume and intensity [7, p. 154–174].

Achieving high efficiency of each lesson is facilitated by the teacher's deep knowledge of the theory and methods of its implementation. If the lesson is effective, arouses interest and satisfaction of students, has an instructive focus, then it becomes a major factor in educating students in a strong habit of engaging in physical culture and sports in various forms. An essential condition for efficiency is the need to achieve optimal motor activity of all students during each lesson. Indicative of modern effective physical education classes is the variety of organizational forms, tools, methods and techniques used by the teacher.

Building a personality-oriented system of physical education of students, aimed at forming personal physical culture, will be more effective in terms of organizing constructive communication between teacher and students, stimulating the subjectivity of boys and girls, as well as ensuring the transition of physical education to physical education.

The end result of educational and training activities of students is the knowledge, skills and abilities acquired in physical education classes, as well as changes in the functional state of organs and systems (immediate training effects), which underlie changes in physical and mental condition of students (cumulative training effect, training, preparedness, sports form).

The introduction of the latest technologies in the process of organizing physical education, in particular personality-oriented, motivates students to exercise, optimize their physical activity not only during classes but also in extracurricular activities, promotes a healthy lifestyle.

For young people, the desire for high sports achievements can remain an important motive. At the same time, the success in a match between students of different faculties is no less significant for a person than the victory of a professional athlete at international competitions.

In order to form motivation for physical self-improvement of students, it is necessary that the proposed technologies of physical education are used not only in the educational space of the institution, but also in extracurricular activities.

Independent physical exercises, which should include morning hygienic gymnastics, hiking and excursions, jogging and walking, sports, skiing, cycling, aerobics, swimming, exercise, etc., should find practical implementation in the life of students.

Independent classes are of great educational importance, arouse interest in sports, cultivate initiative, a critical attitude to their successes and shortcomings. In the course of these classes the discipline of students increases [4, p.61–66].

The planning of such independent classes is carried out with the direct participation of physical education teachers.

Classes in sports sections are one of the forms of independent physical education, a form of self-expression and self-affirmation of the student, determining his lifestyle, cultural and socially significant priorities. Classes in sports sections allow students to solve or optimize certain problems, in addition, regular sports classes are an effective means of improving the value orientations of young people, their moral qualities and real lifestyle.

Motivation for students in sports sections is based on the desire to improve their sporting achievements, to reach a certain level, to be ahead in their sporting achievements of the opponent. The desire to be the best among their peers is a powerful motivation for independent exercise and sports [6, p. 297–308].

Comprehensive use of all forms of physical education should ensure the introduction of physical culture in the daily lives of students, achieving the optimal level of their physical activity.

### Conclusions

1. According to the conducted survey, physical exercises, active motor mode are of great importance in the formation of a healthy lifestyle, spiritual and physical development of student youth. Exercise strengthens health, increases resilience to emotional stress, and maintains physical and mental performance. The formation of motivation, improvement of skills and abilities, conscious perception of physical education as an important subject in the learning process are prerequisites for the formation of physical culture of the individual. 2. In the formation of students' motivation for physical improvement a decisive place is occupied by a teacher of physical culture. The richness of his personality, professional culture and pedagogical skills should provide such techniques and methods of pedagogical influence that enrich the emotional experience of a young person, develop imagination, interest, form in them a value attitude to exercise. When conducting physical education classes should take into account the interaction of teacher and student as a necessary condition for the harmonious development of personality.

We see the prospects for further research in the justification of the use of modern learning technologies to attract students to active physical education.

*Conflict of interest.* The authors state no conflict of interest.

### References

1. Базильчук В. Б. Організаційні засади активізації спортивно-оздоровчої діяльності студентів в умовах вищого начального закладу: автореферат дисертації на здобуття наукового ступеня кандидата наук з фізичного виховання: 24.00.02. Львівський державний інститут фізичної культури. Львів, 2004. 22 с. Bazilchuk V.B. Organizacijni zasady` akty`vizaciji sporty`vno-ozdorovchoyi diyal`nosti studentiv v umovax vy`shhogo nachal`nogo zakladu [Organizational bases of activation of students' sports and recreation activity in the conditions of higher elementary institution]. Dissertation author's abstract on obtaining a scientific degree of Candidate of Sciences in Physical Education: 24.00.02. Lviv State Institute of Physical Culture. Lviv, 2004. P.5. [in Ukraine].
2. Бугайчук Н. Способи оптимізації фізичного виховання студентів вищих навчальних закладів на сучасному етапі. Фізичне виховання, спорт і культура здоров'я у сучасному суспільстві: збірник наукових праць Східноєвропейського національного університету імені Лесі Українки. 2015. № 4 (32). Bugaychuk N. Sposoby` opty`mizaciji fizy`chnogo vy`hovannya studentiv vy`shhy`x navchal`ny`x zakladiv na suchasnomu etapi [Methods of optimization of physical education of students of higher educational establishments at the present stage]. *Physical Education, Sport and Health Culture in Modern Society: A Collection of Scientific Papers of Lesya Ukrainka Eastern European National University*. 2015. No. 4 (32). Pp.56–58. [in Ukraine].

3. Долженко Л., Погребняк Д. Формування мотивації до рухової активності студентської молоді з різним рівнем фізичного здоров'я. Теорія і методика фізичного виховання і спорту. Київ, 2014. № 4.  
Dolzhenko L., Pogrebnyak D. Formuvannya motyvaciyi do ruhovoyi aktyvnosti students'koyi molodi z rizny'm rivnem fizychnogo zdorov'ya [Formation of motivation for motor activity of student youth with different level of physical health]. *Theory and methodology of physical education and sport*. Kiev, 2014. № 4. Pp. 52–56. [in Ukraine].
4. Коваль О.Г., Гуска М.В. Проблеми оптимізації процесу формування фізкультурно-оздоровчих компетентностей студентів гуманітарних факультетів. Вісник Кам'янець-Подільського національного університету імені Івана Огієнка. Фізичне виховання, спорт і здоров'я людини: Випуск 15, 2019. doi: 10.32626/2309-8082.2019-15.61-65.  
Koval O.G., Guska M.V. Problemy` opty`mizaciyi procesu formuvannya fizkul`turno-ozdorovchy`x kompetentnostej studentiv gumanitarny`x fakul`tetiv [Problems of optimization of the process of formation of physical and health competences of students of humanities faculties]. *Bulletin of Kamyanets-Podilskiy Ivan Ogiyenko National University. Physical Education, Sports and Human Health: Issue 15, 2019*. Pp. 61–66. [in Ukraine].
5. Косинський Е. Самооцінка стану здоров'я студентів і їх мотивація до занять фізичним вихованням. Молода спортивна наука України. Збірник наукових праць з галузі фізичного виховання, спорту і здоров'я людини. Львів, 2011. Вип. 15. Т. 2.  
Kosinski E. Samoocinka stanu zdorov'ya studentiv i yix motyvaciya do zanyat` fizychny`m vy`hovannjam [Self-esteem of students' health and their motivation for physical education]. *Young sports science of Ukraine. Collection of scientific works in the field of physical education, sports and human health*. Lviv, 2011. Vol. 15. T. 2. Pp. 106–109. [in Ukraine].
6. Москальов В. В., Русанов М. В., Левченко М. О. Мотивація як один із засобів залучення студентів ХДУХТ до регулярних тренувань у спортивних секціях та індивідуальних занять фізичною культурою. Економічна стратегія і перспективи розвитку сфери торгівлі та послуг: збірник наукових праць. Харків: ХДУХТ, 2016. Вип. 2(24).  
Moskalyov V. V., Rusanov M. V., Levchenko M. O. Motyvaciya yak ody`n iz zasobiv zaluchennya studentiv XDUXT do reguljarny`x trenuvan`u sportyvny`x sekciyah ta indy`vidual'ny`x zanyat` fizychnoyu kul`turoyu [Motivation as one of the means of attracting CDCC students to regular training in sports sections and individual physical education classes]. *Economic Strategy and Prospects for Trade and Services Development: Collection of Scientific Papers*. Kharkiv: CDHDT, 2016. Vol. 2 (24). Pp.297–308. [in Ukraine].
7. Плахтій П. Д., Коваль О. Г., Марчук В. М., Рябцев С. П. Основи фізичного виховання студентської молоді: Навчальний посібник. Кам'янець-Подільський: ТОВ «Друкарня Рута», 2012.  
Plakhty P.D., Koval O. G., Marchuk V. M., Ryabtsev S. P. Osnovy` fizychnogo vy`hovannya students'koyi molodi [Fundamentals of Physical Education of Student Youth]: A Textbook. Kamianets-Podilskiy: Ruta Printing House, 2012. Pp. 154–174. [in Ukraine].
8. Петренко Ю. І., Ашанін В. С. Про актуальність формування рухових компетенцій студентів вищих закладів освіти: Матеріали XVII Міжнародної науково-практичної конференції «Фізична культура, спорт та здоров'я: стан, проблеми та перспективи» (м. Харків, 7–8 грудня 2017 р.). Харків, 2017.  
Petrenko Yu. I., Ashanin V. S. Pro aktual`nist` formuvannya ruhovy`x kompetencij studentiv vy`shhy`x zakladiv osvity` [On the relevance of the formation of motor competencies of students of higher education institutions]: *Physical Culture, Sports and Health: State, Problems and Prospects*. 17<sup>th</sup> International Scientific and Practical Conference, December 7–8, 2017. Kharkiv: Kharkiv State Academy of Physical Education. Pp. 106–109. [in Ukraine].
9. Ткаченко П. П. Модернізація системи фізичного виховання студентів на основі особистісно орієнтованого вибору рухової активності. Біомеханічні, педагогічні, медико-біологічні та психологічні аспекти фізичного виховання та спорту: вісник Чернігівського національного педагогічного університету. 2016. № 139 (Т. 1).  
Tkachenko P. P. Modernizaciya sy`stemy` fizychnogo vy`hovannya studentiv na osnovi osoby`stisno oriyentovanogo vy`boru ruhovoyi aktyvnosti [Modernization of the system of physical education of students on the basis of personally oriented choice of physical activity]. *Biomechanical, pedagogical, medical, biological and psychological aspects of physical education and sport: Bulletin of Chernihiv National Pedagogical University*. 2016. №. 139 (Vol. 1). Pp. 183–186. [in Ukraine].

Received for publication 10.02.2020

# MEANS OF IMPROVING THE PHYSICAL AND TECHNICAL PREPAREDNESS OF AMATEUR VOLLEYBALL PLAYERS AGED 18–21 IN THE EDUCATIONAL PROCESS

V. Liashenko<sup>1</sup>, O. Gatsko<sup>2</sup>, N. Gnutova<sup>2</sup>, N. Petrova<sup>2</sup>

<sup>1</sup> National University of Food Technologies, Kyiv, Ukraine

<sup>2</sup> Borys Grinchenko Kyiv University, Kyiv, Ukraine

corresponding author – V. Liashenko : v.liashenko@kubg.edu.ua

doi: 10.32626/2309-8082.2020-16.37-41

The influence of systematic training on the development of physical properties that promotes good mastering techniques and tactical interactions. *The purpose* of the study was to pilot test the effectiveness of application of selected tools aimed at the development of physical qualities and technical proficiency of Amateur volleyball players 18–21 years. To achieve this goal we used the following research methods: analysis and generalization of literature sources, questioning, pedagogical observation, pedagogical experiment, methods of mathematical statistics. *Results*. After using a specific program with the use of tools aimed at improving technical skills, we found that in an exercise “attacking blow with a private toss the ball (from zone 4 to zone 5)” index in the control group made up 6.54 points, 0.50 points better than in the beginning of the experiment, the experimental group showed

improvement by 1.79 points and became equal to 8.33 points, by 2.80 points more than the control group ( $p < 0.05$ ). Regarding “Attacking impact from a zone 4 to zone 1” have a record in the control group – 5.95 points, 0.50 points better than in the beginning of the experiment, the experimental group showed improvement by 2.43 points and equal to 8.15 points, to 2.20 points more than the control group ( $p < 0.05$ ). *Conclusions*. According to studies, volleyball is one of the most popular sports among students and is 36, as 36 soccer, 12 – table tennis and 16 of other sports. The influence of selected media on the physical and technical preparedness of Amateur volleyball players 18–21 years, the differences in the indicators of physical and technical preparation control and experimental groups significant ( $p < 0,05$ ).

**Keywords:** volleyball, preparedness, striker, shuttle, jumping.

## Introduction

Modern volleyball is a complex sport that requires athlete training and perfect technical and tactical skills. Without persistent and systematic training work to achieve high sports results in modern volleyball is impossible [7; 9].

Modern requirements for achieving the greatest results in volleyball make certain changes in the training of volleyball players. Playing volleyball includes sudden and rapid movements, jumps, falls and other actions, in this regard, the volleyball player must have an instant reaction, speed on the court, jumping and other properties in certain combinations [4]. At the small sizes and limited touches of a ball, performance of all technical and tactical elements demands accuracy and purposefulness of movements [3].

Therefore, the systematic development of physical properties contributes to the successful mastery of the game technique and tactical interactions. Physical training is mainly focused on the development of speed, agility, general endurance, speed-power qualities. When skills and tactics are acquired or improved, physical training provides the basis for improving mastery of techniques and tactics. It is known that the physical training of a volleyball player is closely related to tactical, technical and psychological training and contributes to the rapid

mastery and strong consolidation of tactical skills and techniques [4; 5; 12].

In the educational and training process, volleyball training involves a system of pedagogical influence on the formation of personality, not just physical education. Therefore, the training process is subject to high requirements, which are not limited to the training of athletes [1].

## Material and research methods

The purpose of the study was to experimentally test the effectiveness of the selected tools aimed at the development of physical qualities and technical training of amateur volleyball players 18–21 years.

To achieve this goal, the following research methods were used: analysis and generalization of literature sources, questionnaires, pedagogical observation, pedagogical experiment, methods of mathematical statistics. Analysis and generalization of literary sources were used to study the impact of various means of physical education on improving the level of physical fitness and technical skill. The questionnaires were used to collect data on the age of the respondents, the most popular sports among students and the roles in which they play. Pedagogical observation consisted in the objective registration of each training, purposeful and systematic recording of research data. During the pedagogical experiment, respondents

were divided into control and experimental groups, where the control group was engaged in a standard program, and experimental – using our program applying tools aimed at developing physical qualities and technical training of amateur volleyball players aged 18–21. Among the methods of mathematical statistics used t – Student for statistical validation of the data.

### Results of the research

The research was conducted on the basis of Borys Hrinchenko University of Kyiv. The pedagogical experiment involved 25 students aged 18–21, who are engaged in the volleyball section 2 times a week. Initially, we conducted a survey in which students said that in their opinion, volleyball is one of the most popular sports among students and is – 36 %, as well as 36 % – soccer, 12 % – table tennis and 16 % – other sports. We found out

from the respondents in which roles they play: in the role of a striker – 37 %, 30 % in the role of a defender, 33 % in the role of connecting players and libero.

During the experiment, the level of physical and technical training of the control and experimental group was determined. According to the results of the study, there were no significant differences among the subjects at the beginning of the experiment ( $p > 0.05$ ).

After running classes with the use of our proposed tools to improve the level of physical and technical skills, re-testing was conducted. The results in the tests «Attack hit of volleyball after it being tossed by player himself (from zone 4 to zone 5)» and «Attack hit from zone 4 to zone 1» volleyball players aged 18–21 of control and experimental groups are presented in table 1.

**Table 1 – Test indexes in the control and experimental group before the experiment**

Tests	Control group	Experimental group	Certainty	
	$X \pm m$	$Y \pm m$	t	t table
"Attack hit of volleyball after being tossed by player from zone 4 to zone 5" (points)	$6,04 \pm 0,33$	$6,54 \pm 0,33$	0,60	2,18
"Attack hit from zone 4 to zone 1" (points)	$5,45 \pm 0,25$	$5,72 \pm 0,43$	0,32	2,18

The test results obtained at the beginning of the pedagogical experiment were as follows: «Attack hit of volleyball after it being tossed by player himself (from zone 4 to zone 5)» index in the control group was 6.04 points, in the experimental – 6.54 points. No reliably significant discrepancies between the indexes of the control and experimental groups were found ( $p > 0.05$ ). In the next exercise «Attacking hit from zone 4 to zone 1» index of the control group at the beginning of the experiment was 5.45 points, in the experimental group – 5.72 points.

No reliably significant discrepancies between the indexes of the control and experimental groups were found ( $p > 0.05$ ). After running the selected program with the use of tools aimed at improving technical skills, we compared the results in the tests «Attack hit of volleyball after it being tossed by player himself (from zone 4 to zone 5)» and «Attack hit from zone 4 to zone 1» volleyball players aged 18 – 25, the data are presented in table 2.

**Table 2 – Test indexes in the control and experimental groups after the experiment**

Tests	Control group	Experimental group	Certainty	
	$X \pm m$	$Y \pm m$	t calc	t table
«Attack hit of volleyball after being tossed by player from zone 4 to zone 5» (points)	$6,54 \pm 0,22$	$8,33 \pm 0,18$	2,80	2,18
"Attack hit from zone 4 to zone 1" (points)	$5,95 \pm 0,11$	$8,15 \pm 0,34$	2,33	2,18

According to the results of the test «Attack hit of volleyball after it being tossed by player himself (from zone 4 to zone 5)» the index in the control group was 6.54 points, which is 0.50 points better than at the beginning of the experiment. In the experimental group the index improved by 1.79 points and became equal to 8.33 points, which is 2.80 points more than in the control group ( $p < 0.05$ ).

Regarding the «Attack hit from zone 4 to zone 1» in amateur volleyball players aged 18-25 in the experimental and control groups, we have the following results: the index in the control group was 5.95 points, which is 0.50 points better than at the beginning of the experiment. In the experimental group the index improved by 2.43 points and is equal to 8.15 points, which is 2.20 points more than in the control group ( $p < 0.05$ ).

Determining the reliability of differences according to Student's t-test indicates that the differences between the arithmetic mean values obtained during the experiment are reliable and the tools and methods we selected had a positive impact on technical training of volleyball players.

To determine the physical fitness of the subjects and the effectiveness of means aimed at developing physical qualities before and after the experiment, we used tests such as shuttle running 3x10 meters, running 60 meters, jumping up from a deep squat and jumping rope (table 3

In the test «Shuttle run 3x10m» no significant increase is observed, but in other tests changes that are mathematically confirmed when processing the results are recorded..

**Table 3 – Comparison of the results of physical fitness before and after the experiment in the experimental and control groups**

Tests	Before and after the experiment		
	Before the experiment	After the experiment	Certainty
	<b>Experimental group</b>		
Shuttle running 3x10, (c)	11,9 ± 0,32	11,6 ± 0,26	$p > 0,05$
Running 60 m, (s)	9,9 ± 0,29	9,0 ± 0,13	$P < 0,05$
Jumping up from a deep squat for 30 seconds. (number of times)	21,0 ± 0,62	25,0 ± 0,32	$P < 0,05$
Jumping rope in 30 seconds. (number of times)	50,7 ± 0,65	58,3 ± 2,27	$p < 0,05$
	<b>Control group</b>		
Shuttle running 3x10 m, (s)	12,6 ± 0,29	12,4 ± 0,32	$P > 0,05$
Running 60 m, (s)	10,3 ± 0,34	10,0 ± 0,32	$p < 0,05$
Jumping up from a deep squat for 30 seconds. (number of times)	19,2 ± 0,68	21,0 ± 0,39	$p < 0,05$
Jumping rope in 30 seconds (number of times)	48 ± 2,92	50,8 ± 1,95	$p < 0,05$

### Discussion

Amateur volleyball players have a level of technical training at the initial level, where they are just beginning to learn and develop in this sport, so with regular and methodically sound training, the technical elements become clearer and more confident. Various authors argue that it is important in the process of training volleyball

players to select preparatory exercises for special physical training, which in nature and structure of movements are similar to certain techniques to their varieties and elements [2; 8; 11]. According to the research of O. Shvai, volleyball players of different game roles have different levels of physical fitness, in particular, players of the first tempo have the highest rates of long jump, throwing a

stuffed ball and shuttle running. Of the many indicators of assessment of physical fitness, libero players are inferior to players of the first tempo and are closer to the level of training of volleyball players of the second tempo [10].

In our study, we also used exercises to develop physical qualities, among which, for instance, to develop jumping skills, were used: jumping up from a deep squat, which is – 27 %, 23 % – jumping over barriers and 20 % – long jumping. For the development of speed – shuttle running, and for the development of strength endurance – pull-ups and pushups.

According to G. Protsenko, the influence of volleyball-specific means on the comprehensive development and functional state of the organism completely depends on the level of mastering the skills of the game. Therefore, at the initial stage of the long-term process of training volleyball players, exercises in technique, tactics and the game of volleyball do not sufficiently affect the overall physical development of students. Therefore, in order for the workload to be optimal, it is necessary to use a certain number of general developmental and preparatory exercises [6].

According to Khavrunyak I. V. skillful and correct selection of methods, principles and tools used in the

classroom, will help to form skills in mastering techniques and tactical actions, will promote the development of physical and moral qualities of the athlete. An important stage of the methodology of training is the phasing of classes and their year-round periodization, taking into account the principles of training [9].

### Conclusions

The results obtained during the work, in particular after the tests for physical (shuttle run 3x10, run 60 m, jumping up from a deep squat for 30s, jumping rope for 30s.) and technical readiness («Attack hit of volleyball after it being tossed by player himself (from zone 4 to zone 5)» and «Attack hit from zone 4 to zone 1») indicate that our selected tools have increased the level of development of physical qualities and technical training of amateur volleyball players aged 18–21.

Prospects for further research are to develop new sets of exercises aimed at improving the technical skills of amateur volleyball players aged 18–21 in the training process, taking into account the role of player in the game.

*Conflict of interest.* The author declares no conflict of interest.

### References

1. Аверин И. В. Специальная подготовка волейболиста. Спорт в shk. 2000. № 11–12. С. 9–16.  
Averyn, Y. V. (2000), "Spetsyalnaia podgotovka voleibolysta" [Volleyball Special Training]. Sport v shk. No. 11–12. pp. 9–16. [in Russia].
2. Арзютов Г. Точність побудови руху в спортивних іграх, відмінності та зміни в структурі підготовленості спортсменів різної кваліфікації, статі, віку. Фізичне виховання, спорт і культура здоров'я у сучасному суспільстві : зб. наук. пр. Волин. нац. ун-ту ім. Лесі Українки. Луцьк: ВНУ ім. Лесі Українки. No 3 (19). 2002. С. 312–316.  
Arziutov, H. (2012), "Tochnist pobudovy rukhu v sportyvnykh ihrakh, vidminnosti ta zminy v strukturі pidhotovlenosti sportsmeniv riznoi kvalifikatsii, stati, viku". [Accuracy encourage athletes in sports games, performance and training in the structure of preparedness of sportsmen, qualifications, statistics, statistics]. Fizychnе vykhovannia, sport i kultura zdorovia u suchasnomu suspilstvi : zb. nauk. pr. Volyn. nats. un-tu im. Lesi Ukrainky. Lutsk: VNU im. Lesi Ukrainky. No 3 (19). pp. 312–316. [in Ukraine].
3. Буданова, Е. А. Козырева, Е. В. Оценка эффективности технико-тактических действий квалифицированных волейболистов. Теория и методика физической культуры и спорта: Наследие основоположников и перспективы развития: Материалы Международной научной конференции, посвященной 85 – летию со дня рождения Л. П. Матвеева, РГУФКСИТ, 26 – 28 мая 2010 / под общей редакцией А. Н. Блеера, В. П. Полянской. М.: Светотон. 2011. С. 97–99.  
Budanova, E. A. Kozireva, E. V. (2011), "Otsenka effektivnosti tekhniko-taktycheskykh deistviy kvalifitsirovannykh voleibolistov". [Evaluation of the effectiveness of the technical and tactical actions of qualified volleyball players]. Teoriya y metodyka fizycheskoi kulturi y sporta: Nasledye osnovopolozhnykov y perspektyvi razvytiya: Materialy Mezhdunarodnoi nauchnoi konferentsyy, posviashchennoi 85 – letiyu so dnia rozhdeniya L. P. Matveeva, RHUFKSyT, 26–28 maia 2010 / pod obshchei redaktsiyei A. N. Bleera, V. P. Poliianskoi. M.: Svetoton. 1. pp. 97–99. [in Russia].
4. Вольчинський А. Особливості тренування студентів-волейболістів із різною фізичною підготовкою. Молодіжний науковий вісник Східноєвропейського національного університету імені Лесі Українки. 2015. Вип. 17. С. 38–42.  
Volchynskyi, A. (2015), "Osoblyvosti trenuvannia studentiv-voleibolistiv iz riznoiu fizychnoiu pidhotovkoiu". [Specialties of coaching student-volleyball club]. Molodizhnyi naukovyi visnyk Skhidnoevropeiskoho natsionalnoho universytetu imeni Lesi Ukrainky. Vyp. 17. pp. 38–42. [in Ukraine].
5. Круцевич Т. Ю. Теорія і методика фізичного виховання. Т. 1. К. : Олімп. л-ра, 2012. 392 с.  
Krutsevych, T. Yu. (2012), "Teoriia i metodyka fizychnoho vykhovannia" [Theory and methodology of physical education]. T. 1. K. : Olimp. l-ra, 392 p. [in Ukraine].
6. Проценко Г. Визначення особистісно-орієнтованого стилю спілкування тренера в процесі тренувальної та змагальної діяльності юних волейболісток. Молода спортивна наука України, 2008. Т. 1. С. 270.  
Protsenko, H. (2008), "Vyznachennia osobystisno-orientovanoho stiliu spilkuvannia trenera v protsesi trenuvainoi ta zmahalnoi diialnosti yunykhn voleibolistok" [Visualization of a special and coordinated style of coaching a coach in the process of training and training of young volleyball players]. Moloda sportyvna nauka Ukrainy. T. 1. p. 270. [in Ukraine].

7. Соколюк О. Структура та зміст тренувальної роботи учнів-волейболістів 10–11 класів протягом підготовчого періоду річного циклу підготовки в спортивній секції. Фізичне виховання, спорт і культура здоров'я у сучасному суспільстві: зб. наук. пр. Волин. нац. ун-ту ім. Лесі Українки. Луцьк, 2012. № 4(20). С. 486–491.  
Sokolvak, O. (2012) "Struktura ta zmist trenovalnoi roboty uchniv-voleibolistiv 10–11 klasiv protiahom pidhotovchoho periodu richnoho tsykladu pidhotovky v sportyvni sektsii" [Structure and content of the training work of volleyball students of 10– 11 grades during the preparatory period of the annual cycle of preparation in the sports section]. Fizychnе vykhovannia, sport i kultura zdorovia u suchasnomu suspilstvi: zb. nauk. pr. Volyn. nats. un-tu im. Lesi Ukrainky. Lutsk. No 4(20). pp. 486–491. [in Ukraine].
8. Савицкая, Г. В. Ключникова, Н. Н. Техническая подготовка для достижения желаемого результата в волейболе. Совершенствование учебного и тренировочного процессов в системе образования: сборник научных трудов. Ульяновск: УлГТУ. 2009. С. 168–169.  
Savitskaia, H. V. Kliuchnykova, N. N. (2009), "Tekhnicheskaia podhotovka dlia dostyazhenia zhelaemoho rezultata v voleibole" [Technical training to achieve the desired result in volleyball]. Sovershenstvovanye uchebnoho y trenirovochnoho protsessov v systeme obrazovaniia: sbornik nauchnykh trudov. Ulianovsk: UIHTU. pp. 168–169. [in Russia].
9. Хавруняк І. В. Особливості навчально-тренувального процесу підготовки волейболістів у вищих навчальних закладах. Молодий вчений. 2015. № 2(6). С. 515–518.  
Khavruniak, I. V. (2015), "Osoblyvosti navchalno-trenovalnoho protsesu pidhotovky voleibolistiv u vyshchyykh navchalnykh zakladakh" [ Peculiarities of the training process of training volleyball players in higher educational establishments]. Molodyi vchenyi. No 2(6). pp. 515–518. [in Ukraine].
10. Швай О. Ефективність фізичної підготовки кваліфікованих волейболістів різних ігрових амплуа. Фізичне виховання, спорт і культура здоров'я у сучасному суспільстві : зб. наук. пр. Волин. нац. ун-ту ім. Лесі Українки. Луцьк : ВНУ ім. Лесі Українки, 2012. № 2 (18). С. 332–335.  
Shvai, O. (2012), "Efektyvnist fizychnoi pidhotovky kvalifikovanykh voleibolistiv riznykh ihrovykh amplua" [The efficiency of physical training of qualified volleyball players of different playing fields]. Fizychnе vykhovannia, sport i kultura zdorovia u suchasnomu suspilstvi : zb. nauk. pr. Volyn. nats. un-tu im. Lesi Ukrainky. Lutsk : VNU im. Lesi Ukrainky. No 2 (18). pp. 332–335. [in Ukraine].
11. Стрельникова Е. Я., Ляхова Т. П. Особенности подготовки игроков I темпу на современном этапе развития волейболу. Проблемы и перспективы развития спортивных игр и единоборств в высших учебных заведениях: сборник статей X международной научной конференции. Белгород-ХарьковКрасноярск, ХГАФК, 2014. Т. 2. С.175–178.  
Strelnykova, Ye. Ya., Liakhova T. P. (2014), "Osoblyvosti pidhotovky hrovtsiv I tempu na suchasnomu etapi rozvytku voleibolu" [Features of preparation of players and tempo at the present stage of development of volleyball]. Problemi y perspektyvi rozvytia sportyvnykh yhr y edynoborstv v visshykh uchebnykh zavedenyakh: sbornyk statei X mezhdunarodnoi nauchnoi konferentsyy. Belhorod-KharkovKrasnoiarisk, KhHAFK. T. 2. pp.175–178. [in Ukraine].
12. Ievgeniia Strelnykova, Alina Mel'nik, Tamara Liakhova. Analysis of gaming actions of the central blocking in competitive activity of women's volleyball amateur teams. Slobzhanskyi herald of science and sport. № 2(64), 2018. P. 57–60.  
Ievgeniia Strelnykova, Alina Mel'nik, Tamara Liakhov, (2018), "Analysis of gaming actions of the central blocking in competitive activity of women's volleyball amateur teams" Slobzhanskyi herald of science and sport. No 2(64). pp. 57–60.

Received for publication 15.01.2020

# FEATURES OF INDICATORS OF HIGHLY QUALIFIED ROWERS DURING THE PASSAGE OF THE COMPETITIVE DISTANCE ON THE SIMULATOR «CONCEPT-2»

O. Omelchenko<sup>1</sup>, M. Sidak<sup>2</sup>

<sup>1</sup> Prydniprovsk State Academy of Physical Culture and Sports, Dnipro, Ukraine

<sup>2</sup> National University «Zaporizhia Polytechnic», Zaporizhzhya, Ukraine

corresponding author – O. Omelchenko: ollenka7777@gmail.com

doi: 10.32626/2309-8082.2020-16.42-46

The main problem of specialists in the field of physical culture and sports for a long time is to improve the training process of athletes, namely highly skilled rowers in rowing academic. Improving the training process involves finding new tools and techniques that can improve the rower's athletic performance. This includes improving the various qualities of rowers – strength, strength endurance, special endurance, maximum strength, as well as the functional preparedness and technical qualities of athletes. Improving the rowing process of rowing in academia also involves the use of various tools and techniques, as well as special simulators and devices. These simulators include the “Concept-2” simulator. This simulator allows you to measure the speed of rowing, the power of rowing, the time of passing the distance and the time of passing individual segments of the competitive distance. *Purpose:* to determine the peculiarities of time, pace and power of highly skilled rowers in rowing at the academic course 2000 m on the simulator “Concept-2”.

*Material and methods:* analysis and generalization of scientific and methodological literature, analysis of the passing of the competitive distance on the simulator “Concept-2” (n = 20), methods of mathematical statistics. Results: The results of the analysis of indicators show that when passing the first and fourth segments of the competitive distance, rowing athletes show the best results, while the second and third are the lowest. These data testify to the fact that rowers have a well-developed speed and high-speed strength, but require the development and improvement of qualities such as strength and special endurance. It is established that the need to improve the strength and special endurance of athletes in the construction of the rowing process in rowing academic. *Conclusions:* The results of the study showed the need to improve the rowing training process in rowing academic using the “Concept-2” simulator.

**Key words:** indicators of time, pace, rowers, the simulator «Concept-2».

## Introduction

Academic rowing is one of the oldest sports, which has been included in the program of the Olympic Games since 1900. In addition to the Olympic Games, the World Championships, the World Cup, the World Championship among students, and the World Championship among youth are held annually.

One of the leading problems of modern sports, of course, is improving the system of training highly qualified athletes [2; 3; 19]. Today, the training process of highly qualified rowers is impossible without the use of simulators and special devices [11; 12; 16]. Different types of simulators are used in academic rowing (simulators for general physical training, simulators for technical improvement, simulators with variable resistance) [5; 9; 17]. According to leading experts, the improvement of physical training, including the use of the simulator «Concept -2» is the basis for achieving high sports results of rowers [18; 20].

Ergometer « Concept-2» is one of the main simulators, which allows you to combine the process of development of various motor skills of the rower with technical improvement and which accurately imitates the technique of rowing, the degree and nature of muscular effort. Currently, the use of the simulator allows you to get many indicators, namely: the pace of rowing, the power

of rowing, the time of the entire distance and the time of the distance segment. Obtaining these indicators makes it possible to analyze the effectiveness of the training or competitive distance, identify errors and shortcomings, as well as adjust the training process of the athlete [9; 15].

The purpose is to determine the features of time, pace, power of highly qualified rowers when passing the competitive distance on the simulator «Concept-2» at the Championship of Ukraine in rowing on ergometers.

## Material and methods

The research was conducted during the Championship of Ukraine in rowing on ergometers 2020 (Koncha-Zaspa). The passage of the 2000 m competitive distance by rowers was analyzed (n = 20). Analysis concerned the passage of a competitive distance of 2000 m in general and passing some segments – 500 m, 1000 m, and 1500 m.

## Methods of study

Analysis and generalization of scientific and methodological literature and the Internet, analysis of the competitive distance on the simulator «Concept-2», methods of mathematical statistics. The research was carried out on the ergometer «Concept-2» PM 5. Indicators of time, pace, power of rowers were measured at the following distances – 500 m, 1000 m, 1500 m, and 2000 m.

### Research results

We present our analysis of time, pace, power of rowers-academicians while passing the competitive distance on the simulator «Concept-2» during the Championship of Ukraine in rowing on ergometers. The analysis of the above indicators was carried out by us in order to determine those sections of the distance that athletes go with the worst indicators. Thus, the analysis

made it possible to adjust the training process of physical training of rowers using the simulator «Concept-2» and emphasize the improvement of those qualities that are needed to overcome the competitive distance on this simulator. Thus, Figure 1 shows the time indicators for the competitive distance by rowers on the simulator «Concept-2».

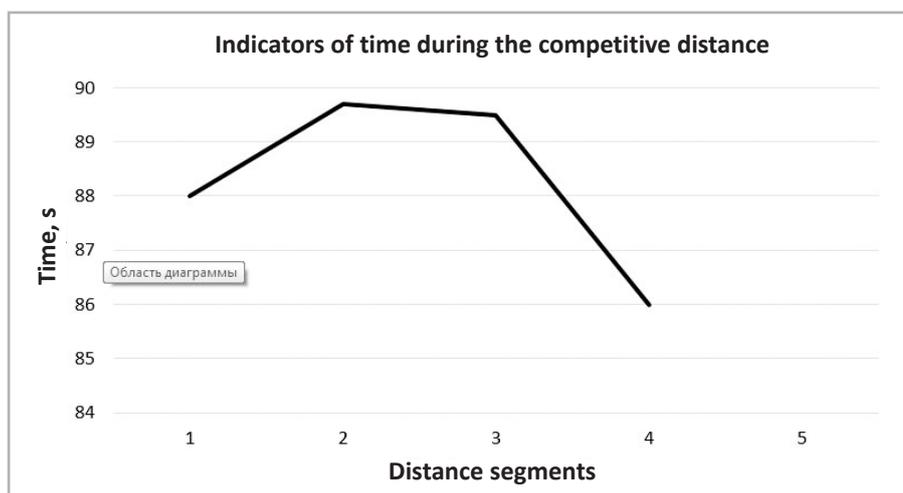


Fig. 1 Time indicators of rowers on the passage of the competitive distance of 2000 m on the simulator «Concept -2»

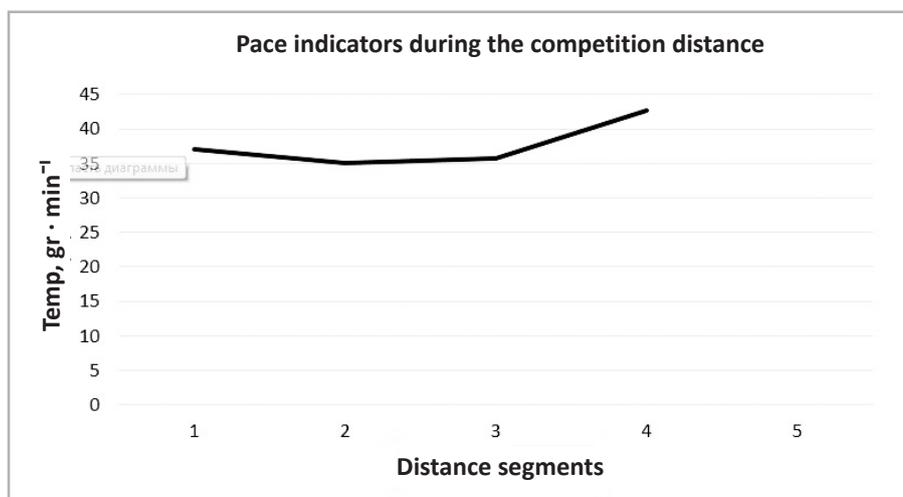


Fig. 2 Indicators of the pace of rowers on the passage of the competitive distance of 2000 m on the simulator «Concept -2»

The analysis of indicators was made on separate segments of 500 m. Thus, the study of time indicators during the distance shows that the first segment of 500 m was passed by athletes in 88 s, while the second and third segments were passed in 89.7 and 89, 5 s, respectively. Athletes with the best result of 86 seconds overcame the fourth segment of the distance.

In Figure 2 presents the data of the rate of pace when passing the competitive distance by rowers on the simulator «Concept-2».

The obtained indicators show that the rowers equally successfully overcame the first three sections of the

distance at a rate of 35 strokes per minute, and during the last, fourth segment of 500 m the pace increased to 42 strokes per minute.

Figure 3 shows the power data of rowers when overcoming the competitive distance of 2000 m on the simulator «Concept-2». Athletes with a power of 504 W, the second and third segments with a power of 479 and 488 W, respectively, covered the first segment of the distance.

The last, fourth segment of 500 m was overcome with a power of 554 watts.

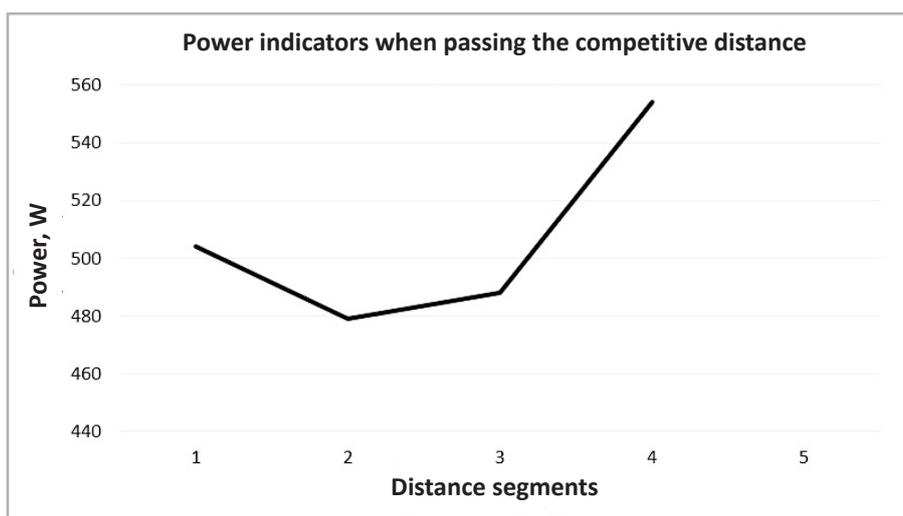


Fig. 3 Indicators of rowers power on passing the competitive distance of 2000 m on the simulator «Concept -2»

The obtained data allowed establishing that the indicators of time, pace and power of rowers when overcoming the competitive distance of 2000 m on the simulator «Concept -2» indicate the following. Athletes showed the best results on all three indicators in the first and last segments of the competitive distance - the first and fourth. Worse indicators of time, pace and power of rowers are observed on the second and third sections of the distance.

The time indicators of athletes in the second and third segments of the distance deteriorated by 4% compared to the time of the last segment.

The pace of the rowers during the distance varied as follows. In the first segment, the pace was 37 strokes per minute, in the second and third segments the rowing speed deteriorated by 5 %, but in the last, fourth segment it improved by 14 % and amounted to 42 strokes per minute.

The analysis of power indicators showed that the highest indicators were at the finish, fourth segment of the distance and amounted to 554 watts. In comparison with this indicator, the power of the first leg of the distance was worse by 9%, the second and third by 13 and 12 %, respectively.

The data obtained during the study make it possible to establish that when athletes overcome the competitive distance of 2000 m on the simulator «Concept-2» the following trend is observed. Rowers covered the first and last sections of the distance with the best results. While the second and third segments were passed with much lower scores. The obtained indicators point out the need to improve such qualities of rowers as strength and special endurance.

### Discussion

The study complements and confirms the data of special scientific and methodological literature that the leading qualities of rowers are strength and special endurance [1; 4]. This is due to the fact that academic rowing refers to cyclic sports, the work of which is performed for 6-8 minutes. Some experts emphasize the development and improvement of other individual physical qualities, such as special and general endurance [8; 10], speed [14], strength [7], as well as improving the power component of special endurance [1]. Also, the results of our study coincide with the opinions of experts that when overcoming the competitive distance on the simulator «Concept-2» the determining factors are the speed and pace of the distance [6; 13].

The obtained results of passing the competitive distance are conditioned by its length and duration of passing. When overcoming the distance, rowers need to show many physical qualities, such as endurance, special endurance, strength endurance, speed, maximum strength. However, maintaining the same level of all physical qualities is technically impossible. The predominant influence is those qualities that carry the main load during competitive activities [7]. Naturally, some qualities are well developed, while others need attention and additional training. Uneven development of physical qualities affects the result of the distance – when passing the first and last segments, such physical qualities as strength, speed force, maximum force play a significant role. Still when passing the second and third segments - general, special and strength endurance.

## Conclusions

1. The peculiarities of time, pace, power of highly qualified rowers during the competitive distance on the simulator «Concept -2» were analyzed.

2. It was established that the following tendency is observed when passing separate segments of the distance: the first and last segments of the competitive distance were passed with the best indicators in comparison with the second and third segments.

3. According to the results of the study, it was determined that the obtained data indicate the need to improve such physical qualities of rowers as strength and special endurance.

Gratitude. The study was conducted in accordance with the Thematic plan of scientific research of the Prydniprovsk State Academy of Physical Culture and Sport for 2016-2020 on the topic: «Theoretical and methodological foundations for improving the training process and competitive activities at different stages of training athletes», state registration number 0116 U 003007.

*Conflict of interest.* The authors declare no conflict of interest.

## References

1. Дьяченко А.Ю. Ярмошук В. Методика вдосконалення силового компонента спеціальної витривалості веслувальників із застосуванням спеціалізованого ергометра Dyno-Concept. Теорія і методика фізичного виховання і спорту. 2009. № 1. С. 7–12.  
Djjachenko, A.J. Jarmoshuk, V. (2009), Metodyka vdoskonalennja sylovogho komponenta special'noji vytryvalosti vesluval'nykiv iz zastosuvannjam specializovanogho erghometra Dyno-Concept. [The technique of improving the strength component of special endurance of rowers with the use of specialized ergometer Dyno-Concept] Teorija i metodyka fizychnogho vykhovannja i sportu.. № 1. P. 7–2. [in Ukraine]
2. Коженкова А. Особливості змагальної діяльності спортсменів високої кваліфікації у веслуванні академічному. Теорія і методика фізичного виховання і спорту. 2013;(2):14-7.  
Kozhenkova, A. (2013), Osoblyvosti zmaghal'noji dijal'nosti sportsmeniv vysokoji kvalifikaciji u vesluvanni akademichnomu. [Features of competitive activity of athletes of high qualification in rowing academic] Teorija i metodyka fizychnogho vykhovannja i sportu. (2): 14-7. [in Ukraine]
3. Крылов Л.Ю. Оценка функциональной подготовленности гребцов на байдарках с использованием гребного эргометра. Спортивный психолог. 2015. № 1 (36). С. 62–66.  
Krylov, L.J. (2015), Ocenka funkcjonal'noj podgotovlennosti ghrebcov na bajdarkakh s ispol'zovanyem ghebnogho erghometra. [Evaluation of the functional readiness of kayakers using a rowing ergometer] Sportyvnyj psykholoh. № 1 (36). P. 62–66. [in Ukraine].
4. Кун С, Дьяченко А, Пенчен Го. Контроль специальной работоспособности на основе оценки взаимосвязи эргометрических и физиологических показателей обеспечения соревновательной деятельности в гребле академической. Молодіжний науковий вісник Східноєвроп. нац. ун-ту ім. Лесі Українки. 2016;(23):125-32.  
Kun, S. Djjachenko, A. Penchen Gho (2016), Kontrolj special'noj rabotosposobnosti na osnove ocenky vzajmosvjazu erghometrycheskykh u fizyologhycheskykh pokazatelej obespechenja sorevnovatel'noj dejatel'nosti v gheble akademicheskoj. [Monitoring of special performance based on the assessment of the relationship of ergometric and physiological indicators to ensure competitive activity in rowing academic]. Molodizhnyj naukovyj visnyk Skhidnojevroп. nac. un-tu im. Lesi Ukrajinky;(23): 125-32 [in Ukraine].
6. Омельченко О.С., Сідак М.В. Аналіз проходження змагальної дистанції спортсменами на Чемпіонаті Європи «European rowing indoor championships» Матеріали XXIII Міжнародної науково-практичної інтернет-конференції «Проблеми та перспективи розвитку сучасної науки в країнах Європи та Азії», Переяслав, 31 січня 2020. С. 153–155.  
Omeljchenko, O.S. Sidak, M.V. (31 sichnja 2020), Analiz prokhozhdzhennja zmaghal'noji dystanciji sportsmenamy na Chempionati Jevropy «European rowing indoor championships» [Analysis of the passing of competitive distance by athletes at the European Championship «European rowing indoor championships»] Materialy XXIII Mizhnarodnoji naukovo-praktychnoji internet-konferenciji «Problemy ta perspektyvy rozvytku suchasnoji nauky v krajynakh Jevropy ta Aziji», Perejaslav,. P. 153–155 [in Ukraine]
7. Платонов В. М. Система подготовки спортсменов в олимпийском спорте. Общая теория и ее практические приложения: учебник [для тренеров]: в 2 кн. К.: Олимпийская литература, 2016. Кн.1. 2015. 680 с.  
Platonov, V. M. (2016), Sistema podghotovky sportsmenov v olympijskom sporte. Obshhaja teoryja u ee praktycheskye prylozhenija: uchenyk [dlja trenerov]: v 2 kn. [The system of training athletes in Olympicsports: textbook [for trainers]: K.: Olympijskaja lyteratura, Kn.1. 2015. 680 p. [in Ukraine]
8. Приходько П. Н. Развитие выносливости путем использования специальных тренажеров в академической гребле. Вісник Запорізького національного університету. Серія: Фізичне виховання та спорт: збірник наукових статей. Запоріжжя, 2010. № 1(3). С. 190–194.  
Prykhodjko, P. N. (2010), Razvytye vynoslyvosti putem yspol'zovanyja special'nykh trenazherov v akademicheskoj gheble [The development of endurance through the use of special simulators in rowing academic.] Visnyk Zaporiz'kogho nacional'nogho universytetu. Serija: Fizychno vykhovannja ta sport: zbirnyk naukovykh statej. Zaporizhzhja,. № 1(3). P. 190–194. [in Ukraine]
9. Скрипченко И. Т., Омельченко О. С. Использование эргометра «Concept-II» в спортивной тренировке и оздоровительных занятиях. Днепр: Издательство «ПФ Стандарт-сервис», 2017. 130 с.  
Skrypchenko, Y. T. Omeljchenko, O. S. (2017), Yspol'zovanye erghometra «Concept-II» v sportyvnoj trenirovke u ozdorovytel'nykh zanjattjah. Dnepr: Yzdatel'stvo «PF Standart-servys», 130 p. [in Ukraine]

10. Скрипченко І. Т., Омельченко О. С. Порівняльний аналіз проходження змагальної дистанції на весловому ергометри «Concept-2» спортсменами різної ваги. Слобожанський науково-спортивний вісник. 2008. № 1-2. С. 52–54.  
Skrypchenko, I. T. Omeljchenko, O. S. (2008), Porivnjalnijnyj analiz prokhodzhennja zmaghaljnoji dystanciji na veslovomu erghometri «Concept-2» sportsmenamy riznoji vaghy. [Comparative analysis of the passing of the competition distance on the paddle ergometer «Concept-2» by athletes of different weights] Slobozhanskyj naukovosporyvnyj visnyk. № 1–2. P. 52–54. [in Ukraine]
11. Adamson, J. (2017), The Erging Notebook: A Blank Notebook For Coxswains, Rowers, and Rowing Coaches to Track Erging Workouts. J. Adamson. Create Space Independent Publishing Platform, 100 p.
12. Albert, A. (2017), Rowing Machine Workout: Rowing for Beginners. Kindle Edition, 37 p.
13. Basalp, E. Bachmann, P. Gerig, N. Rauter, G. Wolf, P. (2020), Configurable 3D Rowing Model Renders Realistic Forces on a Simulator for Indoor Training - Applied Sciences. - mdpi.com
14. Flood, J. (2012), The Complete Guide to Indoor Rowing (Complete Guides). A & C Black. 47 p.
15. Kleshnev, V. (2005), Comparison of on-water rowing with its simulation on Concept 2 and Rowperfect mashines. Scientific proceedings. XXII International Symposium on Biomechanics in Sports. Beijing. P. 30–133.
16. Mattes, K. Wolff, S. (2019), Asymmetry of the stretcher force during symmetrical ergometer rowing and leg press test of scullers and sweep rowers. - Biology of Exercise, 120 p.
17. Palmer, R. (2012), The Complete Rowing Machine Workout Program. Roy Palmer. Front Runner Publications, 47 p.
18. Nithus, J. (2015), Indoor Rowing: Perfection In Exercise. J. Nithus. Create Space Independent Publishing Platform, 208 p.
19. Omelchenko, O. S. Afanasiev, S. M. Savchenko, V. G. Mikitchik, O. S. Lukina, O. V. Solodka, O. V. Mischak, O. S. (2020), Preparation of athletes in cyclic sports taking into account the functional state of the external respiratory system and cardiovascular system // Pedagogy of physical culture and sports. 24 (2). P. 93–99 [in Ukraine]
20. Selter, P. (2014), Rowing WOD Bible: 80+ Cross Training C2 Rower Workouts for Weight Loss, Agility & Fitness (Rowing Training, Bodyweight Exercises, Strength Training, Kettlebell, Training, Wods, HIIT, Cardio, Cycling). P. Selter. Kindle Edition, 52 p.

Received for publication 18.02.2020

# PROFESSIONALLY IMPORTANT QUALITIES OF FUTURE OFFICERS OF ENGINEERING DIVISIONS OF THE ARMED FORCES OF UKRAINE

J. Pankevych, O. Lesko, V. Afonin, M. Kuznetsov,  
I. Romaniv, A. Demkiv, O. Rolyuk

Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine

corresponding author – J. Pankevych: 0990990@ukr.net

doi: 10.32626/2309-8082.2020-16.47-53

Physical training is one of the important components of combat training for military personnel of all armies of the world. Many studies have been conducted by Ukrainian scientists on the content, organization and methodology of physical development and improvement of the Armed Forces personnel. These studies have helped to reveal the nature and features of the physical training of military personnel of different types and types of armed forces. At the same time, these studies have ignored the issue of the physical training of service personnel in engineering units. The nature and specificity of the professional activity of specialists of engineering units is very diverse and requires serious scientific research on their special physical training. To date, there is very little research and this makes it relevant to research this topic. The aim of the study was to determine the important professional and psychophysical qualities of cadets of higher educational establishments and future specialists of engineering support units. *Methods.* To achieve this goal, common scientific methods were used, namely analysis, systematization, generalization. They also used pedagogical and sociological methods: pedagogical observation, analysis of literary sources, questionnaires, methods of mathematical statistics. *Results and conclusions.* The results of the questionnaire revealed a wide variety of cadets' answers. Such a wide range of answers to the question can be explained both by the personal (individual) experience of training and practice, and by the division of cadets into two subgroups: mechanical engineers and engineers commanders. There is some discrepancy between these specializations.

The results of the conducted research, stated in the article, show that through the questionnaire the peculiarities of professional activity in the chosen specialty were revealed in view of the specifics of its object. Cadets categorized their profession as "human-technical" – 47 %, "human-human" – 53 %, and their professional activity will take place both outdoors (47 %) and indoors (51 %). The most important systems of the body for the future profession cadets have identified: the body as a whole – 90 %; visual analyzer – 43 %; cardiovascular system – 37 %. At the same time, the most important psychophysical qualities for the profession, respondents say well-developed eye – 82 %; resistance to hypoxia, overload, thermal radiation, cold resistance – 74 %. Among the applied knowledge, motor skills, physical and special qualities, which are necessary for the specialist of engineering divisions in professional work, the most important cadets have defined the general endurance – 80 %; coordination of movements – 56 %, which should be formed in the process of physical education, focused on the applied aspect of professional activity of future specialists. The cadets are convinced that cadets consider effective for the chosen specialty of the profession: athletics; 58 %; 62 % – swimming; 48 % – football. The results of the study provide the basis for a more detailed development of the program of special physical training of cadets of engineering specialties, which will be the subject of our further research.

**Keywords:** cadets-engineers, physical training, professional qualities.

## Introduction

Engineering troops are a very important type of troops. It was the engineering troops who were the first to master the latest means of waging war, introducing them into the army's arsenal. According to the Combat Charter of the Land Forces, engineering support is one of the types of combat support. Engineering support of military operations is organized and carried out in order to create the necessary conditions for troops to timely and covertly deploy, maneuver, successfully perform combat missions, increase protection of troops and objects from all kinds of defeat, to inflict losses on the enemy, to complicate action. the enemy [25].

Specialists of engineering troops erect facilities for fire, surveillance, shelter of personnel and equipment; cover with minefields and mask their positions and areas of location; pave and mark the paths of movement;

overcome obstacles and obstacles; force water obstacles. The whole range of features of this category of servicemen is manifested in the actions of sappers, specialists of repair units operating on the battlefield, paramedics, etc. Their main physical qualities are general and speed endurance. They also need skills in accelerated movement, running, crawling, carrying loads, overcoming obstacles and engineering barriers.

The cadets of higher military educational institutions (HEIs)–future officers of engineering units, must be formed professionally important physical, psychophysiological qualities, developed a system of applied knowledge, skills and abilities in the professional sphere, developed the necessary qualities that characterize a person as a person. In addition, it is necessary to take into account the peculiarities of training cadets of engineering specialties in higher education.

They are divided into two main categories: commanding engineers and mechanical engineers. Having certain common features of specialization, they also have certain differences in professional activity. Commander engineers communicate with people most of the time, and mechanical engineers – with various mechanisms and units. This, of course, affects the structure and development of their professional and psychophysical qualities [13].

#### Material and research methods

The aim of the study was to identify important professional qualities of university cadets – future specialists of engineering support departments for the development of the author's program of special physical training. To achieve this goal, general scientific methods were used, namely analysis, systematization, generalization. Pedagogical and sociological methods were also used: pedagogical observation, analysis of literary sources, questionnaires, methods of mathematical statistics. Relevant recommendations were taken into account when developing the questionnaire questions [24]. The cadets were asked to provide answers to a specially designed questionnaire on 22 questions [22] aimed at solving such tasks. The first was to reveal the specifics of the activity in the chosen specialty and to establish specific professional conditions in which the activities of engineering officers will most often take place. The second task is to determine the most significant professional (psychophysical) qualities and systems of the body, motor skills and knowledge that are effective for professional activities. The next task is to identify sports that help develop the necessary physical qualities of future engineering officers.

Questionnaire survey of cadets of 3-4 courses of specialization «military engineer» was conducted with their consent. 87 cadets aged 20-24 took part in the survey, 22 of whom took part in the joint forces operation in eastern Ukraine. Several answers were offered to each question. The respondent had the right to choose the most accurate answers in his opinion or to indicate his own answer separately. Then the percentage of each answer relative to the total number of respondents was calculated. In addition, the results of VG Fotinyuk's research were taken into account, which provided for the study of similar issues in peers, but students – future engineers. Such data were compared with those obtained in our study. The reason was the high proximity in the content of both future professions, and the questionnaire

provided for the definition of the type of their profession in accordance with the existing classification [22].

#### Research results

Professionally important qualities are those qualities on which the efficiency of professional activity and the possibility of its improvement significantly depend. It was found that senior cadets, who have already passed a sufficient period of practice in the field, believe that this profession belongs to the type: «human-technique» (47 %) and 53 % of respondents classified it as «man-man». At the same time, 97 % of civilian university students classified the profession as «human-technique» and only 3 % as «human-human».

To the question «what type of activity predominates in professional work», the answers were distributed as follows: «installation and assembly, repair» – 61 % (students – 34 %); «Control» – 75 % (students – 25 %); «Solving operational tasks planning, decision-making, experimentation» – 35 % (students – 23 %); «observation» – 23 % (students – 6 %); «team management and education» – 40 % (students – 6 %). This range of answers indicates the multifunctionality of the professional role of a specialist in this field, especially the military with an emphasis on control.

Surveys of cadets made it possible to make sure that the main forms of work organization in the future profession respondents consider «collective» – 51 % (students – 66 %); «Leading» – 75 % (students) – 25 %; «Individual» (23 %); «Executive» (35 %). That is, again the emphasis is on the leading, controlling form of labor organization.

When asked in what conditions professional activity takes place, 51 % of respondents answered that «indoors» (66 % of students); 47 % – «outdoors» (students v 33 %); 46 % – in variable conditions. Thus, most of the time spent by military specialists is spent in changing conditions and outdoors. This requires a certain, special preparation of the body.

When asked which working posture is typical for professional activities, 20 % of respondents answered: «sitting» (students – 30 %); 17 % – «standing» (students – 27 %); 57 % – «alternating» (students – 16 %). He does not have a fixed working position for military engineering specialists.

As for the types of occupational hazards in future work, then 57 % of respondents named «vibration, noise, ultrasound» (54 % of students); 62 % – «dust»

(students – 23 %); 65 % – «sensitive temperature fluctuations» (students – 19 %); 61 % – «poor lighting» (students – 15 %); 46 % – «current of different frequency» (students – 11 %); 48 % – «lifting and carrying heavy objects (students – 6 %). The high rates of certain types of harmfulness of cadets were prompted by industrial practice during field trips (in real conditions of military activity).

The analysis of the questionnaires revealed that 80 % of the respondents when asked which analyzers' work is especially important for your professional activity, 80 % named «visual» (students – 63 %); 75 % – «auditory» (students – 20 %); 34 % – «vestibular» (students – 12 %); 44 % – «temperature» (students – 9 %). As it turned out, the visual and auditory analyzers are of the greatest importance for the professional work of engineering specialists.

When asked which working bodies mainly take part in motor actions during the performance of professional functions, 68 % of respondents answered that the most active is the participation of the «motor apparatus of the upper and lower extremities» (students – 28 %); 55 % – «lower extremities (whole leg, foot, shin, right or left leg, both legs)» (students – 26 %). As can be seen from the results of the survey for military specialists, high motor activity of both the upper and lower extremities is more important.

Assessing the nature of labor movements, 22 % of respondents noted «large» (students – 52 %) and 18 % – «small» movements (students – 48 %), more than 70 % noted the mixed nature of labor movements. If for future civil mechanical engineers labor movements are divided mainly into «large» and «small», then for military professionals most of their production movements are «mixed».

When asked what type of performing movements predominates; 76 % of respondents answered – «pressure» (students – 25 %); 48 % – «rotating» (in students – 18 %); 53 % – «lifting» (students – 13 %); 32 % – «shock» (students – 12 %); 42 % – «pushers» (students – 12 %). Certain discrepancies in performance may be the result of a wider range of practical movements used by cadets during field trips.

According to the direction of movement, respondents named the following types of movements: «mixed nature of movements» – 54 % (students – 60 %); «Top-down» – 45 % (students – 16 %).

According to the cadets, the most significant psychophysical qualities and personality traits for their

future effective professional activity are: fast, precise finger movements when working with small parts, objects in a regulated or variable program of action that requires coordination or agility of the upper and lower extremities – 56 % of respondents (students – 51 %); consistency of movements with the process of perception, which requires sensorimotor coordination – 52 % (students – 23 %); work actions do not cause increased requirements for coordination of movements and the level of development of psychophysical qualities – 5 % (for students – 6 %). There are almost no differences between the indicators of cadets and students.

When asked which emotional state is effective for professional activities, 44 % of respondents said increased readiness for various unexpected actions in response to the influence of emotional factors (students – 56 %); 45 % – a condition with an optimal combination of tension and relaxation (students – 38 %).

The most significant degrees of fatigue in the process of activity for the day cadets identified «average» (65 % (students – 60 %), «variable» – 65 % (students – 24 %); «Strong» – 22 % (students – 22 %);

«Weak» – 18 % (students – 4 %). Fatigue is characterized by students and cadets more or less identically.

The cadets established the type of fatigue during the day: «physical» – 69 % (students – 58 %); «Mental» – 72 % (students – 22 %) «mental» – 24 % (students – 14 %). The cadets emphasized a fairly high percentage of mental fatigue. This may be due to the fact that they perform a large number of variable tasks during military practice.

When asked which body systems and individual organs are most tired, 58 % of respondents said «general fatigue» (students – 39 %); 45 % – «nervous system» (students – 25 %); 26 % – «muscles of the upper and lower extremities, torso» (students – 23 %), the differences are statistically insignificant.

Respondents believe that the most important physical qualities for their future profession are:

overall endurance – 80 % (in students – 86 %);  
 coordination of movements – 56 % (students – 82 %);  
 static endurance – 40 % (students – 77 %);  
 strength of the upper extremities – 23 % (students – 73 %);  
 back strength – 31 % (student – 70 %);  
 strength of the lower extremities – 22 % (students – 65 %);  
 overall agility – 32 % (in students – 63 %);  
 press force – 56 %;  
 flexibility – 16 % (students – 46 %).

It is not entirely clear what the high importance of almost all physical qualities for civilian specialists in mechanical engineering is based on. This may be due to deficiencies in the physical development of this category of students.

The most significant psychophysical qualities for the profession, respondents call a well-developed eye – 82 % (students – 77 %); ability to stand up – 45 % (students – 72 %); reserve capacity of the body (resistance to hypoxia, overload, heat radiation, cold resistance) – 74 % (students – 71 %); sense of time – 44 % (students – 69 %); spatial and temporal orientation – 29 % (students – 67 %); musculoskeletal sensitivity 66 %; resistance to motion sickness – 36 % (students – 46 %).

The most important body systems for their profession cadets consider: the body as a whole – 90 %; (students – 90 %) visual analyzer – 43 % (students – 82 %); neuromuscular system – 23 % (students – 80 %); nervous system – 28 % (students – 78 %); cardiovascular system – 37 % (students – 77 %). As can be seen from the results of the survey, students attach more importance to individual body systems for professional activities.

For effective professional activity in the composition of mental processes, the most important respondents consider first of all attention – 91 %; memory – 80 %; thinking – 69 %; sensation and perception – 80 %; speech – 71 %; imagination – 75 %. Engineering students also determined the composition of mental processes in the same proportions.

The most professionally significant personality traits cadets consider: purposefulness – 78 %; persistence – 73 %; diligence – 66 %; observation – 63 %; intelligence – 65 %; stability – 45 %; ability to work in extreme situations – 54 %; independence – 44 %; endurance and self-control – 43 %; courage and determination – 43 %; efficiency – 42 %; discipline – 42 %; decency – 41. Students consider all these qualities very important and gave them a rank of 76 % to 88 %.

Cadets consider: 58 % (34 %) – athletics to be especially relevant for preparation for professional activity; 62 % (30 %) – swimming; 48 % (21 %) – football; 42 % (19 %) – cycling; 38 % (18 %) – gymnastics; 15 % (15 %) – table tennis; 14 % (14 %) – volleyball and tourism; 42 % (13 %), – struggle; 16 % (11 %) – basketball; 8 % (8 %) – weightlifting; 15 % (7 %) – skiing; 24 % (6 %) – all-around; 13 % (3 %) – badminton (students' indicators are in parentheses).

## Discussion

Military scientists have conducted a significant number of studies of the physical fitness of servicemen of various military specialties. Thus, professor GA Yedinak and co-authors [26] studied the factors of changes in the physical training of cadets during their studies at a military institution,

MV Kuznetsov [4] studied the selection criteria and the specifics of physical training of soldiers of the Special Operations Forces; OD Gusak devoted his research to the problem of psychophysical readiness of servicemen of airmobile units [3]. OM Olkhovy [10], KV Prontenko [17] studied the physical and functional condition of military operators; YuA Borodin [1], VM Romanchuk [19] - physical fitness of cadets of military universities of engineering and operator profile; VV Paevsky [11],

O. O. Shevchenko [23] – organization of the system of physical training of Air Defense units. SV Romanchuk [20], AM Oderov [9] studied motor activity and express control of physical fitness of servicemen of mechanized units of the Land Forces of the Armed Forces of Ukraine and foreign armies, OM Nedashkivsky [7] – improving the content of physical training of servicemen of artillery units. Researcher SS Fedak [21] directed his research to the issue of physical training as a means of early adaptation of peacekeeping troops to actions in unusual conditions of service, and IS Ovcharuk [8] studied the peculiarities of physical training of security officers of Ukraine and liquidation specialists. emergencies to action in combat. The interdependence of professional and physical training of servicemen of different military specialties was studied by the scientist O. Petrachkov [15]. All these studies have helped to some extent to understand the nature and features of physical training of many military specialists (specialists). But among the conducted researches there is a lack of researches of features of physical training of military specialists of engineering divisions of the Armed Forces of Ukraine.

The works of MT Gromkova [2], GV Ponomarev [16] are devoted to the problem of professionally important qualities that graduates of civil higher educational institutions of engineering profile should possess.

RT Raevsky [18] and others. Their work reveals the problems of physical training of representatives of specific technical specialties (mechanics, tractor drivers, agronomists, etc.). researched and does not lose its relevance. Although the general issues of

engineering support are specified in the Guidelines for engineering support of the Armed Forces of Ukraine [6] and the textbook for cadets [5]. The issues of working conditions of military specialists of engineering profile and development of psychophysical qualities necessary for them were practically not studied. The study of the peculiarities of physical activity of specialists of engineering departments was initiated by J. Pankevych [12–14].

Summing up the study, it should be noted that the results of the survey in many cases differ slightly from a similar study of students - future civil engineers-mechanics [22]. One of the main reasons is that the cadets - future engineering officers, have a wider and more diverse field of professional activity and they have already gained some practical experience of such activities during long field trips, where practical tasks of the chosen profession were worked out.

### Conclusions

The results of the research presented in the article indicate that the peculiarities of professional activity in the chosen specialty were revealed with the help of the questionnaire, taking into account the specifics of its object. The cadets classified their profession as «human-technical» – 47 %, «human-human» – 53 %, and their professional activities will take place both outdoors (47 %) and indoors (51 %).

The most significant body systems for the future profession cadets identified: the body as a whole – 90 %; visual analyzer – 43 %; cardiovascular system – 37 %. At the same time, the most significant psychophysical qualities for the profession, respondents call a well-developed eye – 82 %; resistance to hypoxia, overload, heat radiation, cold resistance – 74 %.

Among the applied knowledge, motor skills, physical and special qualities that are necessary for a specialist of engineering departments in professional work, the most significant cadets identified the overall endurance – 80 %; coordination of movements – 56 %, which should be formed in the process of physical education, focused on the applied aspect of professional activity of future professionals. The cadets are convinced that the cadets consider effective for the chosen profession: 58 % athletics; 62 % – swimming; 48 % – football.

We see further research in the development of the author's program of special physical training of cadets of engineering specialties.

The authors are grateful to all cadets who took part in the survey.

*Conflict of interest.* The authors state no conflict of interest.

### References

1. Бородин Ю. А. Тенденции изменения требований профессиональной деятельности и организации системы физической подготовки курсантов и слушателей ВВУЗОВ инженерно-технического профиля. Физическое воспитание студентов творческих специальностей. 2007. № 3. С. 15–29.  
Borodyn, Yu. A. (2007), "Tendentsy yzmeneniya trebovaniy professionalnoi deiatelnosti y orhanyzatsyy systemy fizycheskoi podgotovky kursantov y slushatelei VVUZOV ynzhenerno-tekhnycheskoho profylya" [Trends of changing requirements of professional activity and organization of the system of physical training of cadets and students of HELs of engineering and technical profile]. *Physical education of students of creative specialties*. № 3, pp. 15–29. [in Ukraine]
2. Громкова М. Т. Психология и педагогика профессиональной деятельности. М. : ЮНИТИ-ДАНА, 2003. 415 с.  
Hromkova, M. T. (2003), *Psykhohohyia y pedahohyka professionalnoi deiatelnosti* [Psychology and pedagogy of professional activity]. YuNYTY-DANA, Moskow. 415 p. [in Russia]
3. Гусак О. Д. Корекція психофізичної готовності військовослужбовців аеромобільних підрозділів до навчально-бойової діяльності під час занять з подолання перешкод : дис. ... канд. наук з фіз. виховання і спорту. 24.00.02. ЛДУФК. Львів, 2012. 189 с.  
Husak, O. D. (2012), "Korektsiia psykhofizychnoi hotovnosti viiskovosluzhbovtziv aeromobilnykh pidrozdiliv do navchalno-boiovoi diialnosti pid chas zaniat z podolannia pereshkod" [Correction of psychophysical
4. Кузнецов М. В., Афонін В. М., Федак С. С. Фізичний стан курсантів – кандидатів до підрозділів Сил спеціальних операцій Збройних сил України. Молодіжний науковий вісник Східноєвропейського національного університету імені Лесі Українки. 2016. Випуск 24. С. 30-34.  
Kuznetsov, M. V., Afonin, V. M., Fedak, S. S. (2016), "Fizychnyi stan kursantiv – kandydativ do pidrozdiliv Syl spetsialnykh operatsii Zbroinykh syl Ukrainy" [Physical condition of the cadets - candidates for the special operations units of the Armed Forces of Ukraine.]. *Youth Scientific Bulletin of Lesya Ukrainka Eastern European National University*. Issue 24. pp. 30–34. [in Ukraine]
5. Мілютин В. А., Фтемов Ю. О., Павлючик В. П., Куцька О. М. Інженерне забезпечення загальновійськового бою : равч. посібник. Львів : АСВ, 2010. 164 с.  
Miliutin, V. A., Ftemov, Yu. O., Pavliuchyk, V. P., Kutska, O. M. (2010), *Inzhenerne zabezpechennia zahalnoviiskovoho boiu* [Engineering of all-military combat]. ASV, Lviv. 164 p. [in Ukraine]
6. Настанова з інженерного забезпечення Збройних Сил України. Київ: ГШ ЗС України, 2010. 170 с.  
Nastanova z inzhenernoho zabezpechennia Zbroinykh Syl Ukrainy [Engineering instruction of the Armed Forces of Ukraine] (2010). HSH ZS Ukrainy, Kyiv. 170 p. [in Ukraine].

7. Недашківський О. М. Удосконалення змісту фізичної підготовки військовослужбовців артилерійських підрозділів. Фізична підготовка особового складу Збройних сил, інших військових формувань та правоохоронних органів України: досвід, сучасність, проблеми та перспективи розвитку : матеріали наук.-метод. конф. 26–28 листопада 2014 р. Київ : МОУ, 2014. С. 14–19.  
Nedashkivskiy, O. M. (2014), "Udoskonalennia zmistu fizychnoi pidhotovky viiskovosluzhbovtiv artyleriiskykh pidrozdiliv" [Improvement of the content of physical training of members of the artillery units]. *Physical training of the Armed Forces personnel, other military formations and law enforcement agencies of Ukraine: experience, present, problems and prospects of development*. pp. 14–19. [in Ukraine]
8. Овчарук І. С., Єдинак Г. А. Моделювання параметрів занять з фізичної підготовки курсантів, майбутніх фахівців з ліквідації наслідків надзвичайних ситуацій : метод. рекомендації. Кам'янець-Подільський : ПП Зарицький А. В., 2007. 118 с.  
Ovcharuk, I. S., Iedynak, G. A. (2007), *Modelyuvannya parametriv zanyat' z fizychnoyi pidhotovky kursantiv, maybutnikh fakhivtsiv z likvidatsiyi naslidkiv nadzvychaynykh sytuatsiy : metod. rekomendatsiyi* [Modeling of parameters of occupations on physical training of cadets, future specialists on elimination of consequences of emergency situations]. PP Zaritsky AV, Kamianets-Podilsky. 118 p. [in Ukraine]
9. Одеров А. М., Одерова О. В., Гульоватий В. І. Роль фізичного стану військовослужбовців у забезпеченні їх готовності до бойової діяльності. Фізична підготовка особового складу Збройних сил, інших військових формувань та правоохоронних органів України: досвід, сучасність, проблеми та перспективи розвитку : матеріали наук.-метод. конф. 26–28 листопада 2014 р. Київ : МОУ, 2014. С. 84–91.  
Oderov, A. M., Oderova, O. V., Hulovaty, V. I. (2014), "Rol fizychnoho stanu viiskovosluzhbovtiv u zabezpechenni yikh hotovnosti do boiovoi diialnosti" [The role of the physical condition of military personnel in ensuring their readiness for military activity]. *Physical training of the Armed Forces personnel, other military formations and law enforcement agencies of Ukraine: experience, present, problems and prospects of development*. pp. 84–91. [in Ukraine]
10. Ольховий О. М. Концепція професійно спрямованої системи фізичної підготовки курсантів. Сучасний стан та перспективи розвитку фізичної підготовки військовослужбовців в системі бойового навчання військ (сил) Збройних сил та інших силових структур України : матеріали наук.-метод. конф. 28-29 листопада 2013 р. Київ : МОУ, 2013. С. 21–30.  
Olkhoviy, O. M. (2013), "Kontseptsiia profesiino spriamovanoi systemy fizychnoi pidhotovky kursantiv" [The concept of professionally directed system of physical training of cadets.]. *Current status and prospects of development of physical training of servicemen in the system of combat training of troops (forces) of the Armed Forces and other power structures of Ukraine*. pp. 21–30. [in Ukraine]
11. Паевский В. В., Шевченко О. А. Роль физической подготовки в совершенствовании задач и функциональных особенностей учебно-боевой деятельности личного состава подразделений ПВО Сухопутных войск. Педагогика, психология та медико-біологічні проблеми фізичного виховання і спорту. 2004. № 9. С. 53–62.  
Paevskiy, V. V., Shevchenko, O. A. (2004), "Rol fyzycheskoi podhotovky v sovershenstvovannyi zadach y funktsyonalnykh osobennostei uchebno-boevoi deiatelnosti lychnoho sostava podrazdeleniy PVO Sukhoputnykh voisk" [The role of physical training in improving the tasks and functional features of the training and combat activities of the personnel of the Air Forces units]. *Pedagogy, psychology and medical and biological problems of physical education and sports*. № 9. pp. 53–62. [in Ukraine]
12. Панькевич Я. Специфіка фізичних навантажень військовослужбовців інженерних військ Збройних Сил України. Вісник Кам'янець-Подільського національного університету імені Івана Огієнка. Фізичне виховання, спорт і здоров'я людини. 2019. Вип. 15. С. 110–115.  
Pankevych, Ya. (2019), "Spetsyfika fizychnykh navantazhen viiskovosluzhbovtiv inzhenernykh viisk Zbroinykh Syl Ukrainy" [Specificity of physical activity of servicemen of engineering troops of the Armed Forces of Ukraine.]. *Bulletin of Kamyanets-Podilskyi Ivan Ogiyenko National University. Physical education, sports and human health*. Issue 15. pp.110-115. [in Ukraine]
13. Панькевич Я. А., Афонін В. М. До проблеми фізичної підготовки військовослужбовців інженерних військ. Сучасні тенденції та перспективи розвитку фізичної підготовки і спорту у Збройних Силах України, правоохоронних органах, рятувальних та інших спеціальних служб на шляху євроатлантичної інтеграції України : матеріали Міжнародної науково-практичної конференції (Київ, 14–15 лютого 2019 р.). Національний університет оборони України імені Івана Черняхівського: за заг. ред. В. Свістун, О. Петрачкова. Київ : НУОУ, 2019. С. 75–77.  
Pankevych, Ya. A., Afonin, V. M. (2019), "Do problemy fizychnoi pidhotovky viiskovosluzhbovtiv inzhenernykh viisk" [To the problem of physical training of servicemen of engineering troops.]. *Current Trends and Prospects for the Development of Physical Training and Sports in the Armed Forces of Ukraine, Law Enforcement Agencies, Rescue and Other Special Services on the Way of Euro-Atlantic Integration of Ukraine*. pp.75–77. [in Ukraine]
14. Панькевич Я. А., Афонін В. М., Романів І. В. Професійно-прикладна фізична підготовка військовослужбовців інженерних військ. Сучасні тенденції та перспективи розвитку фізичної підготовки і спорту у Збройних Силах України, правоохоронних органів, рятувальних та інших спеціальних служб на шляху Євроатлантичної інтеграції України : матеріали III-ої Міжн. науково-практичної конференції (Київ, 21-22 листопада 2019 р.). Київ: НУОУ, 2019. С. 132–134.  
Pankevych, Ya. A., Afonin, V. M., Romaniv, I. V. (2019), "Profesiino-prykladna fizychna pidhotovka viiskovosluzhbovtiv inzhenernykh viisk" [Professional-applied physical training of servicemen of engineering troops]. *Current Trends and Prospects for the Development of Physical Training and Sports in the Armed Forces of Ukraine, Law Enforcement Agencies, Rescue and Other Special Services on the Way of Euro-Atlantic Integration of Ukraine*. pp. 132-134. [in Ukraine]
15. Петрачков О. Аналіз взаємозв'язку між фізичною та професійною підготовленістю у військовослужбовців різних військових спеціальностей. Теорія і методика фізичного виховання і спорту. 2007. № 4. С. 67–69.  
Petrachkov, O. (2007), "Analiz vzaiemovv'язku mizh fizychnoiu ta profesiinoiu pidhotovlenistiu u viiskovosluzhbovtiv riznykh viiskovykh spetsialnostei" [Analysis of the relationship between physical and vocational training in military personnel of different military specialties]. *Theory and methodology of physical education and sports*. № 4. pp. 67–69. [in Ukraine]
16. Пономарева Г. В. Формирование профессионально важных двигательных способностей у студентов : дис. ... канд. пед. наук : 13.00.04. РГПУ. Рязань, 2009. 155 с.  
Ponomareva, H. V. (2009), "Formyrovanye professyonalno vazhnykh dvyhatelnykh sposobnostei u studentov" [Formation of professionally important motor skills in students] : dys. ... kand. ped. nauk 13.00.04 RSPU. Ryazan, 155 p. [in Russia]

17. Пронтенко К. В. Динамика показателей физического развития и функционального состояния курсантов ВВУЗ операторского профиля на этапе первоначального обучения под воздействием занятий гиревым спортом. Педагогика, психология та медико-біологічні проблеми фізичного виховання і спорту. 2008. № 5. С. 111–115.  
Prontenko, K. V. (2008), "Динамика pokazateley fizycheskoho rozvytytva y funktsional'noho sostoyannya kursantov VVUZ operatorskoho profylya na etape pervonachal'noho obuchenya pod vozdeystviem zanyatyy hyrevym sportom" [Dynamics of indicators of physical development and functional state of the cadets of the University of the Operator profile at the stage of initial training under the influence of weight training]. *Pedagogy, psychology and medical and biological problems of physical education and sports*. No 5. pp. 111–115. [in Ukraine]
18. Раєвський Р. Т., Канишевський С. М. Професійно-прикладна фізична підготовка студентів вищих навчальних закладів : навч.-метод. посіб. Львів : Наука і техніка, 2010. 380 с.  
Raievskiy, R. T., Kanishevskiy, S. M. (2010), *Profesiino-prykladna fizychna pidhotovka studentiv vyshchyykh navchalnykh zakladiv* [Professional-applied physical preparation of students of higher educational establishments]. Nauka i tekhnika, Lviv. 380 p. [in Ukraine]
19. Романчук В. М. Обґрунтування змісту та організації форм фізичної підготовки курсантів вищих військових навчальних закладів технічного профілю : дис.... канд. наук з фіз. виховання і спорту : 24.00.02. Житомир, 2007. 196 с.  
Romanchuk, V. M. (2007), "Obgruntuvannia zmistu ta orhanizatsii form fizychnoi pidhotovky kursantiv vyshchyykh viiskovykh navchalnykh zakladiv tekhnichnoho profilu" [Substantiation of content and organization of forms of physical training of cadets of higher military educational establishments of technical profile] : dys. ... kand. ped. nauk 24.00.02. Zhytomyr. 196 p. [in Ukraine]
20. Романчук С., Шлямар І., Климович В. Порівняльний аналіз фізичної підготовленості курсантів ВНЗ Сухопутних військ різних спеціальностей. Молода спортивна наука України. 2012. Вип. 16, т. 2. С. 166–170.  
Romanchuk, S., Shliamar, I., Klymovych, V. (2012), "Porivnialnyi analiz fizychnoi pidhotovlenosti kursantiv VNZ Sukhoputnykh viisk riznykh spetsialnostei" [Comparative analysis of physical fitness of land cadets of different specialties]. *Young sports science of Ukraine*. Issue 16, Vol. 2. pp. 166–170. [in Ukraine]
21. Федак С. С. Фізична підготовка як засіб адаптації військовослужбовців до дій в незвичних умовах. Перспективи розвитку озброєння і військової техніки Сухопутних військ. 2013. С. 273-274.  
Fedak, S. S. (2013), "Fizychna pidhotovka yak zasib adaptatsii viiskovosluzhbovtiv do dii v nezvychnykh umovakh" [Physical training as a means of adapting military personnel to action in unusual conditions]. *Prospects for the development of weapons and military equipment of the Land Forces*. pp. 273–274. [in Ukraine]
22. Фотинюк В. Г. Визначення складу професійно важливих якостей майбутніх інженерів-механіків авіаційної галузі. Вісник Чернігівського національного педагогічного університету імені Т. Г. Шевченка. 2014. Вип. 118. Т. II. С. 244–249.  
Fotyniuk, V. H. (2014), "Vyznachennia skladu profesiino vazhlyvykh yakosteï maibutnykh inzheneriv-mekhanikiv aviatsiinoï haluzi" [Determination of composition of professionally important qualities of future engineers-mechanics of aviation industry]. *Bulletin of Chernihiv Taras Shevchenko National Pedagogical Universit.* Issue 118. Vol. II. pp. 244–249. [in Ukraine]
23. Шевченко О. О. Удосконалення професійної працездатності військових фахівців протиповітряної оборони Сухопутних військ засобами фізичної підготовки : автореф. дис. ... канд. наук з фіз. виховання та спорту. 24.00.02 ЛДУФК. Львів, 2010. 189 с.  
Shevchenko, O. O. (2010), "Udoskonalennia profesiinoï pratsezdatsnosti viiskovykh fakhivtsiv protypovitrianoi oborony Sukhoputnykh viisk zasobamy fizychnoi pidhotovky" [ ] : avtoref. diss. for the sciences degree of candidate in phys. education and sports: 24.00.02 Lviv state University in phys. culture. Lviv, 189 p. [in Ukraine]
24. Шиян Б. М., Єдинак Г. А., Петришин Ю. В. Наукові дослідження у фізичному вихованні та спорті : навч. посібник. Кам'янець-Подільський : ПП Видавництво «Оіюм», 2012. 280 с.  
Shiyan, B. M., Iedynak, G. A., Petryshyn, Yu. V. (2012), *Naukovi doslidzhennya u fizychnomu vykhovanni ta sporti* [Scientific research in physical education and sports]. PE Oyum Publishing House, Kamianets-Podilsky, 280 p. [in Ukraine].
25. Данілов І. П. Інженерна підготовка : навч. посібник. Львів : НАСВ, 2016. 552 с.  
Danilov, I. P. (2016), *Inzenerna pidgotovka* [Engineering training]. Lviv: NASV, 2016. 552 p.
26. Melnykov, A., Iedynak, G., Galamandjuk, L., Blavt, O., Duditska, S., Balatska, L., Mazur, V. (2018). Factors that influence changes in cadets' physical preparation during the first half of study at a military academy. *Journal of Physical Education and Sport*. Vol. 18(2), pp. 781–786.

Received for publication 16.01.2020

# THE ROLE OF «UNIVERSAL EDUCATION» IN THE FORMATION AND DEVELOPMENT OF PHYSICAL CULTURE IN UKRAINE

O. Piven, M. Gorbenko

Pereyaslav-Khmelnytsky Hryhoriy Skovoroda State Pedagogical University, Pereyaslav-Khmelnytsky, Ukraine

corresponding author – O. Piven: pivon16@ukr.net

doi: 10.32626/2309-8082.2020-16.54-58

The article substantiates the system, which was approved by the decree of the Supreme Soviet of the RSFSR (April 22, 1918) "On compulsory military training", which also existed in Soviet Ukraine. He was also the organizer of the first Olympic committees on the ground. Historical and pedagogical issues of the development of physical culture in Ukraine 1917–1923, which until recently have not been given due attention, are considered. The main methods of research are: analysis of legislative documents adopted in Ukraine from 1917–1923 with the aim of developing physical culture and sports and improving the professional training of personnel that would ensure the organization of youth fitness; historical and chronological approach, which was used to systematize the adopted state documents in the field of physical culture and sports, as well as methods of analysis and synthesis,

which make it possible to trace the interconnections of all directions of physical culture movement during this period. Generally, during the formation of the Soviet sports system, the influence of the state physical education system practically did not go beyond the range of persons who were drafted into the army. However, propaganda in the press, sports holidays, involvement in youth physical education contributed to the further expansion of the number of people involved in the physical culture movement. Undoubtedly, those who were demobilized brought elements of physical culture, an elementary concept of sport into peaceful life, and became the best propagandists of physical culture in the countryside and the city.

**Keywords:** Sports, physical culture, Soviet Ukraine.

## Introduction

At the present stage of development of national education, the problem of improving the content and forms of physical education of young people is quite acute.

One of the manifestations of this was the Intersectoral Comprehensive Health Program of the Nation. Among the important problems of public health were identified, in particular, unsatisfactory state of health, low level of awareness about the means of maintaining health and the formation of a healthy lifestyle, as well as insufficient efficiency of the physical education system, which would contribute to improving health. people. Modern conditions for the development of Ukrainian society make new demands on the education system, including physical education.

As you know, the creative search for new ways to improve the system of physical education and scientific solutions to theoretical problems of physical education in general are impossible without studying and rethinking the historical experience of the past, which is a mandatory component of any science and is essential for understanding successful and effective progress. The experience of physical culture and health work in Ukraine in 1917–1923 is important for us, because at that time Ukrainian society was in the conditions of transformational changes associated with the formation of the Soviet totalitarian system. Therefore, the study of aspects of the implementation of physical education of young people will reveal the origins of modern successes

and shortcomings, achievements and problems of the system of physical education in Ukraine, which inherited the Soviet system.

## Material and research methods

The main research methods are: analysis of legislative documents adopted in Ukraine from 1917–1923 for the development of physical culture and sports, which would ensure the organization of physical culture and health work of young people; historical and chronological approach, which was used to systematize the adopted state documents in the field of physical culture and sports; methods of analysis and synthesis, which make it possible to trace the relationship of all areas of physical activity in this period.

## Results of the research

From the first days of Soviet rule in Ukraine, much attention was paid to the military and physical training of workers in general and young people in particular.

At this time, combat squads were created throughout Ukraine, in particular in such cities as Kyiv, Odesa, Kharkiv, and Katerynoslav. In classes, the fighters learned to shoot accurately, possess cold steel hand-to-hand combat, throw grenades. This work intensified especially during the Civil War. Demonstrative military-physical training of special forces units was organized in many cities of the country.

Given the importance of military and physical training to strengthen the combat capability of the army: the VII Emergency Congress of the RCP (B) in March 1918 in its decision obliged policymakers to take measures for

«comprehensive, systematic, universal training of adults in military knowledge and military operations.» [2, p. 16].

To implement this directive, a special commission was set up under the Council of People's Commissars, which prepared a decree, which was approved by the All-Russian Central Executive Committee on April 22, 1918, «On compulsory military training» (Vseobuch) [4, p. 11].

The decree established compulsory education for male students of school, preparatory (16-18 years) and conscription (18 to 40 years). The training period was determined at 8 weeks, at least 12 hours a week, without interruption from production. The programs provided primarily training in shooting and combat operations of the fighter. Along with this, part of the time was devoted to field gymnastics, wrestling, skiing, fencing.

Congresses of general education played an important role in improving the whole system of general military training. The first such congress was held on June 6, 1918. It developed a «Draft Regulation on General Military Training» and recommendations for the preparation of young people for military service in schools and the organization of military training of young people aged 12 to 16 who did not study in schools [1, p. 136-138].

During the Civil War, the leadership of the development of physical culture was entrusted to the Main Department of General Military Training of Workers (General Education) [2, p. 19].

Martial law on the fronts of the Civil War required more intensive training of reserves. In October 1918, the task was set to create a three-million army to defend the Soviet republic. This task was directly related to the education system as one of the important factors in the preparation of army reserves. This question was the subject of a detailed discussion at the Second Congress of General Education Workers in December 1918 in Moscow.

The Congress developed a new regulation on universal education, a new 96-hour program, specified the issues of pre-conscription training, sports development, and gave specific instructions for further improvement of the methods of training the Red Army's combat reserves. According to this program, all workers without exception had to study military affairs and go to the place of residence for 96 hours, ie 2 hours a day. It was assumed that young people under the age of 16 in schools should engage in gymnastics, «light» sports, and others. At the age of 16 to 18 they undergo pre-conscription training, which consisted of training in military affairs, military discipline, and others. [3, p.72].

February 25, 1919 by order of the People's Commissar for Military Affairs of Ukraine and Crimea MI Podvoysky

in the republic introduced general military training of workers [7, p.141].

The organization of universal education from the first steps of its organization pointed out that the tasks in the field of physical culture could not be solved by one military department, that it required the participation of a number of Soviet and policy organizations. Therefore, as early as 1920, the Supreme Council of Physical Culture was established for universal education, and the provincial and provincial administrations for provincial administrations, which consisted of representatives from universal education, NGOs, NKZ, RKP (b), and RLKSM. The task of this Council was the general management of physical education and development of the population, development of programs, methods and forms of work [6, p. 54].

In October 1920, the Council of Physical Culture was established in Ukraine at the headquarters of special forces and the Central Department of General Education.

Systematically held «Sports Weeks», «Universal Education Days», «Red Barracks Days», sports holidays and parades were the most massive and effective forms of agitation work among the population of the republic. At the same time, detachments of general educators took an active part in rebuilding the national economy of Ukraine destroyed during the civil war. They struggled with disruptions in the work of transport and supply, with epidemics, organized subbotniks on fuel procurement, and so on. Universal education in Ukraine, in particular, served 20 workshops and a number of agricultural facilities. Thanks to the purposeful work of the Universities and youth organizations in 1922 in Ukraine there were more than 200 sports clubs and clubs [6, p. 78]

A memorable event in 1919 was the Day of «Universal Education» on May 25, it was celebrated during the period of mobilization of the people to fight the invaders. In many cities there were rallies and parades of new formations, most of their participants went to the active army. During the first four years of Soviet rule in the system of Universal Education without interruption from production received military training of more than 11 million people [7, p. 143].

The first congress on physical culture, sports and pre-service training took place in Moscow in early April. The congress was attended by 116 delegates, employees of education, the People's Commissariat, the People's Commissariat of Health, sports clubs, and scientists. The Congress discussed the state of work on physical culture, and called for qualification of pre-conscription training, adopted «Regulations on military pre-conscription

training of youth», «Charter of the sports club», as well as the creation of new institutes of physical culture and training courses for physical education instructors [5, with. 101].

However, along with the successes in the work of universal education in 1918-1919, there were many shortcomings; in particular, there was a shortage of instructors, and in many cities military affairs were poorly organized, as a result of which work on physical culture and sports did not reach the scale required by the country's interests. Therefore, on September 24, 1919, the Council of Workers 'and Peasants' Defense adopted a resolution on «Improvement and expansion of the work of universal education.» It undertook the bodies of universal education to expand military training as widely as possible, to improve its quality, to include physical culture and sports as an important part in the general system of military education of workers [1, p. 150-152].

In the early 20's there was a lack of specialists, there was no sports base, but the enthusiasm of young people overcame obstacles. Back in May 1918, a new sports club «Svyatozar» was established in Kiev. In the Chernihiv region - the first sports club «Spartak», which later in the USSR grew into an all-Ukrainian organization. In all provinces, many counties and parishes of the USSR departments of universal education were formed. Together with the organization of military training of the population, they reorganized the former sports clubs and bases, created new ones. In many places, through the organization of subbotniks and conscription, sports grounds and gymnasiums were created. Various shock and excellent demonstration detachments of conscripts were organized, which traveled to villages and towns to organize various sports performances and physical education reports. Sports and gymnastics festivals were organized, and competitions were held for the championships of counties, cities, provinces, districts, and others, which were usually devoted to various revolutionary holidays. In May 1920, a sports parade took place in Kharkiv and competitions were held, which were demonstrative [1, p. 162].

Universal was also the organizer of the first Olympic committees on the ground. Regulations on the All-Ukrainian Olympic Committee (VUOK) in Ukraine were approved by the Commissioner of the Revolutionary Military Council MV Frunze. VUOK, led by Kharkiv sportsman V. Vacek, started its work in 1921 and lasted until 1923, when it was liquidated as a result of

reforming the sports movement. During this period, the search for ways to guide the development of the sports movement. There are temporary bureaus of unions of the Red organizations of physical culture. The first meeting of such a bureau together with representatives of all sports associations and sports centers of Kharkiv, for example, took place on November 17, 1922. This meeting discussed the composition of the Red organizations of physical culture, plans and prospects of winter sports, sports evenings. On December 25, 1922, a congress of assistants for the political unit of the State Educational Institutions of Ukraine and the Crimea took place. On the agenda were questions: about the physical development of working youth, the proletarianization of sports, private clubs, questions about physical education in schools (factory, factory, robotics, etc.).

In August 1922, the Council of People's Commissars at the request of the Central Department of Universal Education considered the issue of material support for physical culture and sports, it was decided to allocate annual costs for the All-Ukrainian Olympiads, provincial executive committees the maintenance of yacht clubs was entrusted to shipyards.

The number of teachers, instructors and doctors working in physical education, who were engaged in physical education, were small. For further work on the general military training of workers and on the development of physical culture and sports, it was necessary to urgently begin training teachers and instructors. To this end, the Main Military Gymnastics and Fencing School was opened in St. Petersburg by order of the People's Commissariat for Naval Affairs on August 28, 1918. In April 1919, the Revolutionary Military Council of the Republic approved regulations on higher courses of universal education, on Moscow courses for sports instructors and pre-service training, on district courses for sports instructors.

In September 1919, a network of courses was approved for a number of cities, which later opened in Yaroslavl, Kharkiv, and Simbirsk. From this time begins the systematic training of personnel for pre-service training and sports. Courses opened in the districts (reorganized in May 1921 into district schools) needed qualified teachers, and before the general education there was an urgent task in training such personnel [5, p.102]. By the end of 1920, 4,385 such courses had been completed. The largest issues were given by the Leningrad, Kharkiv, Yaroslavl, and Moscow courses.

At the initiative of doctors and teachers of the Main Military School, scientific control over the physical development of those involved in sports was organized. It was necessary to scientifically substantiate the activities carried out by the University for the development of physical culture and sports.

In 1920, under the leadership of MI Podvoysky, a number of conferences were held to unite the scientific forces and create a scientific center of physical education. In Kharkiv in 1921 by order of the Commander of the Armed Forces of Ukraine and the Commissioner of the Republic of Belarus MF Frunze in the All-Ukrainian Academy of Sciences was founded Research Institute of Physical Culture under the leadership of Professor VY Pidgaetsky [1, p. 145].

In October 1922, a congress of members of the All-Ukrainian Academy of Sciences took place in Kyiv. Prior to this congress, the Pedagogical Commission and the Institute of Physical Culture at this Academy organized an exhibition dedicated to physical culture and sports. The purpose of the exhibition was: to highlight the current state of physical education and sports, to promote the dissemination of the general public correct views on physical education, sports and physical culture.

The development of physical culture and sports in the country was facilitated by the activities of the head of the Main Department of Universal Education MI Podvoysky, he proposes to create a special body that would take over the leadership of this important matter. This proposal was supported, and in 1920 the Supreme Council of Physical Culture was established at the Main Department of Universal Education. Physical education councils are also organized on the ground at the district departments of universal education.

Universities have united all sports associations and clubs, turned them into mass sports organizations, formed a wide network of military sports associations and clubs. In 1920, there were more than 1,500 sports clubs in the Soviet country, which employed more than 140,000 people.

At the Third Congress of the Komsomol in 1920, a decision was made on the purpose and objectives of physical culture and sports. It stated that physical education is one of the necessary elements of the general system of youth education and has a direct practical purpose – to prepare young people for work and armed defense of the Motherland. This idea was later formulated in the All-Union complex «Ready for work and defense of the USSR.» The party documents, in particular, emphasized that the interest of young people in physical education and sports in the broadest sense of the word

should be used in order to involve young people in public and political life. Physical culture work already in that period occupies a significant place in the activities of trade unions and the Komsomol.

### **Discussion**

As a result of revolutionary transformations, physical culture loses its class character and becomes accessible to all segments of the population. At that time, the Vsevobuch system (April 22, 1918) provided for acquaintance with the basics of military affairs of schoolchildren under 16 years of age, pre-conscription training of citizens from 16 to 18 years of age and training of men of conscription age (from 18 to 40 years). The Vsevobuch system in this form was abolished in 1923.

Regulation of the process of physical education is undertaken by the state. In Ukraine, the Soviet model of physical culture management is being formed, the characteristic features of which are the centralization of management, the unity of state and public forms of physical education.

Due to the implemented reforms, propaganda work, sports events, etc. in society the demand for sports is increasing, a new attitude to physical culture is formed, which resulted in a significant increase in the number of athletes, increasing the level of their sportsmanship.

Physical education acquires ideological features, is a politically motivated means of communist education and general culture of the people.

During this period, the ideological and theoretical foundations of physical culture and sports are laid. Material and technical support of the physical culture movement is being improved, specialized educational institutions for the training of specialists in the field of physical education and sports are being created.

In the 1920 s, a certain system of republican and all-Union competitions, physical culture and sports events began to take shape, the most popular of which were sports contests, mass races, sports weeks, Universal Education days, and so on.

### **Conclusions**

Thus, in the conditions of formation of the Soviet system of education, searches of the maintenance, forms and methods of physical culture and improving activity in 1920-1923 there is a change of approaches to realization of system of physical education of youth. This process was also influenced by the position of the Communist Party, which saw physical culture as an element primarily of ideological influence on people, control and management. This did not contribute to the development of physical education of young people, it happened

only sporadically. Only in connection with the change of the paradigm of physical culture (its militarization) physical education becomes the basis of a scientifically sound system of physical education of workers. Public authorities combined obligatory, voluntary, amateur forms, and it was marked by scale and scope.

Isolation by international sports organizations had a negative impact on the level of sports achievements.

These contacts take place along the lines of the international labor movement.

We consider the study of the content of the physical culture movement in the following historical periods of Ukraine's development to be a promising area of further research.

*Conflict of interest.* The authors declare no conflict of interest.

### References

1. Вербицький В.А., Бондаренко І. Г. Історія фізичної культури та спорту в Україні. навч. посіб. Миколаїв : ЧДУ ім. Петра Могили, 2014. – 340 с.  
Verbytskyi V.A., Bondarenko I.G. (2014) "History of Physical Training and Sport in Ukraine", Textbook, Mykolaiv, Petro Mohyla Chornomorsk State University, 340 p. [in Ukraine].
2. Кулик В.В. Від всеобучу до світових рекордів. Київ, 1971.183с.  
Kulyk V.V. (1971) "From Overall Military Education to World Records", Kyiv, 183. [in Ukraine].
3. Лук'янченко М.І. Становлення теорії та практики фізичного виховання в радянській Україні через призму реформаторської педагогіки (1920-1930 рр.) *Педагогіка, психологія та медикобіологічні проблеми фізичного виховання і спорту.* – 2010. № 12. С. 72–75.  
Lukianchenko M.I. (2010) "Establishment of Theory and Practice of Physical Training in Soviet Ukraine through the Prism of Reform Pedagogy (1920-1930 years)", *Pedagogy, Psychology and Medical and Biological Problems of Physical Training and Sport*, № 12, p. 72–75. [in Ukraine].
4. Основные постановления, приказы и инструкции по вопросам советской физической культуры и спорта 1917–1957. Москва, 1959. С.10–25.  
"The Main Decrees, Orders and Instructions on the Issues of Soviet Physical Culture and Sport 1917–1957" (1959), Moscow, p. 10–25. [in Russian].
5. Півень О. П., Гордієнко О. І. Історико-педагогічні особливості розвитку спортивно-масової роботи у вузах України в 1920–1930 рр. *Науковий часопис НПУ імені М.П. Драгоманова.* 2019. № 15, Випуск 11 К (119) 19. С.100-103.  
Piven O.P., Hordienko O.I. (2019) "Historical and Pedagogical Characteristics of the Advancement of Sport and Mass Activities in Higher Educational Establishments in Ukraine in 1920-1930 years", *Scientific Journal of Drahomanov National Pedagogic University*, № 15, 11 K (119) 19, p. 100–103. [in Ukraine].
6. Солочук М.С. Олімпійська освіта. Кам'янець-Подільський : Кам'янець-Подільський національний університет імені Івана Огієнка, 2013. – 176 с.  
Solopchuk M.S. (2013) "Olympic Education. Kamianets-Podilskiy", Ivan Ohienko Kamianets-Podilskiy National University, 176 p. [in Ukraine].
7. Тимошенко Ю. О. Мілітарна парадигма фізичної культури в підрадянській Україні (1920–1930 рр.). *Вісник ЛНУ імені Тараса Шевченка.* 2012. № 21 (256). С. 140–148.  
Tymoshenko Yu.O. (2012) "Military Paradigm of Physical Culture in Soviet Ukraine (1920–1930 years)", *Gazette of Taras Shevchenko Lviv National University*, № 21 (256), p. 140–148. [in Ukraine].

Received for publication 17.02.2020

# CHANGES IN INDICATORS OF PHYSICAL PREPAREDNESS OF YOUNG PEOPLE AGED 16–17 UNDER THE INFLUENCE OF PHYSICAL AND HEALTH ACTIVITIES CLASSES WITH ELEMENTS OF AQUARECREATION

V. Pidhaina

National University of Physical Education and Sport of Ukraine, Kyiv, Ukraine

corresponding author – V. Pidhaina: podgajnaya.vera@ukr.net

doi: 10.32626/2309-8082.2020-16.59-63

The article analyzes the influence of physical education classes with elements of aquarecreation on the performance of motor tests, which are included in the method of determining the level of physical fitness of young men (according to the method of T.Yu.Krutsevich, 2006). It is established that there is a direct interdependence between the level of motor activity and indicators of physical fitness. To analyze the dynamics of motor tests among older boys. Methodology of the study: the study involved 48 young men of sixteen and seventeen years of age studying in secondary schools in Kyiv. Results of the work: an analysis of the results of motor tests included in the method of determining the level of physical fitness (according to T. Yu. Krutsevich) before the beginning of the pedagogical experiment showed that the results are mainly at a low level. After the implementation of leisure activities of young men in physical education activities with elements of aquarecreation, there was an increase in the level of development of strength and overall endurance, which were determined using the above motor tests. During the period of pedagogical experiment, we were able to form the need for daily physical

activity among the youngsters of the upper classes, as well as to positively improve their emotional status. Based on the data obtained during the performance of motor tests and the final level of physical fitness of 16–17 year olds, we have found a relationship of these parameters with the physical activity of students. The data obtained indicate that insufficient physical activity leads to a deterioration of the physical condition of young men. According to the results of the study, differentiation of physical activity in physical exercises will be carried out with the use of tools «Aquarecreation» depending on the degree of deviation of normative parameters of indicators of physical fitness of boys. Exercise with the elements of water recreation can be a means of rest, an important factor in the prevention of diseases and functional disorders of the body. Prospects for further research are the implementation of the developed program of physical education and health classes with elements of water recreation for the body of youths 16-17 years old in children's and youth sports rowing schools.

**Keywords:** physical activity, aquarecreation, physical fitness, boys.

## Introduction

Analyzing school programs in physical education, we can trace the fact that nowadays there is no real opportunity to provide an important principle of the physical education system – a differentiated and individual approach to students, taking into account their health, physical development and physical fitness. Current programs do not take into account the peculiarities of the psychofunctional state of the body of schoolchildren, especially high school students [4, S. 9–13; 10, pp. 320–368]. That is why in most high school graduates the level of development of motor skills does not meet the requirements of society for the physical fitness of the younger generation.

The results of scientific research show that in students of grades 7–8, the development of motility is relatively stable, while in grades 9–11 there are some regressive changes. Thus, it is reasonable to assume that such indicators are due to the low efficiency of physical culture and health orientation of physical education and insufficient development of motor skills in physical education lessons [5, P. 134–187; 11, pp. 155–210].

Therefore, it is necessary to improve the conceptual directions of development of physical education in school

and the mechanism of their implementation in everyday work. The content of the new approach to physical education of student youth should be based on the expansion of optional and sectional classes, which are held outside the school schedule [5; 6].

Pedagogical observations and the study of special literature show that in secondary school during all years of study, regardless of social and environmental conditions, physical education lessons use almost the same exercises. With the age development of schoolchildren, only their dosage changes and the requirements for the quality of performance become more complicated [7, pp 19–22; 9, pp. 202–205; 14, pp. 83–89].

## Material and Methods

*The purpose of the study* is to determine the impact of physical culture and health activities classes on aquarecreation on the physical fitness of high school students. By the term «aquarecreation» we mean the use of rowing, swimming and moving games in the aquatic environment.

In order to determine the level of physical fitness of boys in grades 10–11, a confirmatory experiment was conducted. The study involved 112 students of 10–11 classes of Kyiv schools. After the survey, a group of

48 high school students, who expressed a desire to attend physical education and health activities classes with elements of aquarecreation during leisure, was formed. The survey and testing of students was carried out after obtaining the consent of parents or official representatives of students, in accordance with ethical standards.

The level of physical fitness of schoolchildren according to the method of T. Yu. Krutsevich, (2006) [5] was determined before and after the pedagogical experiment. A positive feature of the method is the consideration during the calculation of individual indicators of physical development (body weight and length). The level of development of motor skills, which was determined using tests that are included in the method, was assessed by the results: running on 100 m (s); running on 3000/2000 m (s); long jumps from a place (cm); wrist dynamometry. Processing of the obtained results was carried out using the methods of mathematical statistics with the calculation of determining the probability of discrepancies by Student's t-test.

Based on the analysis of the results obtained at the beginning of the study, a fitness program with elements of aquarecreation that included the following forms of activities: rowing on an ergometer and in a boat, swimming and water games, was developed. The duration of the program of physical culture and health activities classes was 9 months (January-September). The frequency of classes was three times a week, lasting 60 minutes. The ratio of general and special means was 60/40 %. The intensity of classes was in the range of 50–75 % of the MOC (maximum oxygen consumption).

In the period from January to April, the young men received the main load on the rowing ergometer «Concept -2» and in the pool. In the period from May to September, training was conducted in open water. Physical training and health activities classes consisted of three parts.

The preparatory part of the lesson included general developmental exercises, complexes for working out the main muscle groups. The intensity of exercise was determined by heart rate and in the first stages of training was 110–115 beats / min, which corresponds to low intensity. Heart rate gradually increased to the level of medium intensity (125–135 beats/min).

The main part in the winter-spring period consisted of rowing on an ergometer or swimming in the pool, and in the spring-summer-autumn period – rowing in the open water. Development of endurance was made by the

continuous exercise heart rate of 120–150 beats/min. The main part also included local exercises for certain muscle groups: the muscles of the back, abdomen, legs and arms. When performing strength exercises, the heart rate was in the range of 110–130 beats/min. An important part of physical culture and health activities classes were the elements of the initial training of rowing, exercises to teach rowing techniques, especially in the boat.

The final part included exercises to relax, restore breathing, and reduce heart rate to baseline.

During the physical culture and health activities classes, the stage of initial training was identified, and then the stage of improving the content of the lesson by increasing the volume and intensity of the load, taking into account the initial level of preparation of young people. The load was dosed depending on the pace of rowing, the length of the distance. It is much easier to dose on the ergometer, but in the boat we were guided by the data obtained from fitness trackers (heart rate monitor, pedometer).

The program was implemented in three stages: preparatory, basic, final. The preparatory stage lasted three months, the tools that were used: general development, rowing on an ergometer, swimming. The duration of the main stage was also three months, but the number of visits varied depending on the initial indicators of each student and was 2–3 times a week, rowing in a boat on open water and athletics are added to the previous means. The final stage also lasted three months. The main means were rowing in a boat, swimming and water games.

Results of the research. Physical education and health classes play an important role in shaping, strengthening and maintaining the health of students. Among the main indicators that determine the motor activity of young people is physical development. In the scientific literature, the term «physical development» is used in the interpretation: as a process of changing the forms and functions of the human body during his individual life. [5, C 33–47; 6, pp. 63–67].

According to the survey, students have no interest towards the most of the exercises used in the lessons, but perform them because they are the material of the educational process. The greatest negative attitude schoolchildren have to the exercises for the development of endurance (34.5 %), speed (28.7 %) and flexibility (17.5 %). The reason for this attitude to exercise students call the complexity of their execution.

The uniformity of the content of lessons, which often use difficult exercises that do not contain elements of games and competitions, reduces the interest of high school students in physical education. It has been proven that none of the school programs is able to provide a person with a proper level of physical condition for a life term period without further systematic work on themselves at school and during leisure. In order to teach a person to take care of their health, to involve them in conscious and independent physical culture and health-improving classes, it is necessary to bring up students' responsibility for their physical condition. It is the formation of such responsibility that encourages them to engage in regular physical culture and helps to optimize physical condition.

Needs, motives, interests contribute to the formation of certain attitudes to the need for certain sports in extracurricular activities, to attend sectional classes of various orientations [6, P. 63–67; 8, pp. 21–24]. Therefore, answering the question «What kind of sport would you like to do?» – 78.6 % of young people preferred water sports, including swimming, rowing and games. To the question: «Why do you want to do these sports?» – young men gave the following answers: 1) it is prestigious; 2) increase physical fitness; 3) participation in sports competitions. However, to the question: «Do you do sports?» – only 12 % of respondents said “Yes”, 46 % – want to do one or another sport, but for many reasons do not, 42 % of high school students do not want to exercise at all. Such a significant percentage indicates that high school students tend to reduce the desire to exercise, especially in physical education classes. Thus, it is necessary to expand the variety of physical culture and health activities during leisure time, in which students are given the opportunity to engage in those types of exercise that interest them, which they enjoy. Parents and teachers play an important role in this, they must form in student's responsibility for their physical condition, encourage them to regular physical education and health activities

classes. Crucial to fostering interest in physical education is the right combination of teacher explanations and practical physical education for students in both school and extracurricular (section) classes.

To determine the level of physical fitness of high school students who attend aquarecreation classes during leisure time, we used the method of T. Yu. Krutsevych. This technique includes motor tests that meet the requirements of accessibility, objectivity and informativeness. [5, pp. 95–135; 11, pp. 120–175].

The analysis of the results obtained during the observational experiment, presented in previous publications of the author, showed that the level of physical fitness among high school students of age sixteen and seventeen is below average (75 % and 10.71 %) and average (25 % and 67.86 %). ) and only 21.43 % of 17-year-old schoolchildren had a level above the average [10].

Analysis of data on physical fitness as an important indicator of the current level of motor activity of young people 10-11 classes, gave rise to a steady downward trend, which led to the need to develop methods and rehabilitation to engage in physical culture with elements of aquarecreation approach to physical indicators.

As a result of the obtained data, we decided to conduct a detailed analysis of those motor tests that are part of the method of determining the level of physical fitness. This approach reveals the weakest points in the physical development of young people and allows you to make timely adjustments to the proposed program in order to obtain a better result.

We compared the obtained values of the average indicators of physical exercises included in the calculated indices enclosed in the methodology, at the beginning of the pedagogical experiment and after the implementation of physical culture and health activities program among students sixteen and seventeen years old who attended classes during leisure time. The results are presented in table 1.

**Table 1 – Dynamics of physical fitness of young men for the period of pedagogical experiment, (n = 48), ( $\bar{x} \pm S$ )**

№	Young men aged 16 (n=24)					Young men aged 17 (n=24)				
	before	<i>m</i>	<i>p</i>	after	<i>m</i>	before	<i>m</i>	<i>p</i>	after	<i>m</i>
1.	15,23±0,38	0,08	>0,05	14.48±0,30	0,08	15,13±0,34	0,07	>0,05	14,26±0,15	0,05
2.	589±22,26	4,05	<0,05	536,25±17,2	2,89	890±46,34	7,52	<0,05	838,5±27,14	3,47
3.	207±3,5	2,31	<0,05	215±3,9	2,02	205±4,0	1,16	>0,05	213±4,2	0,87
4.	32,88±10,4	1,27	<0,05	38,38±6,89	1,81	41,25±7,12	2,83	<0,05	45,63±4,67	1,27

\* Indicators: 1. Results «Running on 100m (s)»; 2. Results «Running on 3000/2000 m (village)»; 3. Results «Long jumps from a place (cm)»; 4. The results of wrist dynamometry

As can be seen from the table above, the average indicators of motor tests, which are included in the method of determining the physical fitness of young people aged 16–17, have improved significantly after the implementation of the proposed program of physical training and health activities with elements of aquarecreation. Changes were recorded among young men of both groups in such motor tests as running on 2000/3000m; long jump from a place and an indicator of force dynamometry ( $p < 0,05$ ). The obtained data did not have a significant impact on the final assessment of physical fitness.

Among the studied young men, sixteen and seventeen years old, during the implementation of a fitness program with elements of aquarecreation, there was a tendency to improve motor tests (running 2/3 km, long jump), which are included in the calculation of endurance index and speed-power index. The use of aerobic exercises, which is the main property of aquarecreation, has a positive effect on the state of the cardiovascular and respiratory systems, which is an important basis for the physical development of young men.

There was also an increase in strength among young men aged sixteen and seventeen, as evidenced by the results of wrist dynamometry. Such positive dynamics occurred due to rowing with the use of additional weight (hydro braking or rowing by two in a four-seater boat), which is quite relevant for young men of this age.

Thus, our pedagogical experiment allowed us to assert that rationally organized physical culture and health activities classes and properly constructed physical activity in combination with regular attendance, contribute to the body's adaptation to higher physical activity and increase physical fitness in particular. Insufficient level of motor activity reduces the functional capabilities of the body of high school students, resulting in slowed motor development [13; 14].

### Discussion

In our opinion, the issue of increasing the level of physical activity and, accordingly, the level of physical fitness among young people is quite relevant. According to the results of the pedagogical experiment, we found out that the low level of motor activity is primarily due to the lack of motivation of students to regular classes. Our study confirms the opinion of such scientists as T. Yu. Krutsevich [5], N. V. Kovaleva [4]. New, interesting and probably more effective forms of leisure activities should be introduced. Authors such as A. V. Hackman [2], T.W. Blistov [3] in their work showed that the use of physical training and health activities in natural

conditions, involving students in unusual activities, is much more effective than the use of standardized forms of physical activity. According to the results of the pedagogical experiment, aquarecreation is exactly the kind of leisure that meets the requirements of modern students. Classes are held in open water, the forms of classes that are included in the program will allow the harmonious development of personality: physically, mentally, and spiritually.

### Conclusions

During the experiment, it was found that the reason for the negative attitude of high school students to the exercises to develop endurance, speed and flexibility is the complexity of their execution. When surveying young people about the type of physical activity they would like to do, it was discovered that 78.6 % of them preferred innovative types of activity, including swimming, rowing, water games, which are not typical for modern physical education lessons at school. Therefore, we built the experimental work in the form of extracurricular activities with elements of aquarecreation.

After the implementation of the program in practice, we received data proving the effectiveness of the implemented classes. Thus, significant changes ( $p < 0.05$ ) were registered in endurance exercises (running on 2000 / 3000m), long jump from a spot, and the indicators of wrist dynamometry. A detailed analysis of the indicators allowed obtaining the following data: in the results of running on 2000/3000 m, 16-year-old boys had  $589 \pm 22.26$ ,  $536.25 \pm 17.2$ , 17-year-olds –  $890 \pm 46.34$  and  $838, 5 \pm 27.14$ , respectively.

Indicators of long jump from a place at 16-year-old boys before implementation of the program were  $207 \pm 3,5$ , and after  $245 \pm 3,9$ ; but significant changes appeared in 17-year-old boys' results, and it is  $205 \pm 4.0$  and  $213 \pm 4,2$  respectively. The results of wrist dynamometry changed significantly, if the results of 16-year-old and 17-year-old boys were  $32.88 \pm 10.4$  and  $41.25 \pm 7.12$  respectively before the pedagogical experiment, and after  $38.38 \pm 6.89$  and  $45.63 \pm 4.67$  respectively. The obtained data testify to the positive dynamics of changes in physical fitness due to the use of the developed program by high school students.

The prospect of further research is the implementation of the program of physical culture and health activities classes developed by us with elements of aquarecreation in the practical activities of children's and youth sports schools in rowing.

*Conflict of interest.* The authors declare no conflict of interest.

## References

1. Андреева О. В. Фізична рекреація різних груп населення. Київ: Поліграфсервіс; 2014: 280с.  
Andreeva, L. V., (2014) Fizichna rekreaciya riznih grup naselennya. [Physical recreation of different population groups]. Kiev: Poligrafservis; 280 p. [in Ukraine].
2. Гакман А. В. Організація рекреаційно-оздоровчої діяльності дітей 11–14 років в умовах дитячого табору відпочинку [дисертація]. Київ: НУФВСУ; 2012. 231с.  
Gakman, A. V., (2012) Organizaciya rekreacijno-ozdorovchoi diyal'nosti ditej 11–14 rokov v umovah dityachogo taboru vidpochinku [disertaciya]. [Organization of recreational and health activities of children of 11–14 years in the conditions of a children's camp of rest]. Kiev: NUUPES; 231p. [in Ukraine].
3. Блістів Т. В. Організаційно-методичне забезпечення оздоровчо-рекреаційної діяльності учнівської молоді у закладах позашкільної освіти туристсько-краєзнавчого напрямку [дисертація]. Київ: НУФВСУ; 2019. 258 с.  
Blistiv, T.V., (2019) Organizacijno-metodichne zabezpechennya ozdorovcho-rekreacijnoї diyal'nosti uchniv's'koї molodi u zakladah pozashkil'noї osviti turist's'ko-kraeznavchogo napryamu [disertaciya]. [Organizational and methodological support of health-recreational activity of pupils in out-of-school educational establishments of tourist and local lore]. Kiev: NUUPES; 258 p. [in Ukraine].
4. Ковальова Н. В. Андреева О. В. Проблеми активізації рекреаційно-оздоровчої діяльності старшокласників у вільний час. Наук. часоп. Нац. пед. ун-ту ім. М. П. Драгоманова 7(15); 2011; С. 8–13.  
Koval'ova, N. V., Andreeva, O. V., (2011) Problemi aktivizacii rekreacijno-ozdorovchoї diyal'nosti starshoklasnikiv u vil'nij chas. [Problems of activation of leisure and recreational activities of high school students.], Nauk. chasop. Nac. ped. un-tu im. M.P.Dragomanova. 7(15), pp. 8–13. [in Ukraine].
5. Круцевич Т. Ю., Воробйов М. І., Безверхня Г. В.. Контроль у фізичному вихованні дітей, підлітків і молоді: навч. посіб. Київ: Олімп. Література. 2011; 224 с.  
Krucevich, T. Yu., Vorobjov, M. I., Bezverhnya, G. V., (2011) Kontrol' u fizichnomu vihovanni ditej, pidlitkiv i molodi: navch. posib. [Control in the physical education of children, adolescents and young people: Educ. tool]. Kiev: Olimp. Literatura; 224 p. [in Ukraine].
6. Мицкан Б. М., Поташнюк І. В. Фізичний стан учнів старших класів гімназії. Педагогіка, психологія та медико-біологічні проблеми фізичного виховання і спорту. (№ 5). 2011; С.63–67.  
Mickan, B. M., Potashnyuk, I. V., (2011) Fizichnij stan uchniv starshih klasiv gimnazii. [Physical state of high school students]; Pedagogika, psihologiya ta mediko-biologichni problemi fizichnogo vihovannya i sportu (№ 5); pp.63-67. [in Ukraine].
7. Москаленко Н. Педагогічні інновації у фізичному вихованні. Спортивний вісник Придніпров'я (№1.). 2009; С. 19–22.  
Moskalenko, N., (2009) Pedagogichni innovacii u fizichnomu vihovanni. [Pedagogical innovations in physical education] Sportivnij visnik Pridniprov'ya (№1); pp. 19–22. [in Ukraine].
8. Неділько В. П., Камінська Т. М., Руденко С. А., Пінчук Л. П. Стан здоров'я дітей старшого шкільного віку. Здоров'є ребенка (№2). 2011; С. 21–24.  
Nedil'ko, V. P., Kamins'ka, T. M., Rudenko, S. A., Pinchuk L. P., Stan zdorov'ya ditej starshogo shkil'nogo viku. [Health status of older school children]; Zdorov'e rebenka (№2). pp. 21–24. [in Ukraine].
9. Пальчук М. Сучасні підходи до вирішення проблеми наступності у фізичному вихованні школярів. Молода спортивна наука України: зб. наук. Праць (2). 2015; С. 202–205.  
Pal'chuk, M., (2015) Suchasni pidhodi do virishennya problemi nastupnosti u fizichnomu vihovanni shkolyariv. [Modern approaches to solving the problem of continuity in physical education of schoolchildren]; Moloda sportivna nauka Ukrainu: zb. nauk. prac' (2); pp. 202–205. [in Ukraine].
10. Підгайна В. О., Ковальова Н. В. Вплив рухової активності на показники фізичного стану старшокласників. Зб. Наукових праць НПУ ім. Драгоманова. «Науковий часопис». Серія 15. Випуск 3К(97)18К. 2018; С. 393 – 397.  
Pidgajna, V. O., Kovalova, N. V., (2018) Vpliv ruhovoyi aktivnosti na pokazniki fizichnogo stanu starshoklasnikiv. [Influence of motor activity on indicators of physical condition of high school students]; Zb. Naukovih prac NPU im. Dragomanova. «Naukovij chasopis». Seriya 15. Vipusk 3K(97)18K; pp. 393–7. [in Ukraine].
11. Сергієнко Л. П. Тестування рухових здібностей школярів. Київ. 2001; – 438 с.  
Sergienko, L. P., (2001) Testyvannya ryhovih zdbnostej shkolyariv. [Testing of pupils' motor abilities] Kiev; 438 p. [in Ukraine].
12. American College of Sports Medicine. (2000) ACSM Guidelines for exercise testing and pre-scription.–Baltimore: Lippincott Williams&Wilkins, 378p.
13. Redmond K. (2010) Promoting Physical Activity: A Guide for Community Action, Second Edition Centers for Disease Control and Prevention / K. Redmond. – Human Kinetics, 280 p.
14. Rodriguez DA, Arbillaga A, Barberan-Garcia A, et al. (2016) Effects of interval and continuous exercise training on autonomic cardiac function in COPD patients. Clin Respir J 2016; 10(1): 83–89.

Received for publication 17.02.2020

# ORGANIZATION OF MOTOR ACTIVITY OF EARLY PRESCHOOL CHILDREN IN PRESCHOOL EDUCATIONAL ESTABLISHMENTS OF VARIOUS TYPES

A. Polyakova, O. Mykytchyk, O. Konakova

Prydniprovskaya State Academy of Physical Culture and Sports, Dnipro, Ukraine

corresponding author – A. Polyakova: polakovaantonina303@gmail.com

doi: 10.32626/2309-8082.2020-16.64-73

According to the Law of Ukraine «On Preschool Education» the preservation and strengthening the physical, mental and spiritual health of a child is a primary task of developing, educating and upbringing the youngest citizens of the country. Nowadays, both in Ukraine and in the world, new ways of encouraging motor activity of preschool children are being actively searched for. Therefore, studies on improving the efficiency of physical training in preschool educational establishments have been conducted in recent years. The most important task facing modern educators is to provide measures for preserving and strengthening health of a child and creating possibilities for comprehensive physical development through maximum motor activity of preschool children. Unfortunately, both in Ukraine and abroad, studies of the organization of motor activity of preschool children are not systematic, desultory and fragmentary. The purpose of article – scientifically substantiate the process of organizing the motor activity of the preschool children. *Results.* The forms of work and types of physical activity that contribute

to the optimization of the physical condition of children 3–4 years are determined. The forms of work and types of motor activity for children aged 3–4 in different educational establishments have been proposed. Methodological basis for organizing and carrying out various kinds of work and physical training directed at stimulating physical activity of preschool children in different educational establishments (general, combined, sanatorium and compensating types) have been presented. Target indicators of motor activity of children aged 3–4 have been provided. *Conclusions.* The pattern for organizing rational motor mode for children aged 3–4 in preschool educational establishments of various type covering: purpose, tasks, procedural and substantive maintenance, pedagogical conditions of optimization of physical activity in the mode of day of preschool establishments as a factor of increase the level of physical condition of preschool children has been substantiated.

**Key words:** preschool children, motor activity, preschool educational establishments of various types.

## Introduction

According to the Law of Ukraine «On Preschool Education», preserving and strengthening the physical, mental and spiritual health of the child is a priority task of developing, educating and upbringing of the youngest citizens of the country [1].

As indicated by N. O. Pahalchuk, O. I. Miruha, G. M. Romanenko [2] one of the priority areas for improving the modern theory and practice of physical culture in preschool education is the search for new forms, methods and techniques of physical education of children. This requires a rational transformation of modern education, in particular, its preschool level as the basis of socio-cultural development of the individual. One of the leading factors influencing the level of health and physical condition is physical activity. Many researchers emphasize the relationship between motor activity and physical condition of the child [4; 5; 6]. This determines the expediency of using a system of education that provides maximum health, educational and upbringing effect. The most important tasks for teachers are to preserve and strengthen the health of

the child, comprehensive physical development and optimal motor regime of preschool children [3].

Researchers are drawing a lot of attention to this problem. Currently in Ukraine and in the world there are active searches for ways to intensify the motor activity of young preschool children. In recent years, research has been conducted to improve the effectiveness of physical education in preschool institutions. Organizational, pedagogical and methodological basis for improving the system of physical education of preschool children are given in the studies of N. F. Denisenko [7], E. S. Wilczkowski [8], T. Yu. Krutsevich [9], N. E. Pangelova [10].

Foreign scientists also suggest diversifying the forms and methods of organization of motor activity of children of primary school age [11]. Harriet G. Williams and co-authors [12] found out that the level of motility could be an important factor in promoting a physically active lifestyle in preschool children. Saakslaiti A, Numminen P, Niinikoski H. with co-authors [13] investigated the relationship between physical activity and physical development in early childhood. Fisher A, Reilly JJ, Kelly LA. with co-authors [14] devoted their research

to identifying the basic movement skills and habitual physical activity in young children. Reilly JJ, Jackson DM, Montgomery C and co-authors discovered the total energy expenditure for physical activity in preschoolers in Scotland [15]. Nan Zeng and co-authors conducted a systematic review of the impact of physical activity on motor skills and cognitive development in early childhood. Unfortunately, both in Ukraine and abroad, research on the organization of physical activity of young preschool children is not systemic and is bitty and fragmentary. This determined the relevance of our study.

### Material and methods

*The purpose of the article* is to scientifically substantiate the organization of motor activity of children of primary school age.

The method of pedometry was used to determine the motor activity of children. This method was that the pedometer was placed in a bag that is attached to the belt at the waist of the child. The device recorded only the number of movements (walking, running, and jumping). The length of the steps and the speed of the pedometer were not recorded.

Therefore, the pedometer had only a rough estimate of the motor activity of the child. When applying the method of pedometry, the total number of main locomotions throughout the organized and voluntary motor activity of the child during his stay in the preschool institution was taken into account. The obtained indicators were compared with the data given in the studies of E. S. Wilczkowski [8].

*Participants.* Children 3–4 years old took part in researches. They attended preschools of various types in Dnipro. These are children's institution № 282 of the combined type, children's institution № 192 of sanatorium type, children's institution № 28 of compensatory type, children's institutions № 244 and № 404 of general development. The total number of children was 185.

*Statistical analysis.* Statistical processing of the study materials was carried out using the software package Microsoft Excel 2010. The arithmetic mean value and the arithmetic mean error were calculated. Significance of differences between the samples was checked using Student's t-test and was considered statistically significant at  $p < 0,05$ .

### Results

During the development of a rational motor regime, the need to meet the biological needs of children in physical activity was taken into account. The rational maintenance of motor activity based on an optimum ratio of various organizational forms of occupations selected taking into account age, individual features of children and profile of preschool educational institution was provided. These approaches were implemented in the following forms of organization of work on physical education in the conditions of the educational institution: physical education classes, physical culture and health-improving activities during the day, active recreation and independent physical activity of children during the day of preschool education. Forms of work and types of motor activity that contribute to the optimization of the physical condition of children were identified (Table 1).

For preschool institutions of general development, we recommend generally accepted forms of work and such types of physical activity as health-improving jogging, respiratory gymnastics, logarithmic gymnastics. This is because in such kindergartens a significant number of children have indicators of the functional state of the body below average, low, and insufficient speech development. In the institution where there is a swimming pool, twice a week swimming lessons are recommended in combination with hydro massage, water gymnastics, hardening activities.

Preschool institutions of compensatory type are created for children who need adjustment of physical and mental development (with hearing, sight, speech, musculoskeletal disorders). Analysis of the incidence of children revealed that the vast majority of them have impaired vision, musculoskeletal system, etc.; some functional indicators do not meet the average age norms.

Statistical indicators of physical fitness and physical activity are also lower than in pupils of general development institutions. All this led to a change in the ratio of different organizational forms of exercise (reducing the number of physical education classes by conducting health-improving-and-play classes, by conducting different types of corrective gymnastics, etc.).

Table 1 – Forms of work and types of motor activity of children 3–4 years old in institutions of different types

Types of classes and features of their organization, duration	Types of preschool institutions			
	General development	Combined type	Sanatorium type	Compensating type
<b>1. Physical education classes</b>				
Physical education classes	5 times, 2 of them in the air		3 times, 1 of them in the air	
Swimming (if there is a pool). Twice a week, in the afternoon, in subgroups (8-10 children). 25-30 minutes	+			
<b>2. Physical culture and health-improving activities during the day</b>				
Morning gymnastics. Every day outdoor (in the warm season) or indoor. 5-6 min (second junior group); 6-8 minutes (middle group). Exercises for posture correction and prevention of flat feet. Breathing exercises to improve the drainage function of the lungs and bronchi.	+	+	+	+
Moving games and exercise. Every day during the morning outdoor activities, subgroups formed taking into account the level of physical activity of children and their physical condition. 20-25 minutes	+	+	+	+
Jogging. Twice a week, in subgroups of 5-7 children, during a morning outdoor activities. 3-5 minutes	+	+		+
Individual work on the development of movements. Every day while the evening outdoor activities. 10-12 minutes	+	+	+	+
Gymnastics after an afternoon nap. Daily, after a nap. 5-8 minutes, 4-5 exercises	+	+	+	+
Activities for hardening the body in combination with physical exercises. Daily during physical activity, after sleep and during other regime activities	+	+	+	+
Health-improving-and-playing lesson. Daily after an afternoon nap. 25-30 minutes			+	+
Corrective gymnastics. Daily, after an afternoon nap (during health-improving-and-playing lesson). Complexes of corrective exercises can be used in other forms of physical culture and health-improving activities on the recommendation of a doctor. 10-12 minutes			+	+
Breathing exercises. Every day, in the process of conducting organized forms of physical education, as well as – music lessons. 8-10 minutes	+	+	+	+
Logarithmic gymnastics. Twice a week, in subgroups (conducted by a speech therapist)	+	+	+	+
<b>3. Active recreation</b>				
Outdoor activities – hiking in the woods or a nearby park. Twice or thrice a month, during the time allotted for physical education and games and exercises organized by the educator. 60-80 minutes (middle group)	+	+	+	+
Physical leisure. Once or twice a month outdoor with peers of one or two groups. 20-30 minutes	+	+	+	+
Sports holidays. Twice or thrice a year with children of other ages. 60-80 minutes (middle group)	+	+	+	+
Health Day. Once a month. During the day, active physical activity of children in the open air. Its content is determined by the educator	+	+	+	+
Health Week (vacation). Twice or thrice a year (last week of the quarter)	+	+	+	+
<b>4. Independent classes</b>				
Independent motor activity. Every day, under the guidance of an educator, indoors and outdoors. The duration depends on the individual characteristics of children	+	+	+	+

The main contingent of sanatorium-type preschool institutions are children with early manifestations of tuberculosis infection. They often suffer from Cold diseases, or have diseases of the gastrointestinal tract, or diseases of endocrine and cardiovascular systems. Pupils of these institutions are characterized by the highest incidence. Assessment of the functional state of children shows that the adaptive capacity of their body is lower than that of children in general development institutions. Their level of physical fitness is defined as below average, and the level of physical activity is low. Therefore, the process of physical education should be mainly health-adaptation focus and special attention should be paid to body hardening procedures, breathing exercises, and health-maintaining technologies. Methodical bases of the organization and carrying out of various forms of work on physical education and kinds of motor activity of preschool children at establishments of various type are given below. Rational combination of different forms of exercise is a set of educational and health-improving activities, provides optimal motor activity of children.

*Physical education classes* are the main organizational form of physical education in institutions of various types. Pupils of general development institutions and combined type are offered daily classes (in the warm season – all in the air; in the cold season – three indoors, two – outdoors). For children who visit sanatoriums and compensatory types, it is advisable to conduct three classes a week (in the cold season – one in the air), as the motor mode of these kindergartens is supplemented by special types of physical activity – health-and-play, corrective gymnastics, etc. The structure of the lesson corresponds to the construction of the main forms of work on physical education and sports, and consists of three parts – preparatory, basic and final.

*Exercise in the air* in the cold season has its own specific tasks: helps to improve the functioning of the cardiovascular, respiratory, muscular and other body systems; increases the body's resistance to negative environmental factors; forms the child's ability to orient in

space; contributes to the consolidation of motor skills in the natural environment. Outdoor activities are especially useful for children who often suffer from acute respiratory viral infections and other diseases of the respiratory system.

In institutions where there is a swimming pool, children's swimming lessons are held at least 2 times a week (in the afternoon, 8-10 children). The organization of training of children of swimming is carried out in a complex with all forms of physical culture and improving work. Only the combination of activities in the pool with a rational mode of activity and recreation of children during the school year can help to harden and increase their physical activity. Class duration for children 3 years old – 20-25 minutes, children 4 years old – 25-30 minutes.

*Physical training and health-improving activities during the day* are mandatory forms of work in institutions of various types. They promote good health, increase mental and physical performance, activate the motor mode of children. Morning gymnastics, gymnastics after a nap, hardening actions, mobile games during walk are carried out daily. In sanatoriums and compensatory establishments health-and-game occupations, corrective gymnastics which maintenance is caused by individual features of a physical condition of pupils, are held.

*Morning gymnastics* is one of the most important components of the motor regime, its organization is aimed at raising the emotional and muscular tone of the child. Exercises help to give the body an active state, deepening of breath, strengthening of blood circulation, education of attention, purposefulness, and increase vital functions.

Morning exercises are held daily before breakfast. Duration from 5-6 minutes up to 6-8 minutes. Morning gymnastics consists of exercises recommended by the program for this age group and which are previously mastered by children in physical education [5; 10].

The number of general developmental exercises, their dosage in children 3-4 years are shown in table 2.

**Table 2 – Content and dosage of exercises of morning gymnastics complexes for younger preschoolers**

Group	Number of exercises	Number of repetitions	Jogging duration		Number of jumps	Duration of gymnastics
			at a medium pace	at a slow pace		
Second junior	4-5	5-6	20-25 c	до 1 хв	12	5-6 хв
Middle	5-6	6-8	25-30 c	до 90 c	16	6-8 хв

To optimize the motor regime of children in preschool institutions of different types, it is advisable to use the following options for morning gymnastics.

*The traditional complex of morning gymnastics* is performed in the following sequence: short walks of various kinds with a gradual transition to running; continuous running at a moderate pace; different types of arrangements; general developmental exercises; jumps; running on the spot; short walking with breathing exercises.

*Morning gymnastics of game character.* It can include 2-3 moving games of varying intensity or 5-6 general developmental simulation exercises such as «Butterflies fly», «Heron stands on one leg» and so on. You can create a whole plot of simulation movements.

*Morning gymnastics using the obstacle course* allows you to offer exercises with a gradual increase in load, complicate motor tasks, include different types of movements to increase the number of repetitions and pace, alternate sports equipment and obstacle courses. This option should be recommended for children who attend general development institutions.

*Morning gymnastics with the inclusion of health-improving jogging* for pupils of general development institutions, combined and compensatory types. It is held outdoors, during the reception of children (5-7 people). First, a short warm-up of 3-4 exercises. Then – running at an average speed of 80-120 m (once or twice, alternating with walking), depending on the individual capabilities of children and the season. Gymnastics ends with breathing exercises.

*Morning gymnastics using the simplest simulators* for students of all types. It helps to optimize and diversify physical education and health-improving classes. Exercises of general developmental action with the use of the simplest simulators (expander, gymnastic roller) are used.

*Moving games and exercise while outdoor activities.* In educational institutions of general development and combined type, where physical education classes are held daily, one moving game and varieties of any basic movement are organized while outdoor with children. Their duration in the second junior group is 8-12 minutes, in the middle group – 10-15 minutes. In institutions of compensatory and sanatorium type, on days when physical education classes are not held, moving games and exercises on the main types of movements are planned (2-3). Their duration is 15-20 minutes in the second junior group, and 20-25 minutes in the middle group. During

the distribution of games and physical exercises during the day, it is necessary to take into account the ratio of new program material in physical education classes with daily games and exercises, which are supposed to be used on morning and evening walks. The content of outdoors activities are moving games, types of basic movements, some types of sports exercises (walking on skis, sledding, cycling) (except for children with postural disorders). Planning work on the development of movements while outdoor activities with children should ensure consistency and sequence of presentation of all program material, to promote game's fixation, improving the technique of physical exercises, to increase physical activity of children. It is important to choose a time for games and exercises while and not held them at the expense of the time allotted for independent motor activity of the child. Critical importance for *individual work* with the child have medical and pedagogical observations, which allow taking into account indicators of strength.

*Exercise after an afternoon nap* in combination with contrasting air baths helps to improve the mood of children, to raise a muscle tone, and helps to prevent posture and foot disorders. It should be performed with open transoms 5-8 minutes. In institutions of general development and combined type, it is desirable to use different options for gymnastics throughout the year.

Options for gymnastics after an afternoon nap for general development institutions. *Warm-up in bed and self-massage.* Children wake up to the sounds of calm music. Lying on your back on top of a blanket, perform 4-5 simple exercises: turns your head; stroking hands, abdomen, legs, heels; extension and flexion of the arms; flexion of both legs, with the girth of the knees with hands and their gradual extension; raising and lowering both legs; imitation of cycling. Exercises can be performed from different positions: lying on your side, on your stomach, or sitting. After performing the exercises in bed, the children get up and perform several movements on the mat near the bed at different paces. The complex ends with breathing exercises.

*Game gymnastics* consists of 4-5 simulation exercises. Children imitate the movements of birds, animals, plants, create different images («skier», «gymnast», «flower», etc.). Using the same images, you can create plot sets of exercises.

*Running on massage paths*, as one of the options for gymnastics after a nap, is desirable to combine it with contrasting air baths and having such activities at least

twice a week for 4-5 minutes. First, walking at a fast pace (30-35 s), with the transition to running at a medium pace (50-65 s) and back to walk again at a leisurely pace (35-40 s) in combination with breathing exercises throughout. After that, a run at a medium pace (60-80 s) is offered, which ends with a calm walk (45-50 s). Children are wearing shorts, and are barefoot.

In institutions of general development and combined type, after gymnastics water procedures (contrast footbaths) are organized. First, the feet are doused with warm water, then – with the cold and so 5-6 times. Water temperature for healthy children – 36 °C and 18-19 °C respectively, and for the weak – 36 °C and 28 °C.

*Health-improving game lesson* is carried out with the aim of purposeful game activity of children in the period between an afternoon nap and enhanced lunch, which was moved in the schedule by 1 hour. This period allows carrying out hardening actions, to increase motor activity of children. It is mainly used in sanatorium and compensatory institutions. This lesson is held daily after an afternoon nap, in the bedroom or playroom in the cold season, or on the playground – in the warm season. Lessons are in group, slightly longer than physical education, duration (25-30 minutes for younger preschoolers). The structure of the lesson corresponds to the conventional one. The purpose of the preparatory part is to ensure the preparation of the child's functional systems for intensive loads.

Content: walking at different speeds, running, simulation jumps, general developmental exercises (1-2 minutes), breathing exercises (2-3 minutes). The main part is devoted to the development of physical abilities, improvement of basic movements and gymnastic exercises in the game mode (10-12 minutes). Its content includes a moving role-playing game (10-12 minutes). The final part of the lesson offers walking at a slow pace, relaxation exercises, jogging, breathing exercises (2-3 minutes). The main difference of this lesson is the combination of hardening actions with the performance of physical exercises. During the lesson, children are dressed in lightweight sports uniforms (first – in a T-shirt and panties, then – only in panties), barefoot. Classes are held in a room with a temperature of 16-20 °C, with a gradual decrease (depending on the physical activity of children) to 12 °C. During the health-improving game classes, the main hardening procedures are pulsating microclimate, walking barefoot, breathing exercises, and air shower.

The main types of hardening effects are water treatments. They have a sanitary and health function. The method of application of this procedure is to change the duration of footbaths at a relatively constant water temperature (14-16 °C) from 15-20 s to 2-3 minutes, increasing the time each week by 7-10 s. Then the feet are wiped with a towel, rubbed and put on woolen socks.

A significant place is occupied by health days, sports holidays, entertainment, hiking as the most effective forms of *active recreation for children*. Their purpose is the active participation of the whole group in the proposed event, determining the level of development of physical and motor fitness of children in play situations, the formation of a lasting interest in active motor activity. In a rational combination with other organizational forms of physical education, they help to create the optimal motor regime in preschool education.

*Walks – hikes in the woods or the surrounding park* are carried out in the morning (starting with the middle group). Their goal is to improve motor skills and comprehensive development of physical abilities in natural conditions, teaching children to navigate the terrain. Motor activity in combination with the healing forces of nature increases the protective reactions of the body of preschoolers. Surrounding nature, various impressions enrich knowledge about the world around. Dosage of walks for children 4 years – 1.5 km one way. After every 15 minutes' walk, do 4-5 minutes stops for children. The choice of route and speed of movement of the group depends on the physical fitness and health of children. It is necessary to rationally use the terrain and natural conditions to perform movements. Regular transitions can significantly increase the motor activity of children. The use of this type of recreation is recommended for institutions of different types.

*Physical leisure (entertainment)* has a health-improving effect on a child's body, contributes to the improvement of motor skills and abilities, increase the level of physical fitness. Organized 2-3 times a month in the afternoon. For children of junior and middle groups include the appearance of fairy-tale characters. Dedicate entertainment to the season, sporting events, or holidays. The use of musical accompaniment helps to create a positive emotional background

*Sports holidays* are held 2-3 times a year (duration 50 minutes–80 minutes), they are the final form of work on physical education. When organizing a sports holiday, adhere to the following requirements: not turning a

children's holiday into an entertainment event for adults, it is forbidden to select participants according to the level of preparation, rational distribution of workload in different activities (taking into account the level of physical activity and physical fitness of children).

*Health Day* is held once a month with coverage of all various physical activities during the day: in the morning – games of medium mobility (during the reception of children), morning gymnastics, physical education classes (other classes are not held on this day), various games while having an outdoor activities, exercise in basic movements. Organizing health days take into account the climatic features of the season, the possibility of using natural factors.

*Health Week* (vacation) is held twice a year. They contribute to active recreation, recovery and strengthening of the body in unity with the emotionally positive state of mind of preschoolers. During the holidays, classes related to children's mental activity are canceled. All forms of physical education are used and the time spent by children in the fresh air is increased.

The child's independent motor activity takes half the time of his / her general activity in kindergarten. It

is the least tiring for children from all forms of physical activity. Improving the motor activity of preschoolers in independent games and exercises is influenced by the correct placement of equipment, toys and manuals, the novelty of the game material, sufficient space for games. The educator has constantly monitoring the independent motor activity of the children and switch to another activity in time. The organization of independent motor activity of children depends on their physical fitness and motor experience. During outdoor activities, it should be aimed at improving the movements and repetition of games familiar to children. Communication of children also promotes increase of motor activity during games. Games in which they participate in a subgroup are longer and more mobile than individual games.

In order to study the peculiarities of the organization of the educational process, the daily routine of children who attend preschools of different types was analyzed. This allowed finding out the level of motor activity of the child during his stay in the preschool institution and to determine to which group (based on motor behavior) it can be attributed (Table 3-4).

**Table 3 – Statistical values of indicators of motor activity of children 3 years, who attend preschool institutions of different types, (n=103)**

Indexes	Statistical characteristics	Values of statistical indicators									
		Girls (n = 54)					Boys (n = 49)				
		type of preschool institution					type of preschool institution				
		GD n = 11	ST n = 12	KBT n = 10	KST n = 10	GD n = 11	GD n = 10	ST n = 10	KBT n = 10	KST n = 10	GD n = 9
Volume, number of locomotives (in thousands)	$\bar{x}$	15,8	12,3	16,1	12,1	16,9	16,1	12,2	16,3	11,9	16,8
	min	12,5	10,5	14,7	10,3	13,7	12,7	10,3	14,8	10,1	13,6
	max	16,9	13,4	18,1	13,5	17,8	17,1	13,3	17,9	13,0	18,0
	S	1,38	1,02	1,04	0,98	2,42	1,54	0,97	0,97	1,02	1,32
Duration, hours, min.	$\bar{x}$	4.11	3.27	4.15	3.33	4.18	4.10	3.28	4.16	3.35	4.14
	min	3.46	2.58	4.01	3.11	3.57	3.53	3.01	4.01	2.59	4.00
	max	4.21	3.47	4.20	3.43	4.31	4.12	3.35	4.22	3.41	4.19
	S	0,26	0,28	0,12	0,14	0,21	0,11	0,17	0,14	0,24	0,16
Intensity, number of movements per minute	$\bar{x}$	52	41	44	40	48	51	42	45	41	50
	min	38	32	35	31	39	41	35	39	34	42
	max	56	46	50	44	50	57	45	53	46	53
		5,81	4,41	5,26	3,98	6,51	5,19	3,51	4,41	3,89	3,85

Note GD – general development, ST – sanatorium type, KBT – combined type, KST – compensating type

**Table 4 – Statistical values of indicators of motor activity of children 4 years, who attend preschool institutions of different types, (n=82)**

Indexes	Statistical characteristics	Values of statistical indicators									
		Girls (n = 41)					Boys (n = 41)				
		type of preschool institution					type of preschool institution				
		GD n = 8	ST n = 9	KBT n = 8	KST n = 8	GD n = 8	GD n = 8	ST n = 8	KBT n = 8	KST n = 9	GD n = 8
Volume, number of locomotives (in thousands)	$\bar{x}$	16,2	13,1	16,5	13,0	17,1	16,6	12,9	16,5	12,2	17,0
	min	12,6	11,2	15,0	10,7	14,1	13,0	10,7	15,0	10,9	13,8
	max	17,0	13,9	18,1	14,1	18,1	17,5	14,2	17,8	13,2	17,9
	S	1,11	1,02	1,04	1,12	2,01	1,54	1,12	0,98	1,02	1,51
Duration, hours, min.	$\bar{x}$	4.12	3.42	4.18	3.40	4.27	4.17	3.40	4.22	3.37	4.26
	min	3.44	3.01	4.02	3.12	4.03	3.59	3.17	4.04	3.01	4.07
	max	4.22	3.59	4.22	3.53	4.32	4.21	3.56	4.32	3.52	4.41
	S	0,27	0,28	0,15	0,14	0,21	0,11	0,17	0,14	0,27	0,16
Intensity, number of movements per minute	$\bar{x}$	54	45	52	44	53	53	44	56	47	59
	min	41	37	41	35	41	43	37	43	37	47
	max	58	48	55	47	55	58	48	59	52	62
	S	5,61	4,21	5,13	4,11	5,21	4,91	3,12	4,17	3,91	3,81

Note GD – general development, ST – sanatorium type, KBT – combined type, KST – compensating type

The actual variance of individual indicators of motor activity was as followed: in group of children aged 3 – 10,300–18,100 locomotives during the day in a preschool institution; in group of children aged 4 – 10,700–18,100 steps.

Based on the obtained data, we have developed the parameters of motor activity of children 3-4 years old during various organizational forms of physical education, which are used in working with children 3-4 years old. The developed parameters are given in table 5.

**Table 5 – Parameters of motor activity of children 3-4 years old during various organizational forms of physical education**

Види занять	Indicators of motor activity		
	Volume of movement, number of locomotives	Duration, min	Intensity, movements / min.
Morning gymnastics	580–750	5–8	48–52
Physical education	1700–2900	20–30	42–58
Moving games and exercises during a morning outdoor activities	1600–2500	20–25	40–55
Individual work with children on the development of movements during an evening outdoor activities	900–1400	10–12	40–50
Gymnastics after an afternoon nap	500–700	5–8	42–50
Health-improving game	1700–2500	25–30	45–58
Independent motor activity of children during a morning outdoor activities	2000–2500	45–50	40–45
Independent movements indoors and other movements in the day mode	1100–1400	30–35	38–42
Independent motor activity of children during an evening outdoor activities	1200–1400	40–45	30–32
Independent games for children indoors and other movements in the afternoon	1100–1200	30–35	28–32
Together for the day	13100–17800	235–280	44–53

These indexes can be indicative for the development of a rational motor regime of young preschoolers who attend children's institutions of various types.

### Discussion

The results of numerous studies show that the foundations of health are laid in early and preschool childhood, so maintaining, shaping and strengthening the health of each child is a priority of society, family and preschool [2; 3; 5; 6; 9]. It is established that in modern conditions of aggravation of social and economic problems, unsatisfactory ecological condition in Ukraine full-fledged physical development of children, increase of level of adaptive possibilities of their organism acquires importance. One of the important ways to solve this problem is to optimize the motor regime of children in preschool education [10].

Scientists have proved that the organization of rational motor activity of preschool children should include the use of various forms of physical education, tools and methods of their application, which correspond to the age characteristics of children. The recommended weekly volume of motor activity of children aged 3-4 is 15-20 hours [8]. However, these recommendations are generalized and do not take into account the specifics of a certain type of preschool institution. Also in the scientific and methodological literature, there are no data about the optimal parameters of motor activity (volume, duration, intensity) of children 3-4 years old who attend preschool education of different types. This state of affairs in the theory and practice of physical education of primary school children has determined the direction of research on this issue.

As a result of our research, the data of scientists on the existence of the dependence of morpho-functional state, physical fitness and health indicators of children on the level of their motor activity were confirmed [17; 18; 19]; about the absence of a significant difference between the parameters of motor activity of boys and girls of adjacent age groups (3-4 years), which belong to the same health group [8].

For the first time the parameters of motor activity of children 3-4 years old during various organizational forms of physical education were developed.

Gratitude. Research performed under the thematic plan research Prydniprovsky State Academy of Physical Culture and Sport in 2016-2020 years. «Scientific and theoretical foundations of improving the process of physical education of different groups of the population» (state registration 0116U003010).

### Conclusions

The model of the organization of a rational motor mode of children of 3-4 years in preschool educational institutions of various type which covers: the purpose, tasks, procedural and semantic maintenance, pedagogical conditions of optimization of motor activity in a day mode of preschool institution as the factor of increase of a physical condition of children of younger preschool age, were justified. The parameters of motor activity of children 3-4 years old have been developed.

In further studies, we will examine the impact of the proposed motor mode to the level of children's health.

*Conflict of interest.* The authors state that there is no conflict of interest.

### References

1. Закон України «Про дошкільну освіту». URL.: <https://zakon.rada.gov.ua/laws/show/2628-14>  
Zakon Ukrayini «Pro doshkilnu svitu». URL.: <https://zakon.rada.gov.ua/laws/show/2628-14> [in Ukraine].
2. Пахальчук Н. О., Мируха О. І., Романенко Г. М. Педагогічні умови активізації рухової активності дітей. Молодий вчений. № 5.2 (69.2). 2019. С. 72–75.  
Pahalchuk N. O., Miruha O. I., Romanenko G. M. (2019) Pedagogichni umovi aktivizatsiyi ruhovoyi aktivnosti ditej. Molodij vchenij. № 5.2 (69.2). S. 72–75. [in Ukraine]
3. Юрчук О. І. Оптимізація рухового режиму дітей дошкільного віку, як необхідна умова здоров'язберігаючих технологій. *Оновлення змісту, форм та методів навчання і виховання в закладах освіти*: Зб.наук.праць. Наукові записки Рівненського державного гуманітарного університету Випуск 5 (48), 2012.  
Yurchuk O. I. (2012) Optimizatsiya ruhovogo rezhimu ditej doshkilnogo viku, yak neobhidna umova zdorov'yazberigayuchih tehnologij. Onovlennya zmistu, form ta metodiv navchannya i vihovannya v zakladah osviti: Zb.nauk.prac. Naukovi zapiski Rivnenskogo derzhavnogo humanitarnogo universitetu Vipusk 5 (48). [in Ukraine]
4. Дубогай О. Д., Пангелов Б. П., Фролова Н. О., Горбенко М. І. Інтеграція пізнавальної і рухової діяльності в системі навчання і виховання школярів. К.: Оріяни, 2002. 152 с.  
Dubogaj O. D., Pangelov B. P., Frolova N. O., Gorbenko M. I. (2002) Integratsiya piznavalnoyi i ruhovoyi diyalnosti v sistemi navchannya i vihovannya shkolyariv. K.: Oriyani, 152 p. [in Ukraine]
5. Когут І. О. Руховий режим і фізичний стан дітей 6–7 років, які навчаються у школах різного типу: автореф. дис. канд. наук з фіз. вих. і спорту. К.: «Науковий світ», 2006. 20 с.  
Kogut I. O. (2006) Ruhovij rezhim i fizichnij stan ditej 6–7 rokov, yak navchayutsya u shkolah riznogo tipu: avtoref. dis. kand. nauk z fiz.vih. i sportu. K.: «Naukovij svit». 20 p. [in Ukraine]
6. Moskalenko N., Polyakova A., Mykytchuk O. (2019), Methodological Bases of the Motor Activity Organisation among Preschoolers Depending on the Physical State Level. Physical education, sports and health culture in modern society. 2 (46) pp. 28–34.

7. Денисенко Н. Ф. Лиходід Л. В., Лупінович С. В., Михайліченко А. Ф. Витоки здоров'я дитини: Навчально-методичний посібник. Тернопіль: Мандрівець, 2010. 160 с.  
Denisenko N.F. Lihodid L.V., Lupinovich S.V., Mihajlichenko A.F. (2010) Vitoki zdorov'ya ditini: Navchalno-metodichnij posibnik .Ternopil: Mandrivesc. 160 p. [in Ukraine]
8. Wilczkowski E.(2012), Wychowanil firyczne dzieci w wieku przedszkolnym. Piotrkow Trybunalski, 286 p.
9. Теорія і методика фізичного виховання: у 2-х т. [під ред. Т. Ю. Круцевич]. К: Олімпійська література, 2012. Т.2: Методика фізичного виховання різних груп населення. 390 с.  
Teoriya i metodika fizichnogo vihovannya (2012): u 2-h t. [pid red. T.Yu. Kruceovich]. K: Olimpijska literatura, 2012. T.2: Metodika fizichnogo vihovannya riznih grup naseleण्या. 390 p. [in Ukraine]
10. Пангелова Н. Є. Теоретико-методичні засади формування гармонійно розвиненої особистості дитини дошкільного віку в процесі фізичного виховання: автореф. дисерт. ...докт. наук з фіз. вих. і спорту: спец. 24.00.02. К., 2014. 39 с.  
Pangelova N.Ye. Teoretiko-metodichni zasady formuvannya garmonijno rozvivenoyi osobistosti ditini doshkilnogo viku v procesi fizichnogo vihovannya (2014): avtoref. disert. ...dokt. nauk z fiz.vih. i sportu: spec. 24.00.02. K., 39 p. [in Ukraine]
11. Getting a Grip on Things: Building Fine Motor Skills. Message in a Backpack, 2010, *Teaching Young Children* 3 (5): 26–28.
12. Harriet G. Williams, Karin A. Pfeiffer, Jennifer R. O'Neill, Marsha Dowda, Kerry L. Mclver, William H. Brown and Russell R. Pate. (2008), Motor Skill Performance and Physical Activity in Preschool Children. *Obesity*. Volume 16. Number 6. Pp. 1421–1426.
13. Saakslahti A, Numminen P, Niinikoski H et al. (1999) Is physical activity related to body size, fundamental motor skills, and CHD risk factors in early childhood? *Pediatr Exerc Sci*;11: 327–340.
14. Fisher A, Reilly JJ, Kelly LA et al. (2005), Fundamental movement skills and habitual physical activity in young children. *Med Sci Sports Exerc*;37:684–688
15. Reilly JJ, Jackson DM, Montgomery C et al. (2004), Total energy expenditure and physical activity in young Scottish children: mixed longitudinal study. *Lancet*; 363:211–212.
16. Nan Zeng, Mohammad Ayyub, Haichun Sun, Xu Wen, Ping Xiang, Zan Gao. Effects of Physical Activity on Motor Skills and Cognitive Development in Early Childhood: A Systematic Review. *Biomed Res Int*. 2017: 2760716. doi: 10.1155/2017/2760716
17. Бар-Ор О., Т. Роуланд Здоровье детей и двигательная активность: от физиологических основ до практического применения. Пер. с англ. И. Андреев. К.: Олимпийская литература, 2009. 528 с.  
Bar-Or O., T. Rouland (2009) Zdorov'e detej i dvigatel'naya aktivnost': ot fiziologicheskikh osnov do prakticheskogo primeneniya. Per. s angl. I. Andreev. K.: Olimpijskaya literatura, 528 p.
18. Galamandjuk L.L. Effectiveness of methodic system of motor functioning's preventive development in sixth year of children's life in their physical condition's improvement. *Pedagogics, psychology, medical-biological problems of physical training and sports*. 2015. № 6. С. 3–10. URL: [http://nbuv.gov.ua/UJRN/PPMBE\\_2015\\_6\\_3](http://nbuv.gov.ua/UJRN/PPMBE_2015_6_3)
19. Богуш А., Галаманжук Л. Практичне забезпечення модернізації занять фізичною культурою дітей у дошкільний період. Вісник Кам'янець-Подільського національного університету. Фізичне виховання, спорт і здоров'я людини. 2019. Випуск 14. С. 20-26  
Bogush A., Galamanzhuk L. (2019) Praktichne zabezpechennya moderni'zaczi'yi zanyat' fizichnoyu kul'turoyu di'tej u doshki'l'nij peri'od. Vi'snik Kam'yanecz'-Podi'l's'kogo naczional'nogo uni'versitetu. Fi'zichne vikhovannya, sport i` zdorov'ya lyudini. Vipusk 14. pp. 20–26

Received for publication 17.02.2020

## STRUCTURE OF PHYSICAL TRAINING OF WEIGHT ATHLETES AT THE STAGES OF LONG-TERM TRAINING

K. Prontenko<sup>2</sup>, S. Romanchuk<sup>1</sup>, V. Andreychuk<sup>1</sup>, O. Lesko<sup>1</sup>, I. Romaniv<sup>1</sup>,  
O. Leshchinsky<sup>1</sup>, S. Barashevsky<sup>1</sup>, N. Muzyka<sup>1</sup>

<sup>1</sup> Hetman Petro Sagaidachny National Academy of Land Forces, Lviv, Ukraine

<sup>2</sup> S. P. Korolyov Zhytomyr Military Institute, Zhytomyr, Ukraine

corresponding author – O. Lesko: orest\_lesko@ukr.net

doi: 10.32626/2309-8082.2020-16.74-78

Achieving high athletic performance is not possible without a subjective understanding of the effectively significant components of the development of separate physical qualities in the training of athletes. We conducted an interview survey of weightlifting athletes to determine the part of physical qualities at different stages of long-standing training. According to the coaches and athletes of different qualifications it was revealed that the importance of special physical preparedness and functional preparedness of athletes in weight push over a long cycle and in a classic double-event increases with their age. *Aim of the survey* was to identify the significant physical qualities in the training of weightlifting athletes at different stages of long-standing training. *Survey methods* are as follows: theoretical analysis and generalization of scientific and methodological literature, documentary method (the study of protocols and reports of competitions, plans and training diaries of leading sportsmen of Ukraine, etc.); questionnaire; methods of mathematical statistics. *Results*. The survey conducted a sociological interview using a questionnaire consisting of 15 questions. Content of the questionnaire made it possible to determine what physical qualities should be developed first of all for the successful performances

of weightlifting athletes at different stages of long-standing training. The purpose of the questionnaire was to determine the importance of certain aspects of the preparedness of weightlifting athletes. According to the respondents, it was determined that improving children's health and versatile physical development are the most important for the stage of initial preparation; the important physical qualities of high value are: 1 – agility, 2 – flexibility, 3 – speed, 4 – strength, 5 – endurance. Versatile development of the physical capabilities, the development of strength, strength endurance, as well as coordination abilities and flexibility are significant at the stage of preliminary basic preparation (1 – agility, 2 – strength, 3 – flexibility, 4 – endurance, 5 – speed). According to the athletes, at the stage of specialized basic preparation the greatest attention should be paid to strength training, then endurance, flexibility after that, and the least importance have agility and speed. *Conclusions*. Thus, according to the respondents, the importance of strength and special endurance increases with the age, whereas, the importance of developing agility and speed decreases.

**Keywords:** weightlifting, classic double-event, weight push over a long cycle, athlete, physical qualities.

### Introduction

Achieving the maximum possible sports result for a particular athlete is the goal of sports training [4; 6; 8]. One of the tasks of sports training is to ensure the necessary level of development of physical qualities, capabilities of functional systems and special skills that are necessary to obtain maximum sports results [9; 14]. The harmonious combination of physical and technical fitness contributes to high sports results.

Competitive load in the push of the weights over a long cycle is to perform the exercise for 10 minutes, and in a double-event – for 20 minutes (push – 10 minutes, jerk – 10 minutes). Large functional load in a double-event, because the execution of the second exercise – jerk in a double-event in kettlebell lifting combined on a background of significant fatigue and incomplete recovery after the push (at least 2 hours must elapse between the execution of the push and the start of the jerk) requires special training of the athlete's body [10; 14]. This also determines the differences in load planning during the

training process at a certain stage of long-term training.

The scientific and methodological literature on weightlifting deals with the problems of training athletes who perform in classical double-event, however, a small amount of scientific research has been devoted to a long-cycle kettlebell push. In the works of the following scientists: V. M. Romanchuk, K. V. Prontenko, V. V. Prontenko, D. V. Boyko [7; 11, etc.] it is established that in classical double-event to achieve high sports results there is the development of general and strength endurance and on its basis special endurance to work with weights. Leading weightlifting experts have determined that the priority tasks for athletes of light and medium weight categories are the development of strength and endurance, and for heavy weight categories – endurance, while the requirements for strength are reduced [5; 6, etc.]. In the general theory of the training system of athletes established different values of different components of training at different stages of long-term training [9].

### Material and research methods

The purpose of the study is to identify significant physical qualities in the training of weightlifters at different stages of long-term training. Methods: theoretical analysis and generalization of scientific and methodical literature, documentary method (study of protocols and reports of competitions, plans and training diaries of leading athletes of Ukraine, etc.); questionnaires; methods of mathematical statistics. In a questionnaire survey involved 57 respondents, including athletes of the first sports category and candidate for master of sports (CMS) – 34 people, masters of sports and master of sports of international class (MSIC) – 23; their age was 18 – 45 years. This survey involved the use of a questionnaire that consisted of 15 questions.

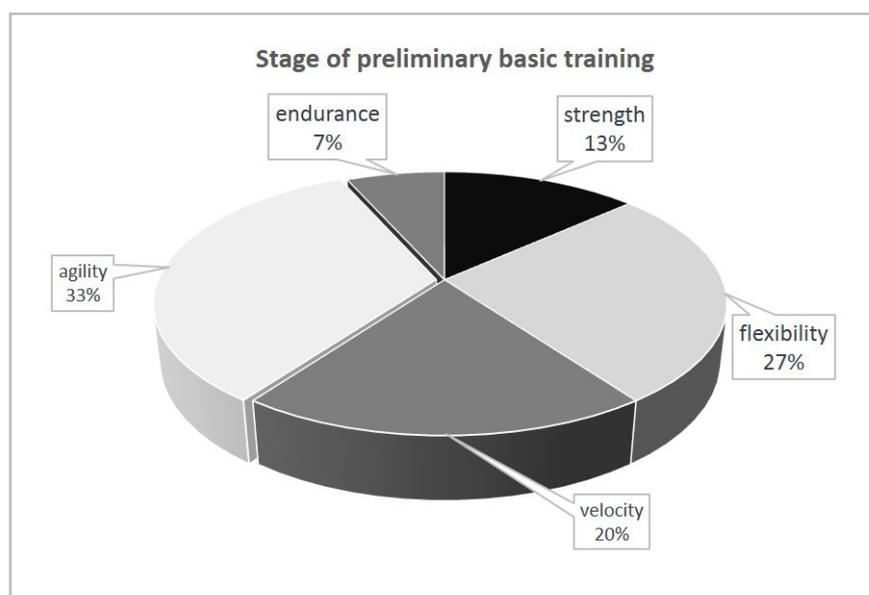
The task of the survey is to determine the significance of certain aspects of the training of weightlifters. We developed the questionnaire, content of which took into account the recommendations of researchers [2; 13] and allowed to determine the sports qualifications, experience, age, what physical qualities should be developed primarily for successful performances of weightlifters at different stages of long-term training.

Respondents were also asked to rank the components of such training in terms of significance. Mathematical processing was performed using standard functions of Microsoft Excel 2016.

### Results of the research

The analysis of the survey results showed that in order to achieve high sports results and with age, the importance of special physical fitness increases, while the role of general physical fitness decreases. At the same time, the main task of the stage of initial training of young athletes is to strengthen health, versatile physical training, elimination of shortcomings in the level of physical development, training in the technique of the chosen sport and various ancillary and special training exercises.

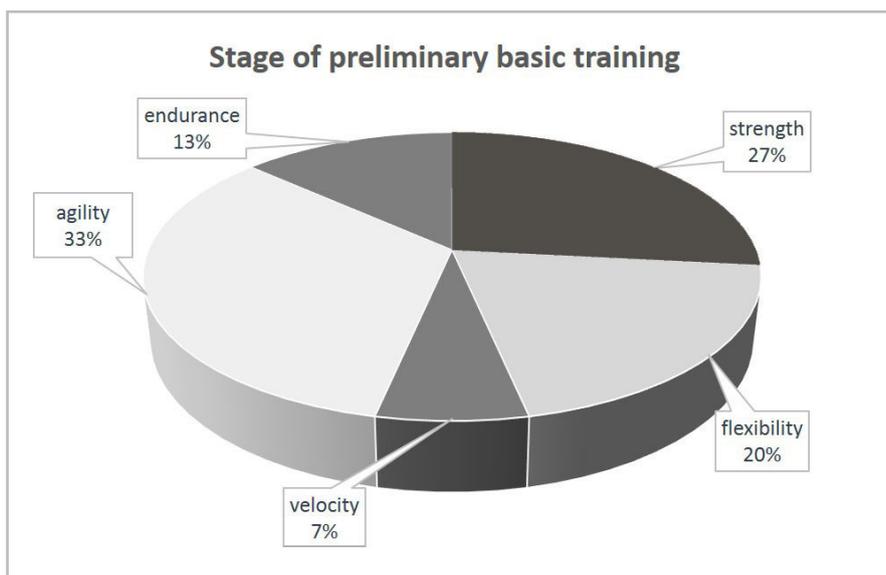
In particular, the contribution of physical qualities to the structure of physical fitness of athletes at different stages of their training is different. In particular, the analysis of the survey results shows that at the stage of initial training the first place is taken by agility (33%), the second – flexibility (27%), the third – velocity (20%), the fourth – strength (13%), the fifth – endurance (7%) (Fig. 1).



**Fig. 1 The contribution of physical qualities to the structure of physical fitness of athletes at the stage of initial training**

At the stage of preliminary basic training the main task according to experts [5; 9; 12] is the development of functionality, strengthening the health of young athletes, the development of various physical abilities, the formation of motor potential, including the mastery of the technique of classical weightlifting exercises.

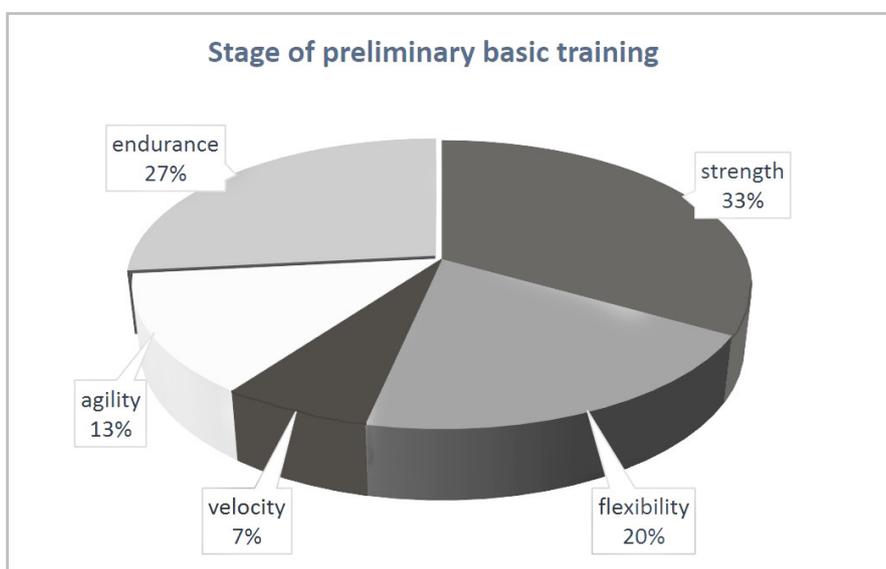
The study found that at the stage of basic training in the structure of physical fitness of athletes in the first place is agility (33%), the second – strength (27%), the third – flexibility (20%), the fourth – endurance (13%), on the fifth – velocity (7%) (Fig.2).



**Fig. 2** The contribution of physical qualities to the structure of physical fitness of athletes at the stage of preliminary basic training

Figure 3 shows the contribution of physical qualities to the structure of physical fitness of athletes at another stage of their training, namely the specialized base. The tasks of this stage, according to experts [5; 9; 12] is not only the improvement of technology, but also the creation of a powerful aerobic base; it is also necessary to increase the functional potential of the athlete. According

to the respondents, the greatest attention should be paid to strength training (33 %), endurance in second place (27 %), flexibility in third place (20 %), and agility (13 %) and velocity (7 %). In the case of weight distribution of physical qualities, this is confirmed by the opinion of leading experts in the field of weightlifting [5].



**Fig. 3** The contribution of physical qualities to the structure of physical fitness of athletes at the stage of specialized basic training

**Discussion**

A variety of tools and methods, the widespread use of material from various sports and moving games, the use of the game method characterize training of young athletes. At the initial training stage, training sessions with significant physical and mental loads that involve the use of monotonous material should not be planned.

Training sessions at this stage, as a rule, should be held no more than 2-3 times a week, the duration of each of them up to 60 minutes. This is confirmed in the works of leading scientists in the field of physical culture and sports [9; 12, etc.].

On the other hand, according to athletes and coaches at the stage of preliminary basic training in weight-

lifting, the skills of classical exercises are mastered: push the weights from the chest, push the weights over a long cycle, weight jerk and various special training exercises aimed at improving technique: coordination of movements arms, legs, torso, breathing etc.

Particular attention should be paid to the development of general physical fitness of the various components of velocity, as well as agility (coordination) and flexibility. With a high natural rate of growth of physical abilities, it is impractical to plan at this stage training tools, including sets of exercises with high intensity and short pauses, important competitions, training sessions with heavy loads, etc. [9; 12].

The main task of the stage of specialized basic training for athlete is to determine in which specific discipline of

weightlifting he will perform – in double-event or in a long-cycle push.

That is, the content involves the choice of specialization, increase the special amount of work, in addition to improving technique you need to create a powerful aerobic base, increase the functional potential of the athlete, which will contribute to a large amount of special work and increase sports results in the future. The share of special training is constantly rising due to the increase in time to perform special preparatory and competitive exercises.

The obtained data testify to the increase in the value of strength and special endurance, but with a decrease in the importance in the structure of athletes' training of the development of their agility and velocity (Fig. 4).

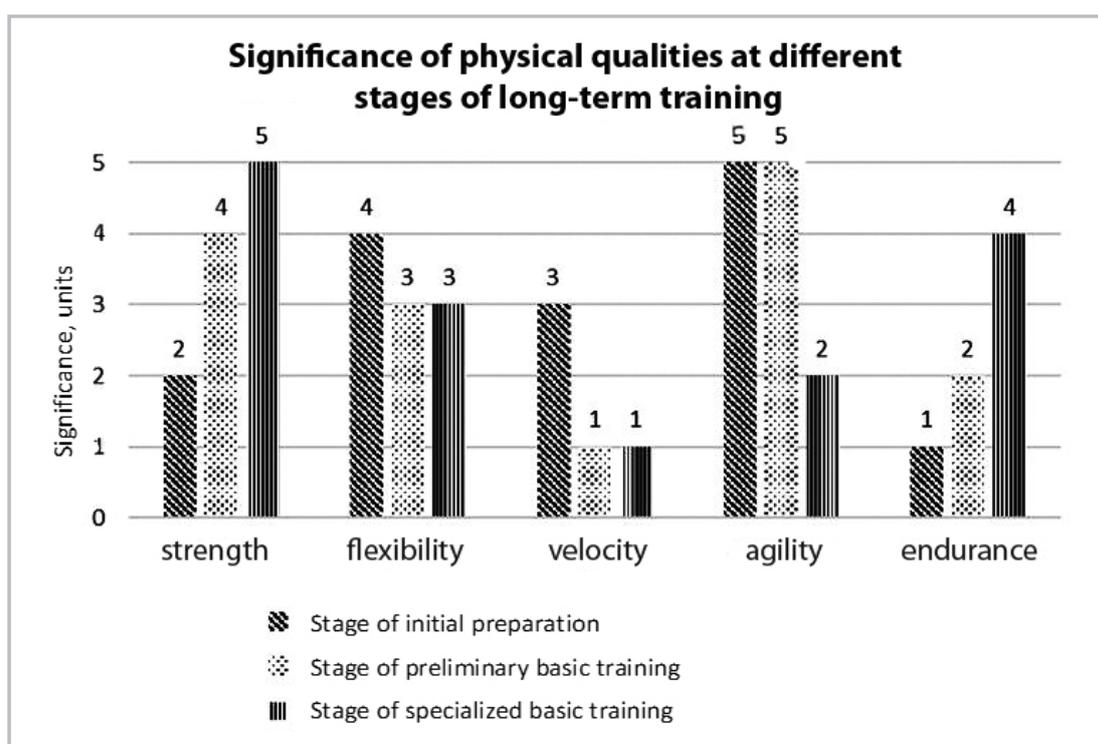


Fig. 4 The contribution of physical qualities to the structure of physical fitness of athletes at different stages of long-term training

### Conclusions

1. Among the individual aspects of the training of weightlifters, according to respondents, for the initial training stage is to strengthen children's health, versatile physical training, the most important are 1 – agility, 2 – flexibility, 3 – velocity, 4 – strength, 5 – endurance. At the stage of preliminary basic training, the diverse development of the body's physical capabilities, the development of strength, endurance, as well as coordination abilities and flexibility (1 – agility, 2 – strength, 3 – flexibility, 4 – endurance, 5 – velocity) are important.

2. At the stage of specialized basic training, according to athletes, the greatest attention should be paid to strength training, then endurance, flexibility after that, and agility and velocity are of the least importance.

Prospects for further research are to study the effective physical qualities at the next stages of long-term training of athletes. We express our sincere gratitude to all the athletes who took part in the survey, we wish you success in all your endeavors.

*Conflict of interest.* The authors declare no conflict of interest.

## References

1. Андрейчук В. Я. Методичні основи гирьового спорту : навч. посібник. Львів : Триада плюс, 2007. 500 с.  
Andreychuk, V. Ya. (2007), *Metodychni osnovy hyrovoho sportu* [Methodical bases of kettlebell sports]. Triada plus, Lviv, 500 p. [in Ukraine].
2. Галаманжук Л. Л., Єдинак Г. А. Основи наукових досліджень : навч.-метод. посібник. Кам'янець-Подільський : Рута, 2019. 150 с.  
Galamanzhuk, L. L., Iedynak, G. A. (2019), *Osnovy naukovykh doslidzhen'* [Fundamentals of scientific research]. Ruta Printing House LLC, Kamianets-Podilskyi, 150 p. [in Ukraine].
3. Грибан Г. П., Пронтенко К. В., Пронтенко В. В. [та ін.]. Гирьовий спорт у вищих навчальних закладах : навч.-метод. посібник. Житомир : Вид-во «Рута», 2014. 400 с.  
Hryban, H. P., Prontenko, K. V., Prontenko, V. V. (2014), *Hyrovyyi sport u vyshchyykh navchalnykh zakladakh* [Weightlifting in higher education]. Vyd-vo «Ruta», Zhytomyr, 400 p. [in Ukraine].
4. Гирьовий спорт : навч. прогр. для дит.-юнац. шк., спеціаліз. дит.-юнац. шк. олімп. резерву / М-во України у справах сім'ї, молоді та спорту, Респ. наук.-метод. каб., Федер. Гирьового спорту України // підгот. Ю. В. Щербина. – К., 2010. 52 с.  
*Hyrovyyi sport* (2010), [Weightlifting]. Kyiv. 52 p. [in Ukraine].
5. Пронтенко К. В., Андрейчук В. Я., Пронтенко В. В., Романів І. В. Підготовка спортсменів у поштовху гир за довгим циклом : навч.-метод. посібник. Львів : Ліга-Прес, 2016. 228 с.  
Prontenko, K. V., Andreychuk, V. Ya., Prontenko, V. V., Romaniv, I. V. (2016), *Pidhotovka sportsmeniv u poshtovkhu hyr za dovhym tsyklom* [Training athletes to push the weights over a long cycle]. Liha-Pres, Lviv, 228 p. [in Ukraine].
6. Пронтенко В. Ефективність спортивної підготовки гирьовиків на сучасному етапі розвитку гирьового спорту. *Молода спортивна наука України*. Львів 2010. Вип. 14, т. 1. С. 238–242.  
Prontenko, V. (2010), "Efektyvnist sportyvnoi pidhotovky hyrovykiv na suchasnomu etapi rozvytku hyrovoho sportu" [Efficiency of sports training of weight lifters at the present stage of development of weight training]. *Moloda sportyvna nauka Ukrainy*. Issue 14, Vol. 1, pp. 238-242 [in Ukraine].
7. Пронтенко К., Андрейчук В., Пронтенко В., Бойко Д. Ефективність підготовки спортсменів у поштовху гир за довгим циклом. *Молода спортивна наука України*. Львів, 2014. Вип. 18, т. 1. С. 225–231.  
Prontenko, K., Andreychuk, V., Prontenko, V., Boiko, D. (2014), "Efektyvnist pidhotovky sportsmeniv u poshtovkhu hyr za dovhym tsyklom" [The effectiveness of training athletes in the push of weights over a long cycle]. *Moloda sportyvna nauka Ukrainy*. Issue 18, Vol. 1, pp. 225–231 [in Ukraine].
8. Пронтенко К., Андрейчук В., Безпалый С. Вплив занять гирьовим спортом на фізичний розвиток курсантів військових закладів вищої освіти. Вісник Кам'янець-Подільського національного університету імені Івана Огієнка. Фізичне виховання, спорт і здоров'я людини. 2019. Вип. 13. С. 46–55. doi: 10.32626/2227-6246.2019-13.46–55.  
Prontenko, K., Andreychuk, V., Bezpalyy S. (2019), "Vplyv zaniat hyrovym sportom na fizychnyy rozvytok kursantiv viiskovykh zakladiv vyshchoi osvity". [Having the urge to engage in weight-lifting sports for physical development of cadets in high school mortgages]. *Bulletin of Kamianets-Podilskyi National Ivan Ohienko University: Physical education, sports and human health*. Issue 13, pp. 46–55. doi: 10.32626/2227-6246.2019-13.46-55 [in Ukraine].
9. Платонов В. Н. Система подготовки спортсменов в олимпийском спорте. Общая теория и ее практические приложения : учебник. Київ : Олімп. л-а, 2004. 808 с.  
Platonov, V. N. (2004), *Systema podhotovky sportsmenov v olymпыiskom sporte. Obshchaia teoriya y ee praktycheskiye prylozheniya* [The system of training athletes in Olympic sports. General theory and its practical applications]. Olymпыiskaia lyteratura, Kyev, 808 p. [in Russia].
10. Рассказов В. С. Пути и перспективы развития гирьового спорта. М. : МФГС, 2004. 32 с.  
Rasskazov, V. S. (2004), *Puty y perspektyvy razvytiya hyrovoho sporta* [Ways and prospects of kettlebell sport development]. MFGS, Moskva 32 p. [in Russia].
11. Романчук В. М., Пронтенко К. В., Пронтенко В. В., Бойко Д. В. Розвиток фізичних якостей у студентів засобами гирьового спорту : навч.-метод. посібник. Житомир : ЖВІ НАУ, 2012. 224 с.  
Romanchuk, V. M., Prontenko, K. V., Prontenko, V. V., Boiko, D. V. (2012), *Rozvytok fizychnyykh yakosteiy u studentiv zasobamy hyrovoho sportu* [Development of physical qualities in students by means of weight training]. ZhVI NAU, Zhytomyr 224 p. [in Ukraine].
12. Матвеев Л. П. Общая теория спорта и ее прикладные аспекты. М. : Известия, 2001. 334 с.  
Matveev, L. P. (2001), *Obshchaia teoriya sporta y ee prykladnye aspekty* [General sport theory and its applied aspects]. Yzvestiya, Moskva, 334 p. [in Russia].
13. Шиян Б. М., Єдинак Г. А., Петришин Ю. В. Наукові дослідження у фізичному вихованні та спорті : навч. посібник. Кам'янець-Подільський : ПП Видавництво «Оіюм», 2012. 280 с.  
Shiyan, B. M., Iedynak, G. A., Petryshyn, Yu. V. (2012), *Naukovi doslidzhennya u fizychnomu vykhovanni ta sporti* [Scientific research in physical education and sports]. PE Oyum Publishing House, Kamianets-Podilskyi, 280 p. [in Ukraine].
14. Пронтенко К., Грибан Г., Алошына А., Блосчынський І., Козина З., Бичук О., Новітська І., Корчагин М. Analysis of Cadets' Endurance Development at Higher Military Educational Institutions during the Kettlebell Lifting Training. *Sport Mont*. 2019. 17 (2). pp. 3–8. doi 10.26773/smj.190601.

Received for publication 20.01.2020

# FORMATION OF THE BASICS OF THE METHODOLOGICAL COMPONENT ON PHYSICAL EDUCATION IN FUTURE OFFICERS, WHO STUDY IN LEADERSHIP COURSES

S. Romanchuk, O. Lesko, M. Kuznetsov, S. Fedak,  
O. Loiko, I. Romaniv, A. Demkiv, Yu. Bobko

Hetman Petro Sahaidachny National Academy of Ground Forces, Lviv, Ukraine

corresponding author – O. Lesko: orest\_lesko@ukr.net

doi: 10.32626/2309-8082.2020-16.79-84

The physical readiness of military personnel to solve combat training tasks as an integral part of the individual combat readiness of military personnel of the Armed Forces of Ukraine largely depends on the quality of the organization of physical education and special physical training. Therefore, in higher military educational establishments, cadets form methodological knowledge and skills to conduct classes in various disciplines of vocational training, including physical training. The change of the summoned contingents from four years to one year of service (leadership courses—for persons who have already graduated and gained at least Bachelor's degree), adequate to the modern requirements of combat practice for the physical readiness of servicemen, make the problem of improving the methodological component of the cadet's qualifications especially relevant. *The purpose of the research* is to present the newest program to form methodological component of physical training of cadets (leadership courses) of higher military educational institutions. *Research methods.* The following methods were used to solve the purpose of the research work: theoretical analysis and data generalization from literary sources and experience of the best practice of physical training of cadets; pedagogical methods (observation, ascertaining experiment). *The results of the research.* The article deals with the actual scientific problem of the

methodological component of the physical education of future officers who are trained in leadership courses (one year on the basis of higher education) at a higher military educational institution (HEI). In the future they will become leaders of various forms of physical training with subordinate personnel of the unit. The program of the methodological component of the physical education system is substantiated, in which structure and content of the methodological component is gradually optimized during physical training, taking into account the peculiarities of the use of military units in the current conditions of activity of the Armed Forces of Ukraine. Methodological tasks and cards for the whole year of training for cadets of leadership courses in high schools have been formed, taking into consideration the peculiarities of military-professional tasks and actions by purpose. *Key findings.* The directions of formation of methodological skills of future officers (who are trained in leadership courses for one year on the basis of higher education) of military units in educational disciplines of military-vocational direction and the direction of optimization of the methodological component of physical education in higher military educational institution have been expanded.

**Key words:** physical education, methodical component, serviceman, leadership courses, higher military education institution.

## Introduction

The physical readiness of servicemen to solve educational-combat training tasks, as an integral part of the individual combat readiness of servicemen of the Armed Forces of Ukraine, largely depends on the quality of the organization of physical education and special physical training. Therefore, in Military Institutions of Higher Education (hereinafter MHEI) methodological knowledge, skills and abilities of cadets to conduct classes in various disciplines of professional training, including physical are formed.

For cadets of leadership courses, all training is compressed from a four years to a one year of service (leadership courses are for those who have already obtained higher education not lower than a bachelor's degree), adequate to modern requirements of combat practice for physical fitness of servicemen, give the problem of improving the methodological component of the cadets of leadership courses MHEI on physical education its special relevance.

Unfortunately, the annual reports of the state examination commission indicate a relatively low level of methodological training of cadets in the MHEI and officers in the army [1; 6; 13; 15; 16]. At the same time, there are no comprehensive studies aimed at forming the methodological component of physical education of cadets, which do not allow resolving the contradictions between the level of requirements for combat training and the effectiveness of the pedagogical process of physical education of cadets in MHEI. This work is especially relevant today, as recently established leadership courses graduate young officers in one year of training based on previously obtained higher education, studying only military special disciplines. We must also remember that for six years now in the east of Ukraine there has been an undeclared war with one of the terrorist, aggressive, insidious armies of the world – the Russian army. A well-known fact is that the physical training of a serviceman, which largely depends on the methodological component, is very

important [3; 10; 11]. To date, the issue of improving the system of physical training of servicemen has become acute. For almost a third of a century, the question of physical training as a system and its component, which is the methodological part, has always receded into the background. Scientists in particular have paid insufficient attention to its improvement. At the beginning of its development, the Armed Forces of Ukraine took as a basis the Soviet model of military-physical education, which was provided for the training of specialists in this field only for big military units (regiment, division, type of armed forces), but for small military units (platoon, company, battalion) such training was not carried out. The formation of methodological training of MHEI cadets in the process of physical training in these units was organized by platoon and company commanders, who got methodological bases of physical training in MHEI. In connection with the implementation of a new Concept for the development of physical training in the Armed Forces of Ukraine, quite important and relevant, in our opinion, is the creation of favorable conditions for physical improvement for cadets and students of MHEI. In the near future, most of them will have to make prompt and correct decisions, on which people's lives and fates will depend. The problem arose in connection with the analysis of physical training, conceptual changes in the organization of the combat training system, the results of individual scientific works and the experience of training servicemen of leading foreign armies [2; 14; 15]. At the current stage of reforming the Armed Forces of Ukraine, the obsolescence of the methodological component of physical training in MHEI, which trains future officers of command units, requires changes in the existing system of physical training and its further improvement and development.

The research was performed in accordance with the research plan on the topic «Model of physical training in the Armed Forces of Ukraine in 2017 and prospects for its development», code – «PERSPECTIVE-FP» (state registration number 0101U001568).

Problems of improving the methodological training of students and different categories of servicemen on professional development stages studied many scientists, including: S. V. Romanchuk, O. M. Olhovy, A. P. Petruk, O. M. Loiko etc. [4; 5; 7; 12].

According to scientists A. V. Maglyovany, O. M. Leska, etc. one of the main areas in which it is possible to address the issue of intensification of physical training of cadets is the improvement of methodological foundations [2; 8; 15].

The methodological basis of the process of physical training of cadets are all known pedagogical methods that scientifically substantiate human improvement in the complex implementation of three processes – learning, education and development [5; 9; 15].

Professor A. V. Maglyovany with others studied the experience of various aspects of the organization of physical training heads' education in leading foreign armies [2]. It is determined that a common feature in the system of training of servicemen is the implementation of methodological training, sufficient for the competent organization, and the process of physical improvement of both own and subordinate personnel of the unit. Foreign experience testifies to the considerable attention paid to the issue of acquiring knowledge, developing skills and habits for independent study.

Although some scholars have considered certain components of the system of training heads, but this is obviously not enough due to the changes in the structure and content of the combat training process, and new approaches to the use of methods, techniques and means of training troops. The analysis of the scientific literature showed an insufficient number of works aimed at a comprehensive study of the requirements for the methodical component of the system of physical training in the realities of modern reform of the Armed Forces of Ukraine and identify areas for improvement.

The issue of methodological preparedness in the complex, as a part of the physical training of cadets has not been studied before, or has been studied sporadically and fragmentary. In independent Ukraine, there is no newly created system of methodical components of physical training of servicemen in general and cadets of command specialties in particular.

#### **Research methods and organization**

The purpose of the study was to develop an innovative program for the formation of a methodical component of physical education of cadets during their training in MHEI leadership courses.

The objectives of the study were aimed at achieving this goal, and it has provided the selection of adequate research methods, obtaining the necessary empirical data, interpretation of these data, taking into account the recommendations of researchers [18; 22]. The following methods were used: analysis, generalization of data from literary sources and experience of best practices of physical training of cadets; pedagogical methods (observation, ascertaining and formatting experiments); mathematical statistics.

### Results of the research

Methodical training is one of the components of the professional competencies of cadets formed during the process of their studying at MHEI. This section of the curriculum provides for the acquisition by cadets the knowledge and skills for organizing and methodology for conducting of all forms of physical training of servicemen and the development of basic psychophysical qualities [5; 9; 15; 20]. Although the question of the content of means and the amount of training in this section is different. The theoretical, methodical and practical sections of the program in the curriculum for MHEI of Ukraine for the discipline «Physical education, special physical training» are closely connected with each other. The issue of content, means and scope of training in each section is determined in the working programs of MHEI, taking into account the specifics of training. It is during the methodical practice that the competence is formed, provided by the system of pedagogical skills (methodical, team, managerial and organizational).

The main purpose of the cadets' training program is to provide cadets with methodical knowledge, skills and abilities sufficient for effective organization and conducting of physical training at the company level, as well as performing functions concerning physical training in accordance with their military-professional purpose.

The main principle is that the formation of methodical knowledge, skills and abilities of cadets occurs gradually from simple to complex.

A program has been developed to certify that methodical training of future heads of physical training of personnel of military units of the Armed Forces of Ukraine is a system of knowledge of basic laws of physical improvement in the military service; abilities and skills by which there is a transfer of knowledge to cadets is carried out, forming the ability to perform physical exercises or other motor actions and develop physical qualities.

According to the author's program, the formation of methodical training of cadets begins in the process of their professional training in MHEI within the discipline «Physical Education and Special Physical Training» and takes place in compliance with certain patterns. Proper understanding of these patterns accelerates the formation of methodological preparedness of future heads of physical training. The most important patterns of formation and improvement of the level of methodical training of servicemen are as follows:

- the formation of pedagogical skills and abilities is more effective when it takes place simultaneously with the study of techniques for performing physical exercises, processes and actions;
- the formation of individual methodical (pedagogical) knowledge and skills is interrelated;
- personnel management skills (giving commands, giving orders, etc.) are formed faster than other methodical skills. This is due to the fact that they are formed by servicemen while the other subjects of professional training being conducted, and are reflected to physical training;
- the pace of development of methodical (pedagogical) skills and abilities is inversely dependent on their initial level. The higher the initial level of skills development were, the smaller their growth is, and vice versa. Yet the absolute increase in methodological preparedness is directly dependent on the initial level of training;
- the degree of preservation of methodical skills and abilities depends on their complexity and nature. Complex skills and abilities (such as organization of physical training, dosing of load, application of training and development methods) are lost faster and less preserved. The practice of physical training in the army shows that the frequency of instructor-methodical classes in 1–1.5 months can prevent the decline of even the most difficult organizational and methodological skills and abilities;
- skills based on motor actions (showing exercises, techniques and actions, providing insurance and assistance) change very slowly over time;
- the higher is the level of absolute methodological readiness, the smaller is the degree of its reduction without reinforcement.

Based on researches we presented the content of the program of formation of methodical readiness for cadets of MHEI of various courses of study in the process of physical training (Fig. 1). It shows that methodical training is its component and it affects the professional (training and combat) activities.

Methodical training includes both theoretical knowledge and their implementation in practice through methodical skills. The determined content of the methodical component of physical training of MHEI cadets is formed according to requirements of educational and qualification characteristics of graduates of various specialties.

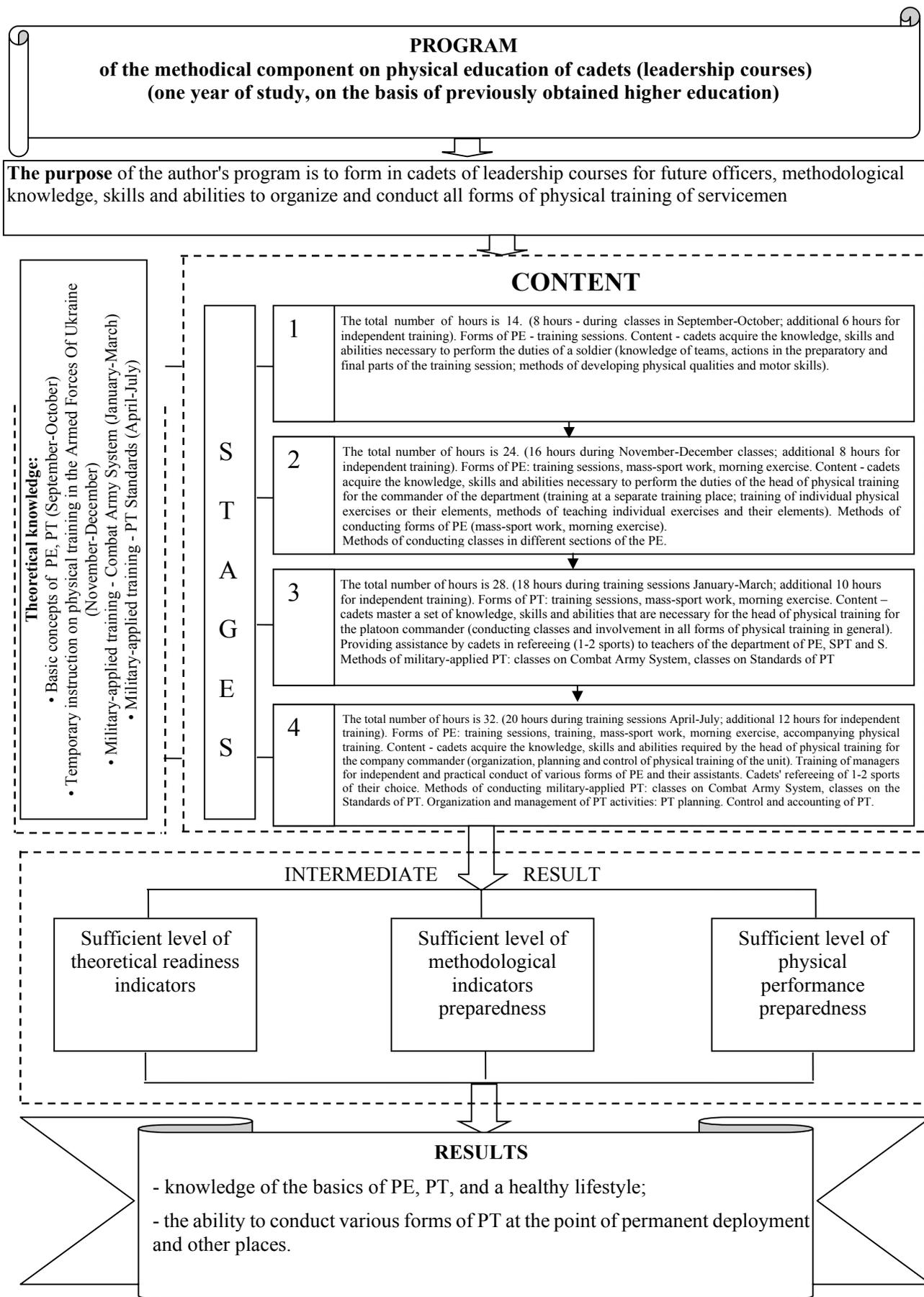


Fig. 1 Block diagram of methodical training of cadets (leadership courses)

Methodical tasks correspond to the principle of sequence of training, as well as programs of professionally oriented disciplines, the content of which is formed in such a way that the cadet has to master the professional skills of the soldier, and then consistently has to master skills of the commander of platoon, company, etc. The special orientation of methodical tasks for cadets of the main groups of military specialties is determined by the content of the program in the discipline «Physical education and special physical training» and by the procedure of preparation for methodical practice.

The expediency and efficiency of the author's program of the methodical component of the system of cadets' physical training (leadership courses) in MHEI are evidenced by the analyzed indicators of overall success of EG (experimental group) cadets in military-applied disciplines (fire training, tactical training, driving military vehicles, combat system of soldier survival, etc.), which are significantly higher compared to the results of CG (control group) cadets.

It has been experimentally proven that the acquisition of theoretical and organizational-methodical knowledge, skills and abilities in conducting various forms of physical training has a positive effect on the success of cadets of the experimental group in military-applied disciplines, although the control group also underwent positive and reliable changes. Thus, in the control group, the improvement of the result of overall success in military-applied disciplines is 0,21 points ( $p > 0,05$ ), in the experimental group positive changes are slightly better, the difference is 0,39 points ( $p < 0,05$ ). At the end of the pedagogical experiment there were a statistical significance in the results between the control (4,06 points) and experimental (4,19 points) groups ( $p < 0,05$ ), which was absent at the beginning of the experiment according to the average values ( $p > 0,05$ ). More detailed information on the results of the formative pedagogical experiment will be provided in a separate text later.

### Discussion

The proposed program of improving the methodological training of MHEI cadets includes four main sub-stages, the content of which is substantiated at the theoretical level. The organization of educational and methodical lesson also consists of several stages, in particular from a preparatory stage; the main stage; and the final stage. In the preparatory stage, the subject and the object of the educational process work in close

tandem, but the main responsibility lies with the teacher. Based on the working program of the discipline and the schedule of classes, the teacher determines the time for performing the task of methodical practice, the procedure for its conduction, and organizational-and-methodological instructions. The organizational-and-methodological instructions involve the organization of classes, the most effective methods and techniques for the formation of pedagogical knowledge, skills and abilities. Simultaneously with the development of the syllabus, the teacher gives tasks to cadets to prepare and conduct methodological practice.

The expediency and effectiveness of the author's program of the methodical component of the system of physical training of cadets (leadership courses) in MHEI are evidenced by the data of individual researchers [19-21].

After analyzing the indicators of overall success of cadets in military-applied disciplines (fire training, tactical training, driving combat vehicles, combat system of survival of a soldier, etc.) it was noted that when using the proposed development, indicators were significantly higher than the indicators of cadets engaged in traditional methods were. Obtaining theoretical and organizational-and-methodological knowledge, skills and abilities in different forms of physical training has a positive effect on the results of successful students in the disciplines of military-applied direction.

The results obtained are to some extent consistent with the data of other researchers [4; 5; 6]. At the same time, they differ quantitatively in some indicators, namely they are higher. One of the reasons for this discrepancy is connected with the content of the development proposed.

### Conclusions

New features of the program of formation of methodical component of cadets of MHEI in the process of physical training were unfolded. The components of methodical skills, requirements and estimation of the head of physical training are presented, methodical tasks for cadets of leadership courses (one year of training in special military disciplines, on the basis of previously obtained higher education) training in various specialties, which take into account the peculiarities of the organization of physical training in military units, where graduates will arrive for further service as commanders - heads of physical training. A guide for the organization of

individual physical (methodical as a component) training for young officers has been developed.

Prospects for the use of research results will be the implementation of this program in practice and the study of its effectiveness; studying the relationship between the levels of methodological, physical, theoretical training

and development of more specific guidelines for various forms and measures of physical training of servicemen.

*Conflict of interest.* The authors note that there is no conflict of interest between them, they confirm the data of the above authors, but with a slightly different contingent of subjects.

#### References

- Єдинак Г. А., Приступа Є. Н. До питання про вдосконалення системи оцінювання фізичної підготовленості військовослужбовців Збройних Сил України. Фізичне виховання, спорт і культура здоров'я у сучасному суспільстві. 2012. № 4(20). С. 276–280.  
Iedynek, H. A. Prystupa, Ye. N. (2012), "Do pytannia pro vdoskonalennia systemy otsiniuvannia fizychnoi pidhotovlenosti viiskovosluzhbovtiv Zbroinykh Syl Ukrainy" [To the question of improving the system of assessment of physical fitness of military personnel of the Armed Forces of Ukraine]. *Physical education, sports and health culture in the modern world*, No. 4 (20), pp. 276–280. [in Ukraine].
- Магльований А., Петрук А., Лесько О., Кожух Н. Фізична підготовка в системі формування військових фахівців провідних іноземних армій. Спортивна наука України : електронне вид. 2015. № 5. С. 16–20. URL: <http://sportsscience.ldufk.edu.ua/index.php/snu/article/view/349/338>  
Mahlovanyi A., Petruk A., Lesko O., Kozhukh N. (2015), "Fizychna pidhotovka v systemi formuvannia viiskovykh fakhivtsiv providnykh inozemnykh armii" [Physical training in the system of formation of military specialists of leading foreign armies]. *Sports Science of Ukraine*, No. 5, pp. 16-20. Retrieved from: <http://sportsscience.ldufk.edu.ua/index.php/snu/article/view/349/338> [in Ukraine].
- Методична підготовка / уклад. Логінов Д. О., Лойко О. М. Львів : Військовий інститут при Державному університеті «Львівська політехніка», 2000. 70 с.  
Lohinov, D. O., Loiko, O. M. (2000), *Metodychna pidhotovka* [Methodical preparation]. Viiskovyi instytut pry Derzhavnomu universyteti «Lvivska politekhnika», Lviv. 70 p. [in Ukraine].
- Овчарук І. С., Єдинак Г. А. Моделювання параметрів занять з фізичної підготовки курсантів, майбутніх фахівців з ліквідації наслідків надзвичайних ситуацій : метод. реком. Кам'янець-Подільський, 2007. 118 с.  
Ovcharuk, I. S., Iedynek, G. A. (2007), *Modeliuvannia parametriv zaniat z fizychnoi pidhotovky kursantiv, maibutnikh fakhivtsiv z likvidatsii naslidkiv nadzvychainykh sytuatsii* [Modeling of parameters of occupations on physical preparation of cadets, future specialists in elimination of consequences of emergencies]. Kamianets-Podilskyi. 118 p. [in Ukraine].
- Петрук А. П. Оптимізація методичної складової системи фізичної підготовки курсантів вищих військових навчальних закладів : дис. ... канд. наук з фіз. виховання і спорту : 24.00.02 Придніпр. держ. акад. фіз. культури і спорту. Харків, 2018. 287 с.  
Petruk, A. P. (2008), *Optimizatsiia metodychnoi skladovoi systemy fizychnoi pidhotovky kursantiv vyshchyykh viiskovykh navchalnykh zakladiv* [Optimization of the methodological component of the system of physical training of cadets of higher military educational establishments ]: diss. for the sciences degree of Cand. Sciences in Phys. education and sports: 24.00.02 Prydnipr. state. Acad. Phys. culture and sports. Dnipro. 287 p. [in Ukraine].
- Петрук А., Романчук С., Лесько О., Демків А., Гоманюк С., Воронцов О. Динаміка методичної підготовленості курсантів у процесі оптимізації фізичної підготовки. Фізичне виховання, спорт і культура здоров'я у сучасному суспільстві. 2018. № 2(42). С. 64–70.  
Petruk, A., Romanchuk, S., Lesko, O., Demkiv, A., Homaniuk, S., Vorontsov, O. (2018), "Dynamika metodychnoi pidhotovlenosti kursantiv u protsesi optymizatsii fizychnoi pidhotovky" [Dynamics of methodological training of cadets in the process of optimization of physical training]. *Physical education, sports and health culture in the modern world*, No.2 (42), pp. 64–70. [in Ukraine].
- Приступа Є. Н., Романчук С. В. Військові багатоборства та військово-прикладні види спорту в системі підготовки фахівців Збройних Сил України. Вісник Кам'янець-Подільського нац. ун-ту імені Івана Огієнка. Серія : Фізичне виховання, спорт та здоров'я людини. 2012. Випуск. 5. С. 223–230.  
Prystupa, Ye. N., Romanchuk, S. V. (2012), "Viiskovi bahatoborstva ta viiskovo-prykladni vydy sportu v systemi pidhotovky fakhivtsiv Zbroinykh Syl Ukrainy" [Military all-rounds and military-applied sports in the system of training of specialists of the Armed Forces of Ukraine]. *Bulletin of Kamianets-Podilskyi national Ivan Ohiienko university. Physical education, sports and human health*. Issue 5, pp. 223–230. [in Ukraine].
- Романчук В., Муляр М., Романчук С. Організація методичної підготовки курсантів з навчальної дисципліни „Фізичне виховання, підготовка і спорт” : метод. реком. Житомир : ЖВІРЕ, 2004. 104 с.  
Romanchuk, V. M., Muliar, M. I., Romanchuk, S. V. (2004), *Orhanizatsiia metodychnoi pidhotovky kursantiv z navchalnoi dystsypliny „Fizychnye vykhovannia, pidhotovka i sport”* [Organization of methodological training of cadets in the discipline "Physical Education, Training and Sports"]. Zhytomyr. 104 p. [in Ukraine].
- Романчук С., Романчук В., Боярчук О., Гусак О. Підготовка керівників фізичної підготовки під час навчання у військових навчальних закладах. Молода спортивна наука України. 2011. Випуск 13, т. 4. С. 126–130.  
Romanchuk, S., Romanchuk, V., Boiarchuk, O., Husak, O. (2011), "Pidhotovka kerivnykiv fizychnoi pidhotovky pid chas navchannia u viiskovykh navchalnykh zakladakh" [Training of physical education leaders during military training]. *Young sports science of Ukraine*, Issue 13 Vol. 4, pp. 126-130. [in Ukraine].
- Романчук С. Методична підготовленість командирів підрозділів щодо організації фізичної підготовки курсантів військових навчальних закладів. Молода спортивна наука України. 2009. Випуск 13, т. 4. С. 216.  
Romanchuk, S. (2009), "Metodychna pidhotovlenist komandyriv pidrozdiliv shchodo orhanizatsii fizychnoi pidhotovky kursantiv viiskovykh navchalnykh zakladiv" [Methodological preparedness of unit commanders for the organization of physical training of military education cadets]. *Young sports science of Ukraine*, Issue 13 Vol. 4, pp. 216. [in Ukraine].
- Романчук С., Логінов Д., Анохін Є. Методичний практикум з навчальної дисципліни «Фізичне виховання, спеціальна фізична підготовка і спорт» : навч.-метод. посіб. Львів, 2010. 128 с.  
Romanchuk, S. V., Lohinov, D. O., Anokhin, Ye. D. (2010), *Metodychnyi praktykum z navchalnoi dystsypliny "Fizychnye vykhovannia, spetsialna fizychna pidhotovka i sport"* [Methodical Workshop on Physical Education, Special Physical Training and Sports]. Lviv. 128 p. [in Ukraine].

12. Романчук С. В. Дослідження фізичної підготовленості військово-службовців під час ведення бойових дій. Науковий часопис Нац. пед. ун-т імені М. П. Драгоманова. Серія 15, Науково-педагогічні проблеми фізичної культури (фізична культура і спорт). 2015. Випуск 3К(56). С. 24–31.  
Romanchuk, S. V. (2015), "Doslidzhennia fizychnoi pidhotovlenosti viiskovosluzhbovtiv pid chas vedennia boiovykh dii" [Investigation of the physical preparedness of military personnel during combat operations]. Scientific journal Nat. ped. MP Dragomanov University. Series 15, Scientific and pedagogical problems of physical culture (physical culture and sports), 3K(56). pp. 24-31. [in Ukraine].
13. Романчук С. В. Об оценке влияния субъективного отношения командиров подразделений к процессу физической подготовки курсантов технического ВУЗа. Фізична підготовка військовослужбовців : матеріали II відкритої наук.-метод. конф. Київ, 2004. С. 171–177.  
Romanchuk, S. V. (2004), "Ob otsenke vliyaniya sub'yektivnoho otnosheniya komandirov podrazdeleniy k protsessu fizycheskoi podhotovky kursantov tekhnicheskoho VUZa" [On the assessment of the influence of the subjective attitude of unit commanders on the process of physical training of cadets of a technical university]. *Fizychna pidhotovka viiskovosluzhbovtiv: Materialy II vidkrytoi nauk.-metod. konf. Kyiv, 171–177.* [in Ukraine].
14. Романчук С. В. Теоретико-методологічні засади фізичної підготовки курсантів військових навчальних закладів Сухопутних військ Збройних Сил України : дис. ... д-ра наук з фіз. виховання і спорту : 24.00.02 Львів, держ. ун-т фіз. культури. Львів, 2013. 540 с.  
Romanchuk, S. V. (2013), "Teoretyko-metodolohichni zasady fizychnoi pidhotovky kursantiv viiskovykh navchalnykh zakladiv Sukhoputnykh viisk Zbroinykh Syl Ukrainy" [Theoretical and methodological principles of physical training of cadets of military educational establishments of the Land Forces of the Armed Forces of Ukraine]: diss. for the sciences degree of Doctor Sciences in Phys. education and sports: 24.00.02 Lviv state. University of Phys. culture. Lviv. 540 p. [in Ukraine].
15. Ткачук П. П., Романчук С. В., Лесько О. М., Петрук А. П., Добровольський В. Б., Небожук О. Р., Балдецький А. А. Методична підготовка керівників форм фізичної підготовки : навч.-метод. посіб. Львів : НАСВ, 2017. 159 с.  
Tkachuk, P. P., Romanchuk, S. V., Lesko, O. M., Petruk, A. P., Dobrovol'skyi, V. B., Nebozhuk, O. R., Baldetskyi, A. A. (2017), *Metodychna pidhotovka kerivnykiv form fizychnoi pidhotovky* [Methodical training of leaders of forms of physical training]. Lviv. 159 p. [in Ukraine].
17. Oderov, A., Romanchuk, S., Fedak, S., Kuznetsov, M., Petruk, A., Dunets-Lesko, A., Lesko, O., Olkhovyi, O. (2017). Innovative approaches for evaluating physical fitness of servicemen in the system of professional training. *Journal of Physical Education and Sport*, 17(3), 23–27.
18. Галаманжук Л. Л., Єдинак Г. А. Основи наукових досліджень : навч.-метод. посіб. Кам'янець-Подільський : Рута, 2019. 150 с. [in Ukraine].  
Galamanzhuk, L., Iedynak, G. (2019), *Osnovy naukovykh doslidzhen'* [Fundamentals of scientific research]. Ruta, Kamianets-Podil'skyi. 150 p.
19. Отравенко О. В. Рухова культура як компонент якісної професійної підготовки здобувача вищої освіти. Вісник Кам'янець-Подільського нац. у-ту імені Івана Огієнка. Фізичне виховання, спорт і здоров'я людини. 2019. Випуск 12. С. 50–54. doi: 10.32626/2309-8082.2019-12.50-54  
Otravenko, O. V. (2019), "Rukhova kul'tura yak komponent yakisnoyi profesiyanoi pidhotovky zdobuvacha vyshchoyi osvity" [Motor culture as a component of high-quality vocational training for higher education applicants]. *Bulletin of Kamianets-Podil'skyi national Ivan Ohienko university. Physical education, sports and human health.* Issue 12, pp. 50–54. doi: 10.32626/2309-8082.2019-12.50-54 [in Ukraine].
20. Поливач В. М. Методика та роль визначення суб'єктивної оцінки якості фізичного виховання студентів факультету підготовки лікарів для Збройних сил України як фактор покращення системи освіти військових лікарів. Вісник Кам'янець-Подільського нац. у-ту імені Івана Огієнка. Фізичне виховання, спорт і здоров'я людини. 2019. Випуск 12. С. 55–59. doi: 10.32626/2309-8082.2019-12.55-59  
Polivach, V. M. (2019), "Metodyka ta rol' vyznachennya sub'yektivnoi otsinky yakosti fizychnoho vykhovannya studentiv fakul'tetu pidhotovky likariv dlya Zbroinykh syl Ukrainy yak faktor pokrashchennya systemy osvity viys'kovykh likariv" [Methodology and role of determining the subjective assessment of the quality of physical education of students of the Faculty of Physician Training for the Armed Forces of Ukraine as a factor for improving the system of education of military doctors]. *Bulletin of Kamianets-Podil'skyi national Ivan Ohienko university. Physical education, sports and human health.* Issue 12, pp. 55–59. doi: 10.32626/2309-8082.2019-12.55-59 [in Ukraine].
21. Ленарт Д., Романчук С., Андрус А., Лесько О., Романів І. Оптимізація навчально-тренувального процесу військових п'ятиборців в умовах недостатнього навчально-матеріального забезпечення. Вісник Кам'янець-Подільського нац. у-ту імені Івана Огієнка. Фізичне виховання, спорт і здоров'я людини. 2019. Випуск 13. С. 40–45. doi: 10.32626/2227-6246.2019-13.40-45  
Lenart, D., Romanchuk, S., Andres, A., Lesko, O., Romanov, I. (2019), "Optimizatsiya navchal'no-trenuval'noho protsesu viys'kovykh p'yatibortiv v umovakh nedostat'noho navchal'no-material'noho zabezpechennya" [Optimization of the training and training process of military pentathlon fighters in conditions of insufficient educational and material support]. *Bulletin of Kamianets-Podil'skyi national Ivan Ohienko university. Physical education, sports and human health.* Issue 13, pp. 40–45. doi: 10.32626/2227-6246.2019-13.40-45 [in Ukraine].
22. Шиян Б. М., Єдинак Г. А., Петришин Ю. В. Наукові дослідження у фізичному вихованні та спорті : навч. посіб. Кам'янець-Подільський : ПП Видавництво «Оіюм», 2012. 280 с.  
Shiyan, B. M., Iedynak, G. A., Petryshyn, Y. V. (2012), *Naukovi doslidzhennya u fizychnomu vykhovanni ta sporti* [Scientific research in physical education and sports]. Oiyum, Kamyanets-Podil'skyi. 280 p. [in Ukraine].

Received for publication 21.01.2020

# FROM THE EXPERIENCE OF USING PILATES IN CORRECTIONAL AND WELLNESS TECHNOLOGIES WITH PEOPLE OF MATURE AGE

S. Savliuk, A. Vakoliuk, I. Panchuk, T. Butenko

Rivne State Humanities University, Rivne, Ukraine

corresponding author – S. Savliuk: d\_sveta@ukr.net

doi: 10.32626/2309-8082.2020-16.86-90

The formation of a healthy style of modern life in recent years is determined by special attention and study of the features of the application of corrective and improving technologies with people of mature age. *Objective:* to study the effect of the Pilates system on the correction of the physique of middle-aged women to improve their health and active life. The objectives of the study are to determine the effect of Pilates exercises on the correction of the figure of middle-aged women. Research methods: analysis and synthesis of literature data, anthropometry (measurement of skin-fat folds on the skin), methods of mathematical statistics. *Research results:* as a result of the experimental program, the skin-fat folds in the experimental group decreased from  $\approx 21,5\%$  до  $6,5\%$ , and the decrease in the value of skin-fat folds was significant ( $p < 0,01$ ) in all measurements. In the experimental group,

the greatest changes were observed in a decrease in the size of skin-fat folds at the lower angle of the scapula –  $21,5\%$ , on the front and rear surfaces of the shoulder –  $21,1\%$  and  $18,5\%$ , on the front wall of the abdomen –  $18,2\%$ . The control group has the largest decrease in the size of the skin-fat folds noted on the front surface of the shoulder –  $20,2\%$  ( $t = 5,29$ ) and hips –  $11,6\%$  ( $t = 4,3$ ). All other changes occurred in the range from  $2,6\%$  to  $5,9\%$ . Significant ( $p < 0,01$ ) were changes in all indicators except for folds on the anterior wall of the abdominal cavity ( $t = 2,55 < t_{cr}$ ). Conclusion: thus, large decrease in skin-fat folds was recorded in the group participating in the Pilates system in comparison to the control group.

**Key words:** correctional and improving technologies, people of mature age, women, Pilates system.

## Introduction

The formation of a healthy lifestyle of modern man in recent years is marked by the special attention of scientists in this field and the study of the peculiarities of the implementation of remedial health technologies on persons of mature age [2; 6; 8; 9]. As a result of innovative development of these systems and methods of physical education, a special direction of health effects on a person was created, which was called «mental fitness», «smart body» or as it is called abroad, «Body & Mind» [4; 5; 7; 12].

Nowadays, there is no doubt about the possibility of a positive effect of exercise on physical and mental health, improving the cardiovascular, respiratory, hormonal systems, improving its physical qualities, prevention and correction of the physique of middle-aged women to improve their well-being and active life [1; 2; 5; 6]. In conditions of deteriorating ecology, constant stress and hypodynamics, the struggle for human health becomes an important factor that determines life in modern conditions [4; 10; 13]. An important role in this fight is given to health programs of physical culture (fitness), designed to meet the needs of different age groups and segments of the population. [5; 6; 9; 10; 13].

To date, there are about two hundred types of recovery programs. Conventionally, they can be divided into two main directions: western and eastern, which

are based on differences in the mentality of people, their ideologies, which generally determine national characteristics [3; 4; 6; 7; 10]. Mental fitness includes a system of Pilates exercises, based on the inseparable body and mind connection and created about a hundred years ago by German doctor, trainer and athlete Joseph Pilates. [1; 3]. At the end of the last century, the method of J. Pilates was revived and modernized. The initial base of this system was only 34 exercises, while now there are about 500.

However, it should be noted that most of the literature and methodological developments on Pilates are descriptive and do not reflect all the complexity and versatility of the possible impact on various body systems [1; 3; 5; 11]. Herewith, there is no objective evidence of the positive impact of this system on the correction of the physique of middle-aged women to improve their well-being and active life. This fact determines the theoretical and practical significance of the topic of this study for the development of the system of physical culture.

## Material and research methods

The aim of the work is to study the influence of the Pilates system on the correction of the physique of middle-aged women to improve their well-being and active life. The task of the study: to determine the course of Pilates classes for the correction of the physique of middle-aged women.

Methods used: analysis and generalization of literary sources, anthropometry (to assess the physical development of middle-aged women [12; 14; 15]) and mathematical statistics. The thickness of the skin-fat folds was measured using an Accu-Measure caliper with 0.2–0.3 mm accuracy: on the posterior surface of the right shoulder above the triceps; on the anterior surface of the upper thigh (in the middle of the outer surface); on the upper iliac crest; at the lower angle of the scapula; on the anterior wall of the abdomen, at a distance of 4–5 cm to the right of the navel; on the front surface of the shoulder; on the shin (vertical fold in the middle of the shin); on the front surface of the forearm (in its middle part).

Organization of study: pedagogical experiment consisted of its ascertaining and formative parts. 100 women from 25 to 45 years old took part in the ascertaining experiment. The task of this stage of the

study was to form experimental and control groups with the same level of physical preparedness (to obtain the most informative results of the main study). Within 12 months (from September 2018 until August 2019) the women of the first group were engaged in a specially designed set of exercises from the Pilates system and another 20 people were trained by the standard basic and strength aerobics lessons used in the fitness club in Rivne [4; 13].

#### Results of the research

During the study, using the method of somatoscopic researches, we defined extent and character of fatty deposits. The research was conducted in two stages – at the beginning and at the end of the year. The physique of the women examined was assessed by skin-fat folds. Detailed calculation of the significance of differences in the values of skin-and-fat folds (further SFF) for 2 groups is presented in Table 1.

**Table 1 – Significance of differences in the values of skin-and-fat folds in women of the experimental and control groups**

SFF (mm)	Experimental group			Control group		
	Before the experiment	After the experiment	Significance of differences	Before the experiment	After the experiment	Significance of differences
At the lower angle of the scapula	17,55 ± 5,39	13,51 ± 3,75	t = 4,72 P < 0,01	17,30 ± 4,16	16,44 ± 4,12	t = 3,87 P < 0,01
On the back of the shoulder	18,89 ± 5,07	15,57 ± 3,94	t = 4,25 P < 0,01	19,22 ± 2,37	18,15 ± 3,33	t = 4,14 P < 0,01
On the front of the shoulder	12,39 ± 4,52	9,73 ± 4,34	t = 3,85 P < 0,01	14,41 ± 4,24	11,31 ± 4,34	t = 5,29 P < 0,01
On the upper iliac crest	17,54 ± 5,58	14,95 ± 3,77	t = 4,91 P < 0,01	17,35 ± 3,93	16,25 ± 4,12	t = 2,92 P < 0,01
On the shin	15,93 ± 3,3	14,68 ± 3,50	t = 5,8 P < 0,01	17,75 ± 4,04	17,54 ± 3,25	t = 4,52 P < 0,01
On the front surface of the forearm	9,20 ± 2,91	7,70 ± 2,36	t = 3,9 P < 0,01	9,66 ± 1,15	8,64 ± 2,41	t = 3,78 P < 0,01
On the anterior abdominal wall	20,03 ± 6	15,81 ± 5,2	t = 6,6 P < 0,01	19,88 ± 3,65	19,79 ± 6,24	t = 2,55 P > 0,01
On the thigh	19,06 ± 5,02	14,32 ± 4,41	t = 4,6 P < 0,01	20,40 ± 2,63	18,35 ± 4,93	t = 4,3 P < 0,01
<b>t<sub>KP</sub> = 2,861</b>						

The results show that during the pedagogical experiment, the value of skin-fat folds decreased significantly in both control and experimental groups. For the experimental group, the reduction in the size of skin-fat folds is significant ( $p < 0,01$ ) in all

measurements, with the largest changes observed for skin-fat folds on the anterior abdominal wall ( $t = 6.6 > t_{KP}$ ), on the shin ( $t = 5.8 > t_{KP}$ ), on the upper iliac crests ( $t = 4,91 > t_{KP}$ ) and on the thigh ( $t = 4,6 > t_{KP}$ ).

Cumulative changes in the indicators of physical development of women in the control and experimental groups were ambiguous. Figures 1 and 2 are clear confirm that in the experimental group by the end of the study revealed significant changes in the size of skin-fat folds than in the control group. For example, skin-fat folds

in the experimental group decreased from 21.5 % to 6.5 %. Moreover, the biggest changes were observed at the lower angle of the shoulder blade – 21.5 %, on the anterior and posterior surfaces of the shoulder – 21.1 % and 18.5 %, on the anterior abdominal wall – 18.2 %.

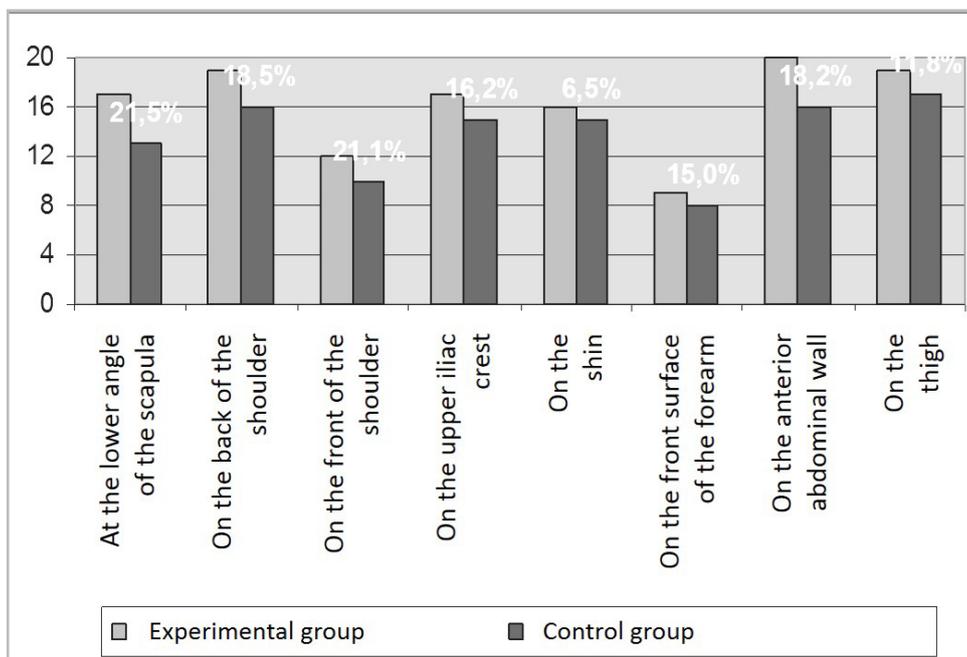


Fig. 1 The relative change in the indicators of skin-and-fat folds of the experimental group as a result of Pilates classes (n = 20)

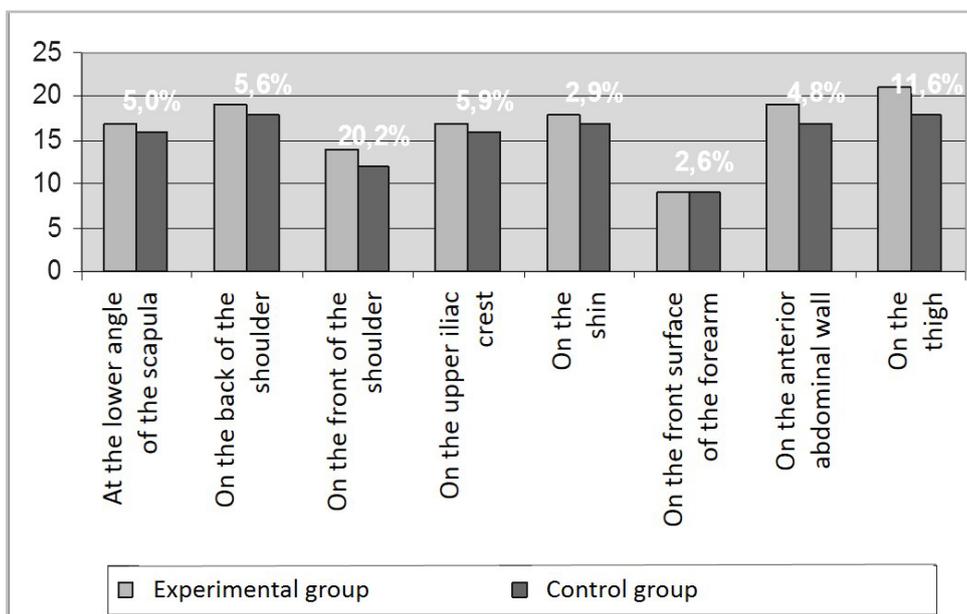


Fig. 2 The relative changes in the indicators of skin-and-fat folds of the control group as a result of aerobics (n = 20)

In turn, in the control group, the biggest reduction in skin-fat folds was observed on the anterior surface of the shoulder – 20.2 % ( $t = 5.29 > t_{kp}$ ) and on the thigh – 11.6 % ( $t = 4.3 > t_{kp}$ ). All other changes ranged from 2.6 % to 5.9 %. Probable result ( $p < 0.01$ ) had changes in all

indicators except the folds on the anterior abdominal wall ( $t = 2.55 < t_{kp}$ ).

Table 2 presents the differences in the size of skin-fat folds after the experiment between the control and experimental groups.

Table 2 – The degree of change in skin-fat folds after the experiment

Skin-fat folds, mm	Experimental group	Control group	Significance of differences
At the lower angle of the scapula	13,51 ± 3,75	16,44 ± 4,12	T = 2,35 p < 0,05
On the back of the shoulder	15,57 ± 3,94	18,15 ± 3,33	t = 2,23 p < 0,05
On the front of the shoulder	9,73 ± 4,34	11,31 ± 4,34	t = 1,15 p > 0,05
On the upper iliac crests	14,95 ± 3,77	16,25 ± 4,12	t = 1,05 p > 0,05
On the shin	14,68 ± 3,5	17,54 ± 3,25	t = 2,68 p < 0,05
On the front surface of the forearm	7,70 ± 2,36	8,64 ± 2,41	t = 1,25 p > 0,05
On the front wall of the abdomen	15,81 ± 5,2	19,79 ± 6,24	t = 2,19 p < 0,05
On the thigh	14,32 ± 4,41	18,35 ± 4,93	t = 2,72 p < 0,05
$t_{kp} = 2,021$			

The differences were significant ( $p < 0.05$ ) in the in the folds at the lower angle of the scapula ( $t = 2,25 > t_{kp}$ ), on the back of the shoulder ( $t = 2,23 > t_{kp}$ ), on the shin ( $t = 2,68 > t_{kp}$ ), on the anterior abdominal wall ( $t = 2,19 > t_{kp}$ ) and on the thigh ( $t = 2,72 > t_{kp}$ ).

Thus, in the group that studied the Pilates system, there was a greater decrease in the size of skin-fat folds compared to the control group.

#### Discussion

Many researchers of innovative health-improving programs consider it appropriate to perform strength exercises to correct the physique, reduce skin-fat folds and circumferential dimensions [5; 7; 8; 9; 13]. Thus, according to Ivliev B. K. [8] shaping classes help to reduce body weight, reduce the circumferential size in the first months of training. Similar results were obtained by Grebennikov A. I. and Pshendin A. I. [6], Leonova L. V. [9], Makhova O. P. , Honyyants S. A. [10] and others. However, the Pilates technique, according to the results of our study, proved to be more effective in achieving these goals.

During the Pilates classes, women aged 25-45 had significant changes in the fat component: fat deposits

decreased by an average of 16.1 %, while the reduction in circumferential size averaged 2 %. Women engaged in the traditional program of conditioning training with aerobic and strength components, had skin-fat folds decrease by an average of 7.3 %, and volumetric body size by 0.84 %.

#### Conclusion

1. As a result of use of the experimental program, the skin-fat folds of women of experimental group decreased from 6,5 % to 21,5 %, moreover decrease in size of skin-fat folds is significant ( $p < 0,01$ ) in all measurements.

2 In the experimental group, the biggest changes were observed in the skin-fat folds at the lower angle of the scapula – 21.5 %, on the anterior and posterior surfaces of the shoulder – 21.1 % and 18.5 % respectively, and on the anterior abdominal wall – 18.2 %. In turn, in the control group, the largest reduction in skin-fat folds was observed on the anterior surface of the shoulder – 20.2 % ( $t = 5.29$ ) and on the thigh – 11.6 % ( $t = 4.3$ ). All other changes occurred in the range from 2.6 % to 5.9 %. Probable result ( $p < 0.01$ ) had changes in all parameters except the folds on the anterior abdominal wall ( $t = 2.55 < t_{kp}$ ).

## References

- Gallagher, S., Kryzanowska, R. (2000). *The Joseph H. Pilates archive collection: photographs, writings and designs*. Philadelphia: Bainbridge Books.
- Kashuba, V., Tomilina, Y., Byshevets, N., Khrypko, I., Stepanenko, O., Grygus, I., Smoleńska, O., & Savliuk, S. (2020). Impact of Pilates on the Intensity of Pain in the Spine of Women of the First Mature age. *Teoriâ ta Metodika Fizičnogo Vihovannâ*, 20(1), 12–17. – doi.org/10.17309/tmfv.2020.1.02.
- Pilates, J. H., J. Robbins, L. A. (2000). *Van Heuit Robbins. Pilates' primer: the millennium edition: includes the complete works of Joseph Pilates*. Incline Village, NV: Presentation Dynamics.
- World Class Clubs. (2017). Описание групповых программ. –http://www.worldclass.ru/members/clubs/schedule.php
- World Class Clubs. (2017), *Opisaniye gruppovykh programm* [Description of group programs]. http://www.worldclass.ru/members/clubs/schedule.php. [in Russia]
- Вейдер, С. (2007), Пилатес от А до Я. Ростов на Дону : Феникс. 320 с.
- Vaider, S. (2007), *Pilates ot A do YA* [Pilates from A to Z]. Phoenix, Rostov-On-Don. 320 p. [in Russia].
- Гребенников, А. И., Пшендин, А. И. Влияние шейпинг-массажа на структуру массы тела при катаболической тренировке. Труды III науч.-практ. конф. по проблемам шейпинга. СПб., 1996. С. 26–27.
- Grebennikov, A. I., Pshendin, A. I. (1996), "Vliyanie sheyning-massazha na strukturu massy tela pri katabolicheskoy trenirovke" [The effect of shaping massage on the structure of body weight during catabolic training]. *Proceedings of the III scientific-practical conference on shaping problems*. St. Petersburg, pp. 26–27. [in Russia].
- Давыдов, В. Ю., Шамардин, А. И., Краснова, Г. О. Новые фитнес-программы. Волгоград : Волгоград, гос. акад. физ. культуры. 2011. 137 с.
- Davydov, V. Y., Shamardin, A. I., Krasnova, G. O. (2011), *Novyye fitness-programmy* [New fitness programs]. Volgograd State Academy of Physical Culture, Volgograd. 137 p. [in Russia].
- Ивлиев, Б. К. Организационно-педагогические основы развития и технологии шейпинга в России : автореф. дис. канд. пед. наук. Росс. гос. ун-т физ. культуры, спорта и туризма. М., 2006. 24 с.
- Ivliev, B. K. (2006), "Organizatsionno-pedagogicheskiye osnovy razvitiya i tekhnologii sheypinga v Rossii" [Organizational and pedagogical foundations of development and technology of shaping in Russia]: abstract of the dissertation of the candidate of pedagogical sciences. Russian State University of Physical Culture, Sports and Tourism. M., 24 p. [in Russia].
- Леонова, Л. В., Решетнева, Г. А. Эффективность применения шейпинга для коррекции телосложения женщин. Материалы межрегион. науч.-практ. конф., посвящ. 10-летию Дальневост. Олимп. Акад. Хабаровск, 1999. С. 17–19.
- Leonova, L. V., Reshetneva, G. A. (1999), "Effektivnost' primeneniya sheypinga dlya korrektsii teloslozheniya zhenshchin" [The effectiveness of shaping to correct the physique of women]. *Materials of the interregional scientific-practical conference dedicated to the 10th anniversary of the Far Eastern Olympic Academy*. Khabarovsk. pp. 17–19. [in Russia].
- Махова, О. П., Гониянц, С. А. Сравнительная эффективность влияния физических упражнений разной двигательной структуры аэробной направленности на снижение толщины кожно-жировых складок у женщин второго зрелого возраста. Труды ученых ГЦОЛИФКа: 75 лет. М., 1993. С. 239–241.
- Makhova, O. P., Gonyants, S. A. (1993), "Sravnitel'naya effektivnost' vliyaniya fizicheskikh uprazhneniy raznoy dvigatel'noy struktury aerobnoy napravlennosti na snizheniye tolshchiny kozhno-zhirovyykh skladok u zhenshchin vtorogo zrelogo vozrasta" [Comparative effectiveness of the influence of physical exercises of different motor structure of aerobic focus on reducing the thickness of skin-fat folds in women of the second mature age]. *Proceedings of scientists of SCOLIPE: 75 years*. M., pp. 239–241. [in Russia].
- Робинсон, Л., Фиер, Х., Жаклин, Н. Пилатес – управление телом. Минск : ООО «Попурри», 2005. 272 с.
- Robinson, L., Fier, K., Jacqueline, N. (2005), *Pilates – upravleniye telom* [Pilates – body control]. Popuri LLC, Minsk. 272 p. [in Russia].
- Утенко, В. Н., Гаврилов, Д. Н., Иванов, Д. А. Скрининговая оценка физического состояния населения. Научно-методическое обеспечение физического воспитания, спортивной тренировки и оздоровительной физической культуры : сборник научных трудов ; отв. ред. А. И. Федоров. Челябинск : Урал. гос. акад. физ. культуры, 1997. С. 99–102.
- Utenko, V. N., Gavrilov, D. N., Ivanov, D. A. (1997), "Skriningovaya otsenka fizicheskogo sostoyaniya naseleniya" [Screening assessment of the physical condition of the population]. *Scientific and methodological support of physical education, sports training and health-improving physical culture / resp. ed. A. I. Fedorov*. Ural State Academy of Physical Culture, Chelyabinsk. pp. 99–102. [in Russia].
- Хоули, Э. Т., Френке, Б. Д. Оздоровительный фитнес. Киев : Олимпийская литература, 2000. 377 с.
- Hawley, E. T., Frenke, B. D. (2000), *Ozдорovitel'nyy fitness* [Wellness fitness]. Olympic Literature, Kiev. 377 p. [in Russia].
- Галаманжук Л. Л., Єдинак Г. А. Основи наукових досліджень : навч.-метод. посібник. Кам'янець-Подільський : Рута, 2019. 150 с.
- Galamanzhuk, L. L., Iedynak, G. A. (2019), *Osnovy naukovykh doslidzhen'* [Fundamentals of scientific research]. Ruta Printing House LLC, Kamianets-Podilskyi, 150 p. [in Ukraine].
- Шиян Б. М., Єдинак Г. А., Петришин Ю. В. Наукові дослідження у фізичному вихованні та спорті : навч. посібник. Кам'янець-Подільський : ПП Видавництво «Оіюм», 2012. 280 с.
- Shiyan, B. M., Iedynak, G. A., Petryshyn, Yu. V. (2012), *Naukovi doslidzhennya u fizychnomu vykhovanni ta sporti* [Scientific research in physical education and sports]. PE Oyum Publishing House, Kamianets-Podilskyi, 280 p. [in Ukraine].

Received for publication 21.01.2020

# COMPARATIVE ANALYSIS OF STUDIES OF PHYSICAL FITNESS LEVELS OF WHO FIRST-YEAR YOUTH STUDENTS ACCORDING TO STATE TESTING RESULTS

V. Fotynyuk

National Aviation University, Kyiv, Ukraine

corresponding author – V. Fotynyuk: biohazard6666@ukr.net

doi: 10.32626/2309-8082.2020-16.91-95

The article analyzes the dynamics of changes in the level of physical fitness of students of the first year of higher education (WHO) different years of study using the standards of annual assessment of physical fitness of the population of Ukraine. First-year university students (WHO) 2017–2019 years of study (n = 408; 408 boys) participated in the study. The age of the study participants was 17–20 years. They passed the following tests for physical fitness: 100 meters' run; 3000 meters run; long jump from the spot; chin ups; 4x9 m shuttle test, sec.; forward torso bending from sitting position, cm. The analysis of the study indicated the weakest aspects of the physical fitness of student youth. It is found that more than 90.44 % of the first year students have low level of fitness, which is not satisfactory. It is found that the highest scores testified to the performance of forceful exercises (pull-ups on the crossbar). The results of the study analysis confirm the tendency to deteriorate the physical fitness of student youth. For the overwhelming

number of students, the requirements of the annual assessment of the physical fitness of the population of Ukraine, as a method of controlling their physical fitness, are impossible. The results of the assessment of the students' qualitative physical training showed that the vast majority of them were rated "unsatisfactory". This indicates the need for improvement in the process of physical education of students, students developing a program on physical education with a focus on wellness orientation and physical self-improvement. Testing according to standards without taking into account the indicators of physical development do not help motivate students to further exercise. It is recommended to increase the volume of compulsory classes of students' motor functioning at the cost of the following: usage of optional classes; physical exercises' practicing in free time; everyday motor activity in the form of morning exercises and sport games.

**Keywords:** students, testing, level, fitness.

## Introduction

To date, the reduction of physical activity in schoolchildren and students is the result of an increased neuropsychological fatigue and the emergence of hypodynamics, which leads to a progressive deterioration of physical fitness. The decline in the level of physical training of students of higher educational institutions in recent decades has become permanent. In such a situation, the question of improving the level of physical fitness of students is particularly acute. Physical fitness is a set of motor abilities (to some extent the development of the basic physical qualities) and morphofunctional properties of the body, as a result of physical training. Physical fitness is the most important component of the life of students. Constant accounting of the results of physical fitness of students provides an opportunity for an effective process of assessing their physical fitness.

The authors of the studies show a decrease in the levels of physical fitness observed in preschool, secondary, and higher educational institutions [1; 2]. It is important that it is in these age periods that motor activity is especially necessary, which contributes to: the soft flow of the processes of restructuring the functional systems of the body; physical development and formation of physical qualities necessary in the life of an adult.

It is proved that a large number of modern students entering higher educational institutions have an insufficient level of physical fitness [5; 9].

Analysis of researches of scientists who studied the dynamics of physical preparedness of students during the whole period of their study at the Higher Educational Institutions (HEI) states that the growth rate of their physical fitness indicators is significantly decreased [3; 4; 6; 7]. It is worrying that this trend is intensifying every year.

Our previous studies examined the levels of physical preparedness of HEI students [10; 11]. Our research confirms the tendency to reduce the level of general physical fitness of students, which is significantly associated with a low initial level of physical fitness of entrants.

## Material and research methods

The purpose of the study was to analyze comparatively the level of physical fitness of the first-year students of higher educational institution (HEI) (2017–2019), according to the results of the State Testing. The study involved 408 first-year students of different specialties of higher educational institution (HEI) (n=408; 2017; 2018; 2019 – 136 young men). The age of the study participants was 17–20 years.

During the testing, the general provisions and requirements for the tests were followed. All participants belonged to the main medical group according to the medical examination.

The study consisted of identifying and summarizing the data of comparative analysis of the levels of physical fitness of first-year students of higher educational institution of different years of study. The study was conducted using the standards of annual assessment of physical fitness of the population of Ukraine to assess the level of physical fitness of students [8].

Physical fitness was determined by following exercises: speed exercise (running 100 meters), endurance exercise (running 3000 meters), strength exercise (pull-ups on the crossbar), or speed-strength exercise (standing long jump), agility exercises (shuttle running 4 x 9 m), flexibility exercises (seated forward bend cm). All control exercises (tests) to determine the indicators of assessment of physical fitness of first-year students were conducted in physical education classes in the main part. They are presented in Table 1 [8].

Assessment of the level of physical fitness was carried out on the scale of results presented in Table 2.

**Table 1 – Criteria for assessing students' physical fitness**

№ з/п	Types of tests	Gender	Standards, points			
			5	4	3	2
1	Uniform running 3000 m, min	ч	13,0	13,3	14,2	15,3
2	Pull-ups on the crossbar, times, or standing long jump, cm	ч	14	12	11	10
			260	240	235	205
3	Running 100 m, s	ч	13,2	14,0	14,3	15,0
4	Shuttle running 4 x 9 m, s	ч	9,0	9,6	10,0	10,4
5	Seated forward bend, cm	ч	13	11	9	6

**Table 2 – Scale of tests results and standards for students (17-20 years)**

Points	Level of physical fitness	Assessment of the level of physical fitness
25–21	High	Excellent
20–16	Sufficient	Good
15–11	Average	Satisfactory
10 and under	Low	Unsatisfactory

*Statistical analysis.* The results of our research data were processed using the parameters of statistical and probable analysis. Student's t-test was used to assess the statistical significance between the results. The null hypothesis was tested. The data generated by these sampling results belong to the set with the same distribution law. Statistical processing of these results was performed using a personal computer.

#### Results of the study

Indicators of physical fitness (PF) are considered the most important criteria for differentiated assessment of students in connection with their preparation for future employment and protection of the state. Physical fitness is justified by the high importance because its implementation leads to successfully strengthen health.

A comparative analysis of the physical fitness of first-year students of different years of study of the HEI

17–20 years of male sex revealed reliably significant indicators that have a steady tendency to reduce all indicators on the performance of the types of tests presented in Table 3.

Following the dynamics of changes in the results of physical fitness of first-year students during 2017–2019 in Table 3, it was found that these test indicators have statistically significant changes, from year to year decrease in all testing exercises, namely a large number of studies have a low level of physical fitness in the 3000 m running, shuttle running 4 x 9 m. A slight decrease with a low level of physical fitness is observed in pull-ups on a high crossbar, or standing long jump, running 100 m, at the same time, indicator of seated forward bend, which characterizes the mobility of joints, improves slightly at high level, but these changes are not statistically significant.

**Table 3 – Indicators of the dynamics of changes in testing the physical fitness of first-year students for 2017-2019**

№ з/п	Types of tests	Levels, points											
		High, %			Sufficient, %			Average, %			Low, %		
		5			4			3			2		
		2017	2018	2019	2017	2018	2019	2017	2018	2019	2017	2018	2019
1	Uniform running 3000 m, min	2.21	1.47	0.00	2.21	0.73	1.47	5.88	6.62	0.73	89.70	91.18	97.80
2	Pull-ups on the crossbar, times, or standing long jump, cm	8.82	8.08	4.65	11.77	11.02	5.15	7.36	4.42	4.17	72.05	76.48	86.03
3	Running 100 m, s	3.67	5.14	1.47	18.83	16.91	13.23	10.30	13.24	7.36	67.20	64.71	77.94
4	Shuttle running 4 x 9 m, s	0,73	0.00	0.00	4.41	3.68	0.00	14.70	13.97	5.88	66.92	82.35	94..12
5	Seated forward bend, cm	2.21	5.14	5.88	3.67	6.62	2.94	8.09	1.47	3.67	86.03	86.77	87.50

Thus, the comparative analysis of the test results revealed the negative dynamics of the low level of physical training of first-year HEI students, which are presented in Table 4.

**Table 4 – Dynamics of changes in testing the physical fitness of first-year students on the scale of test results and standard for students (17-20 years) 2017-2019**

Total participants	136	136	136	408	Among them %	Among them %	Among them %	T. %
Among them according to the level of physical fitness	2017	2018	2019	Among them according to the assessment of the level of physical fitness	2017	2018	2019	
High	1	1	0	Excellent	0.74	0.74	0.00	0.00
Sufficient	5	3	3	Good	3.67	2.20	2.20	1.47
Average	26	20	10	Satisfactory	19.11	14.70	7.36	11.35
Low	104	112	123	Unsatisfactory	76.48	82.36	90.44	13.96

Mathematical analysis of the dynamics of changes in physical fitness on the scale of test results and standards during 2017-2019 in first-year students, we conducted at each level separately (high, sufficient, average and low). As a result of such calculation, we obtained tempiric for «high level» 0.00 %, «sufficient» 1.47 %, «average» 11.35 %, and «low» 13.96 %.

Thus, the obtained results of the comparative analysis indicate that during 2017-2019 there was a tendency to reduce the level of physical fitness of first-year students who have a low level, which corresponds to the unsatisfactory assessment. Testing of physical preparedness allowed to investigate the level of development of basic physical qualities and to identify which ones are leading or lested.

## Discussion

It is known that physical fitness is the result of human motor activity, is its integral indicator that reflects how the performing of physical exercises almost all organs and systems of the body come into interconnection.

The analysis of the results obtained complements the data of the authors [1; 8] about the low level of physical fitness in preschool, secondary, and higher educational institutions. All this takes place against the background of declining interest in PE lessons and a negative attitude towards physical education in general.

The obtained results indicate the importance of assessing the level of physical preparedness, expanding information about the peculiarities of the development of motor abilities.

We agree with the authors [1] on the need for structural and functional analysis in assessing the level of physical fitness. The data also confirm the opinion that tests and methods of assessing the level of physical fitness of students do not meet the age, physical and functional characteristics [12].

Our data confirmed the results of the authors [3; 4; 9] who studied the physical fitness of the students and expressed concern about the development of their level of physical fitness, which did not meet the regulatory requirements. Physical fitness assessment results showed that the vast majority of them were rated as «unsatisfactory.»

The results obtained are in addition to our previous research [10; 11] and the expansion of scientific information on the need to substantiate the tests and standards of the system of current control of students' physical fitness.

## Conclusions

The study found that the level of physical fitness of first-year HEI students according to the exercises of the standards of annual assessment of physical fitness of the population of Ukraine, have a low level, which corresponds to the unsatisfactory assessment. For the vast majority of students, test requirements as a method of monitoring their physical fitness are impossible.

We believe that the main factors of reducing the level of physical fitness of students are: a limited number of academic classes on physical education; lack of need for students in systematic exercise; low level of motivation of students to physical education; lack of interest in physical education in your spare time; deterioration of the health of students before entering the university; imperfection of the process of physical education in secondary school.

*Conflict of interest.* The authors state that there is no conflict of interest.

## References

1. Бутенко Г., Гончарова Н. Динаміка показників фізичної підготовленості молодших школярів в процесі фізичного виховання. Фізична культура, спорт та здоров'я нації: збірник наукових праць. Вінницький державний педагогічний університет імені Михайла Коцюбинського; Житомирський державний університет імені Івана Франка. 2017. Вип. 3(22). С. 30–35.  
Butenko, G., Goncharova, N. (2017), "Dynamika pokaznykiv fizychnoyi pidhotovlenosti molodshykh shkolyariv v protsesi fizychnoho vykhovannya" [Dynamics of indicators of physical fitness of younger students in the process of physical education]. *Physical education, sports and health of the nation*. Iss. 3 (22). pp. 30–35. [in Ukraine].
2. Герасименко С. Ю., Жигульова Е. О. Оцінка рівня фізичної підготовленості учнів 9-х класів. Вісник Кам'янець-Подільського нац. у-ту імені Іван Огієнка. Фізичне виховання, спорт і здоров'я людини. 2017. Вип. 10. С. 134–143.  
Gerasimenko, S. Yu., Zhigulova, E. O. (2017), "Otsinka rivnya fizychnoyi pidhotovlenosti uchniv 9-kh klasiv" [Assessment of the level of physical fitness of 9 th grade students]. *Bulletin of Kamianets-Podilskyi Ivan Ogiyenko National University. Physical education, sports and human health*. Vol. 10. pp. 134-143. [in Ukraine].
3. Гулай В. С. Фізична підготовленість та здоров'я студентів НУДПС України. Науковий часопис НПУ ім. М.П. Драгоманова. Науково-педагогічні проблеми фізичної культури. Фізична культура і спорт. Зб. наук. праць. Київ. НПУ імені М.П. Драгоманова. 2014. Серія № 15. Вип. 10. С. 36–40.  
Gula, V. S. (2014), "Fizychna pidhotovlenist' ta zdorov'ya studentiv NUDPS Ukrainy" [Physical fitness and health of students NUSTS Ukraine]. *Science magazine named NEA. MP Dragomanova. Scientific-pedagogical problems of physical culture. Physical culture and sport*. № 15. Series Vol. 10 pp. 36–40. [in Ukraine].
4. Драчук А., Романенко В., Гудима С. Порівняльна характеристика показників фізичного стану студентів 1-4 курсів ВНЗ України. Фізична культура, спорт та здоров'я нації: зб. наук. пр. 2014. Вип. 18. Т. 1. С. 76–83.  
Drachuk, A., Romanenko, V., Hudyma, S. (2014), "Porivnyalna kharakterystyka pokaznykiv fizychnoho stanu studentiv 1-4 kursiv VNZ Ukrainy" [Comparative specifications in physical condition of students 1-4 courses of universities in Ukraine]. *Physical Culture, Sport and Health of the Nation*. Vol. 18 (1). pp. 76–83. [in Ukraine].
5. Москаленко Н. В. Аналіз фізичної підготовленості студенток. Спортивний вісник Придніпров'я. 2016. № 3. С. 97–100.  
Moskalenko, N. V. (2016), "Analiz fizychnoyi pidhotovlenosti studentok" [Analysis of students' physical fitness]. *Sports Bulletin of the Dnieper*. № 3. pp. 97-100. [in Ukraine].
6. Павлось Р., Світлик В., Боровик Ю., Булатов О. Стан фізичної підготовленості студентів ВНЗ як індикатор якості їхнього фізичного виховання. Науковий часопис НПУ ім. М.П. Драгоманова. Науково-педагогічні проблеми фізичної культури. Фізична культура і спорт: зб. наук. праць. 2016. Серія № 15. Вип. 3. С. 96–99.  
Pavlos, R., Svitlyk, V., Borovik, J., Bulatov, A. (2016), "Stan fizychnoyi pidhotovlenosti studentiv VNZ yak indykator yakosti yikhno'oho fizychnoho vykhovannya" [State of physical fitness of university students as an indicator of their quality of physical education]. *Science magazine named NEA. MP Dragomanova. Scientific-pedagogical problems of physical culture. Physical culture and sport*. № 15. Series Vol. 3. pp. 96–99. [in Ukraine].
7. Підлужняк О., Колос О., Чхань А. Особливості фізичного стану студентів факультету інформаційних технологій та комп'ютерної інженерії Вінницького національного технічного університету. Фізична культура, спорт та здоров'я нації: зб. наук. пр. 2015. Вип. 19. Т. 1. С. 335–340.  
Pidluzhnyak, O., Colossus, O., Features, A. (2015), "Osoblyvosti fizychnoho stanu studentiv fakul'tetu informatsiynykh tekhnolohiy ta komp'yuternoyi inzheneriyi Vinnyts'koho natsional'noho tekhnichnoho universytetu" [Chan physical condition of students of information technology and computer engineering Vinnytsia National Technical University]. *Physical Culture, Sport and Health of the Nation*. Vol. 19 (1). pp. 335- 340. [in Ukraine].

8. Про затвердження тестів і нормативів для проведення щорічного оцінювання фізичної підготовленості населення України. – Режим доступу : <http://zakon.rada.gov.ua/go/z0195-17>  
On the approval of tests and standards for conducting an annual evaluation of physical preparedness of the population of Ukraine. – Available at: <http://zakon.rada.gov.ua/go/z0195-17>
9. Савлюк С. П., Романова В. І., Панчук А. П., Кучер Т. В. Сучасний стан фізичної підготовленості студентської молоді. Науковий часопис Національного педагогічного університету імені М. П. Драгоманова. Науково-педагогічні проблеми фізичної культури (фізична культура і спорт) : зб. наук. праць. 2019. Вип. 10 (118)19. С. 130–134.  
Savlyuk, S. P., Romanova, V. I., Panchuk, A. P., Kucher, T. V. (2019), “Suchasnyy stan fizychnoyi pidhotovlenosti student-s'koyi molodi” [Current state of physical fitness of student youth]. Scientific journal of MP Dragomanov National Pedagogical University. *Scientific and pedagogical problems of physical culture (physical culture and sports)*. Vol. 10 (118) 19. pp. 130-134. [in Ukraine].
10. Фотинюк В. Г. Аналіз результатів державного тестування студентської молоді з фізичної підготовленості. Науковий часопис Національного педагогічного університету ім. М.П. Драгоманова. Науково-педагогічні проблеми фізичної культури (фізична культура і спорт). 2019. Вип. 1 (107)19. С. 104-107.  
Fotynyuk, V. G. (2019), “Analiz rezul'tativ derzhavnoho testuvannya student-s'koyi molodi z fizychnoyi pidhotovlenosti” [Analysis of the results of state testing of students' physical fitness]. *Scientific journal of the National Pedagogical University. MP Dragomanov. Scientific and pedagogical problems of physical culture. physical culture and sports*. Iss. 1 (107) 19. pp. 104-107. [in Ukraine].
11. Fotynyuk, V. G. (2017), Determination of first year students' physical condition and physical fitness level. *Physical education of students*, 21 (3). pp. 116-120. doi:10.15561/20755279.2017.0303
12. Kelly, L. S., Mercier, K. & Garn, A. C. (2019), Do fitness test performances predict students' attitudes and emotions toward physical education? *Physical Education and Sport Pedagogy*, 24 (6), pp. 549-564, doi: 10.1080/17408989.2019.1628932

Received for publication 11.02.2020

# STRUCTURAL ACCENTS OF TEACHERS' READINESS FOR EXTRACURRICULAR WORK

L. Chaly, S. Mamchur

Rivne State Humanities University, Rivne, Ukraine

corresponding author – L. Chaly: lydmula1567@ukr.net

doi: 10.32626/2309-8082.2020-16.96-101

In this article the state of solving the problem of forming the readiness of physical education teachers for extracurricular work was explored. Also, the attempts to identify the main structural elements of readiness based on systematization of references and own researches were made. *The purpose of the study* is to analyze the development of structural components of physical education teachers' readiness for extracurricular work in pedagogical theory. *Material and methods*: the complex of methods was used for the research, such as theoretical analysis of scientific works, educational-methodical and special literature; systematization and generalization of the experience of specialists in the physical culture and sports; methods of mathematical statistics. *Results*: the analysis of scientific researches on the problem of formation of readiness for activity showed that there are different approaches to the interpretation of this process. Here it is possible to find a common feature: formation of readiness implies the presence of motivation, acquisition of knowledge, skills, practical experience,

awareness of the role of vocational training, continual work on self-improvement. Systematization of academic references sources on the problem of research allowed to determine the following components in the structure of physical education teachers' readiness for extracurricular work: motivational, orientational, theoretical and practical, and personal. Each component has its own broad interpretation. Formation of physical education teachers' readiness for extracurricular work is occurred through the development, interaction and interconnectedness of all these components. *Conclusions*: it has been determined that physical education teachers' readiness for extracurricular work is an integrated personal quality that has a multicomponent structure. Each component, in turn, has a wide range of features and requirements, the realization of which should be directed by professional training of specialists in higher education.

**Key words:** physical culture and sports, students, pedagogical activity.

## Introduction

The state policy in the field of physical culture and sports at a time the intensive movement of Ukraine to European standards aims to ensure a healthy lifestyle of the population, maintaining a sufficient level of motor activity of people, involving various population groups to mass sports, supporting promising youth and ensuring their sports growth.

Physical education in school is aimed at achieving the common goal of basic general secondary education, which consists in the development and socialization of students' personalities, the formation of their national identity, general culture, worldviews, ecological style of thinking and behavior, creativity, research and life skills, abilities for self-development and self-learning in the conditions of global changes and challenges [7].

According to V. V. Savitska, the versatile training of a new generation of specialists with a high level of professionalism has become a leading task of higher education institutions today [8].

The problems of professional training of future specialists in physical culture and sports in modern conditions are caused by the need to overcome the contradictions that arise between the requirements of modern society for the professional training of future specialists and their qualifications. After all, the weak

organization of mass-physical culture work at the place of residence, low level of teaching physical education in schools and institutions of higher education of different levels of accreditation, insufficient attention to theoretical training has led to the fact that students lose interest in physical culture, there is no motivation for a healthy lifestyle.

## Material and research methods

The purpose of our study was to analyze the development of structural components of the readiness of physical education teachers for extracurricular activities in pedagogical theory. To achieve this goal it is necessary to perform the following tasks: to analyze the developments of domestic and foreign scientists on this problem; clarify the essence of the concept of «readiness of physical education teachers for extracurricular activities»; highlight the components of the readiness of physical education teachers for extracurricular activities.

In the study we used the following research methods: theoretical analysis of scientific works, educational-and-methodical and special literature, systematization and generalization of the experience of specialists in the field of physical culture and sports; methods of descriptive statistics (random sampling statistics) and methods of verification of statistical hypotheses (Student's parametric t-criterion) [9; 12].

## Research results

Conceptual provisions on the formation of readiness of future physical education teachers for pedagogical activities are given in the Laws of Ukraine «On Education» (2017), «On Higher Education» (2014), the resolution «On approval of the State Target Social Program for the Development of Physical Culture and Sports for the period up to 2020» (2017), the National Strategy for the Development of Education in Ukraine for the period up to 2021.

A powerful cohort of scientists investigated the problem of forming the readiness for pedagogical activity. Among them: K. M. Durai-Novakova, M. I. Dyachenko, L. O. Kandibovich, N. V. Kuzmina, G. S. Kostyuk, O. M. Leontiev, Yu. V. Pelekh, K. K. Platonov, V. O. Slastionin, L. P. Sushchenko, D. N. Uznadze, O. V. Phil and others.

Scientists and researchers in the field of pedagogy and psychology are confident that the main basis of any activity is a person's readiness to implement it. According to L. E. Horonzhevskyy, the purpose of preparing future physical education teachers for extracurricular work is to achieve a state of appropriate readiness [11]. In our study, we will consider the readiness of physical education teachers for extracurricular work as an integrated quality of personality, which is marked by positive motivation for professional activities in extracurricular time and includes a set of theoretical, methodological, psychological and pedagogical knowledge, practical skills and abilities to organize such activities.

To solve the problem of forming the readiness of physical education teachers for extracurricular work, it is necessary to identify the components of readiness for teaching.

S. V. Harkusha notes that the number and content of components in the readiness structure depends on the direction of the study. The author argues that almost all scientists distinguish the motivational-and-target component, content-and-operational (other names: content-activity, procedural-activity), evaluation (other options: evaluative-and-regulatory, evaluative-and-effective). Depending on the peculiarities of psychological and pedagogical activity, it is possible to include emotional-volitional, psychophysiological (L. Kondrashova, G. Trotsko), integral (O. Pekhota), creative (S. Vorobyova, S. Litvinenko), etc. in the structure [3].

Readiness to organize extracurricular activities is connected with professional readiness as partial with general. This dependence allows us to structure the readiness of a physical education teacher for

extracurricular work on the same characteristics as professional readiness, but taking into account the peculiarities of extracurricular activities.

The motivational component, which in the opinion of most scientists is decisive, contains the following components: understanding, awareness of their task in future professional activities; interest in pedagogical activity, physical culture and sports; positive attitudes to work at school, love for children, empathy; responsibility for the quality of their work, the pursuit of success and recognition.

V. Zdanyuk notes that the system of needs, interests, motives, constituting the motivational sphere of personality, is the basis of the motivational component of readiness of future teachers of physical culture [5].

The content of the motivational component of the readiness of physical education teachers for extracurricular work, we understand in the following: the attitude of the future specialist to extracurricular activities, the need to use the reserves of extracurricular work to achieve the tasks of physical culture and sports, the desire for use with the maximum return of all possible means to improving the health of children, setting for a high result.

The motivation required throughout the career is evident in each pedagogical situation, determines the style of behavior of the teacher, especially in difficult situations.

The basis of the motivational component is the system of personal values, professional outlook, perception of norms and conditions of future activity. With regard to extracurricular work, the physical education teacher needs to realize that pedagogy in this case is gaining other characteristics, because it goes beyond the gym and stadium.

The principles of teaching and education also require rethinking, because the nature of communication between teacher and student in extracurricular activities should be different from while in the classroom. In extracurricular work, the teacher has the opportunity to reveal his students from other sides, this requires high-quality preparation for this role.

The future specialist must know the characteristics of future activities and correlate his personal capabilities (innate and acquired) with professional requirements.

To diagnose the values to which a person aspires, and those qualities through which it is possible to achieve this, we used the method of M. Rokich. Students were offered to independently, thoughtfully rank two lists of values

(eighteen positions each) and to decipher the formed hierarchy by key, that is, to determine the qualities that are most valuable in a personal sense.

This test cannot be quantified, it is possible only to track the placement of values that reflect the attitude to work and the desire for fruitful professional activity, in the general order.

We assessed the desire for professional self-realization according to the following scheme: if a student

placed the values of professional self-realization in the range from 1 to 4 positions, it indicates a high level of interest in professional training; if from 5 to 7 positions – average level; from 8 to 10 – basic level and from 11 to 16 – low level (Table 1).

Thus, we can track changes in the number of students belonging to groups with different levels of interest in professional self-realization.

**Table 1 – Scale of conformity of the value of professional self-realization and levels of readiness of future teachers of physical culture for extracurricular work**

Values of professional self-realization according to the method of M. Rokych	Interval of placement of values of professional self-realization in the ranked list of values of the person	Levels of formed readiness
Maximum use of their capabilities, strengths and abilities, interesting work	11–16	low
	8–10	base
	5–7	average
	1–4	high

The experimental study of the value of professional self-realization was conducted within the theme «Ways to improve the training of physical culture», which is registered in Ukr INTEI (state registration number 0116 U 005225, code thematic headings 77.03.17) of the Department of Theory and Practice of Physical Culture and Sports of Rivne State Humanities University. Students of the Stepan Demyanchuk International University of Economics and Humanities, Rivne State University of Humanities, and Lesia Ukrainka East European National University specialty 014 «Secondary Education (Physical Culture)» with a Bachelor's

degree, took part in the survey. Control (n = 83 persons) and experimental (n = 81 persons) groups were formed. Statistical data processing was performed using methods of descriptive statistics (random sampling statistics) and methods of verification of statistical hypotheses (parametric Student's t-criterion).

Our study found that in the first year there was no statistically reliable difference between the average arithmetic value indicators of professional self-realization among students of the control and experimental groups ( $8.94 \pm 0.41$  and  $8.46 \pm 0.43$ , respectively) (Table 2).

**Table 2 – Dynamics of value indicators of professional self-realization of future physical education teachers for extracurricular work**

Value indicators of professional self-realization	Control group, n=83		Experimental group, n=81		$t_{\text{поп}}$	P	$t_{\text{кр}}$
	M+m	D	M+m	D			
At the beginning of the experiment	8,94+0,41	3,77	8,46+0,43	3,87	0,80	0,05	1,972
At the end of the experiment	8,31+0,43	3,95	7,00+0,40	3,58	2,23	0,05	1,972
$t_{\text{поп}}$	1,04		2,49				
P	0,01		0,01				
$t_{\text{кр}}$	1,972		1,972				

Processing of test results upon completion of the research allows to state significant changes between the values indicators of professional self-realization before the beginning and after graduation from students of the experimental group ( $8.46 \pm 0.43$  and  $7.00 \pm 0.40$ , respectively).

Similar indicators in the students of the control group did not change significantly: at the beginning of the experiment –  $8.94 \pm 0.41$ , at the end –  $8.31 \pm 0.43$ .

Thus, in the process of professional training in a higher education institution there is an opportunity to influence the formation of students' value orientations.

## Discussion

Theoretical analysis of the psychological and pedagogical literature has shown that the formation of readiness is an important basis for professional activity. G. M. Alekseeva highlights different types of readiness depending on different activities. The scientist claims that readiness is based on a general pedagogical basis (is a part of professional readiness for teaching). The readiness is special (according to the specifics of a particular type of activity) and individual, because each has its own level of training and personal style of work. Therefore, it is necessary to allocate in structure of readiness both components common to all types of pedagogical activity, and special [1].

The work of M. V. Karchenkova is important for our study. In this work, she defined the readiness of a physical education teacher for professional activity as an integrated multileveled personal formation that includes theoretical knowledge, practical skills, motivational and value orientations, professionally significant abilities and personal qualities, physical and psychophysiological fitness, activity in the field of physical culture [6].

Other scientists, in particular L. N. Kulikova, distinguish two groups of components in the structure of readiness, which are the professional characteristics of readiness and the personal qualities of the future specialist. K. M. Duray-Novakova determines five components in the structure of readiness - motivational, orientation-cognitive, emotional-volitional, operational-active, and institution-behavioral. R. D. Sanzhayeva in the structure of readiness distinguishes such components - motivational, orientation, operational, volitional, evaluation components. B. S. Tropak and I. V. Sheludko divide readiness into the following components: theoretical, practical, psychological.

S. O. Skvortsova divides readiness into theoretical and practical. The generalized ability to think pedagogically, which implies the presence of analytical, prognostic, design and reflexive skills, is the content of theoretical readiness. These skills are complex in their structure, and most of them can be submitted as a composition of lower-order skills. The author interprets the practical readiness of the future teacher to conduct lessons as an experience of applying the components of theoretical readiness in practice: through imitation of future pedagogical activity during role-playing games, through project activities on solving methodological problems, during pedagogical practice [10].

The content of the theoretical component of the readiness of a physical education teacher for extracurricular activities is knowledge of the forms and methods of extracurricular health-and-educational work in comprehensive educational institutions.

The practical component of readiness involves the formation of professional skills. We are investigating the process of training a physical education teacher, so be sure to consider the development of general pedagogical and special abilities, including motor (B. M. Shiyan, V. G. Papusha). The following requirements are set for a specialist in physical education: to know the content of normative-legal documents in the field of physical culture; know the structure of the governing bodies of physical culture; be able to provide first aid; know the sanitary and hygienic standards of physical education classes; be physically prepared at a sufficient level for active training; possess the methodology of conducting classes with people of different ages, different physical development; have methods of control over the process of physical education; know the patterns of development of physical qualities and the formation of motor skills; know safety precautions [4, p. 45].

The pedagogical activity of a teacher is the performance of certain pedagogical functions. They are divided into two groups. The first group includes orientation, development, mobilization and information functions. To implement these functions it is necessary to develop didactic, academic, communicative abilities of students. The second group of pedagogical functions usually includes constructive, organizational, communicative, and gnostic functions. Groups of pedagogical skills are defined by analogy with pedagogical functions

Functions of a physical education teacher in extracurricular work, according to A.A.Vasilkov envisage: management of extracurricular work in physical education; cooperation with a form-masters, subject teachers and the organizer of extracurricular activities in the school; organization of sports associations of students and training of school teams in sports; planning and conducting sports and health improving events; support of business relations with public organizations and parents of students [2, p. 268].

Thus, the practical component of the readiness of a physical education teacher involves the formation of the most significant groups of teacher skills necessary for the organization of extracurricular work.

Based on the studied sources, we distinguish the following groups of skills of physical education teachers of extracurricular activities:

- gnostic – use of educational and reference literature, analysis of additional scientific sources, understanding the essence of educational material, establishing links between new and previously studied material, founding interdisciplinary relationship, formation of tasks and goals, analysis of working and learning conditions of students, study of best practices and its implementation, analysis of the causes of mistakes and failures of students and their own;
- design (prognostic) – planning extracurricular work in general, development of plans for specific classes, use of various forms of organization of education and upbringing, anticipation of possible mistakes and difficulties in work, forecast the use of certain methods and means in each pedagogical situation, taking into account the psychology of extracurricular team;
- constructive – knowledge of the peculiarities of extracurricular work at school, appropriate structuring of classes according to the level of mastering the material, the use of various learning technologies, the ability to build and rebuild extracurricular activities, taking into account the specifics of classes;
- organizational – management of own behavior, rational distribution of the time, self-control, expedient distribution of time on various types of works in structure of employment, management of children's collective, control of student's activity and correction of the performed work, observance of the set requirements;
- communicative – creating a positive atmosphere of extracurricular activities, constructive communication with colleagues, parents of children, cooperation with each student, friendliness in relationships, conflict prevention, establishing contacts with various institutions and organizations, fluency in the state language, correct attitude to students' actions;
- research – taking into account the individual characteristics of students, finding approaches to each child.

A number of scientists divide the personal component separately into the following aspects: psychophysiological, cognitive, volitional, moral, emotional, reflexive, creative, physical, and so on. We agree with this position and consider the personal component of physical education teacher's readiness for extracurricular work as a combination of the above-mentioned parts. Thus, in the formation of the personal component we pay attention to

the following components: memory, operational thinking, emotional stability, poise, self-confidence, activity and mobility of nervous processes, interest, pedagogical thinking, endurance, persistence, self-mobilization, independence, organization, flexibility of behavior, balance in any situation, self-discipline of the teacher, adequacy of reaction to criticism, sensitivity, kindness, love for children, ability to improvise, breadth of imagination, originality in the organization of educational process, new format of relations with students, colleagues, parents, reflection.

Summarizing the powerful scientific-and-reference material on the problem of our study, we define in the structure of readiness of a physical education teacher for extracurricular work the following components: motivational, theoretical, practical, personal. Each of these components, in turn, has a broad interpretation.

The formation of the readiness of a physical education teacher for extracurricular activities occurs through the development, interaction and interconnectedness of all these components.

### Conclusions

1. Analysis of literature sources and scientific publications has shown that the issue of formation of readiness is the subject of many scientific studies, but there are some differences in structuring and interpretation. It is possible to identify a common feature: the formation of readiness involves the presence of motivation, knowledge, skills, abilities and practical experience, awareness of the role of training, constant work on self-improvement.
2. All participants in the educational process in a higher education institution need to realize the importance of equal formation of all components of readiness for future activities in the chosen specialty.
3. Based on the analysis of psychological and pedagogical literature sources, taking into account the specifics of extracurricular work in secondary school, we determined that the readiness of a physical education teacher for extracurricular work is an integrated quality of personality with a multicomponent structure. Each component, in turn, has a wide range of features and requirements, the implementation of which should be aimed at training professionals in higher education.

Further developments are needed to find rational ways to form readiness, responding quickly to the changing conditions of the educational process.

*Conflict of interest.* There is no conflict of interest with other persons.

## References

1. Алексеева Г. М. Сутність і структура готовності майбутніх соціальних педагогів до застосування комп'ютерних технологій у професійній діяльності. Зб. наук. праць Бердянського державного педагогічного університету (Педагогічні науки). 2012. Т.2. С. 9–14. Aliksieieva, H. M. (2012), "Sutnist i struktura hotovnosti maibutnih sotsialnykh pedahohiv do zastosuvannya kompiuternykh tekhnolohii u profesiinii diialnosti" [The essence and structure of future social educators' readiness to use computer technologies in their professional activities]. *Collection of scientific works of Berdyansk State Pedagogical University: Pedagogical science*. Vol. 1, pp. 9–14. [in Ukraine].
2. Васильков А. А. Теория и методика физического воспитания : учебник. Ростов на Дону : Феникс, 2008. 381 с. Vasyukov, A. A. (2008), *Teoriya i metodika fizicheskogo vospitaniya* [Theory and methodology of physical education]. Feniks, Rostov n /d. 381 p. [in Russia].
3. Гаркуша С. В. Поняття та компоненти професійної готовності майбутніх учителів до педагогічної діяльності. Вісник Чернігівського національного педагогічного університету. Педагогічні науки. 2013. Вип. 110. С. 198-201. – URL: [http://nbuv.gov.ua/UJRN/VchdpuP\\_2013\\_110\\_57](http://nbuv.gov.ua/UJRN/VchdpuP_2013_110_57) Harkusha, S. V. (2013), "Poniattia ta komponenty profesiinoi hotovnosti maibutnih uchyteliv do pedahohichnoi diialnosti" [Concepts and components of future teachers' professional readiness for pedagogical activity]. *Bulletin of Chernihiv National pedagogical University: Pedagogical science*. Issue 110, pp. 198-201. –URL: [http://nbuv.gov.ua/UJRN/VchdpuP\\_2013\\_110\\_57](http://nbuv.gov.ua/UJRN/VchdpuP_2013_110_57) [in Ukraine].
4. Герчик М. С. Вступ до спеціальностей галузі «Фізичне виховання і спорт» : навч. посіб. Львів : Українські технології, 2002. 232 с. Hertsyk, M.S. (2002). *Vstup do spetsialnostei haluzi «Fizychne vykhovannia i sport»* [Introduction to the specialties «Physical education and sports»]. *Ukraini tekhnolohii*, Lviv. 232 p. [in Ukraine].
5. Зданюк В. Мотивація як складова готовності фізичних терапевтів до реалізації здоров'язберігаючих технологій. Вісник Кам'янець-Подільського національного університету імені Івана Огієнка. Фізичне виховання, спорт і здоров'я людини. 2019. Випуск 15. С.47–50. doi: 10.32626/2309-8082.2020-15.47-50 Zdaniuk, V. (2019), "Motyvatsiia yak skladova hotovnosti fizychnykh terapevtiv do realizatsii zdoroviazberihaiuchykh tekhnolohii" [Motivation as a component of physical therapists' readiness to implementation of health-saving technologies.]. *Bulletin of Kamianets-Podilskyi National Ivan Ohienko University: Physical education, sports and human health*. Issue 15, pp. 47–50. doi: 10.32626/2309-8082.2020-15.47-50 [in Ukraine].
6. Карченкова М. В. Педагогічні умови формування готовності майбутніх учителів фізичної культури до професійної діяльності: дис. канд. пед. наук : 13.00.04 / Переяслав-Хмельницький держ. педагогічний ун-т ім. Григорія Сковороди. Переяслав-Хмельницький, 2006. 228 с. Karchenkova, M. V. (2006), "Pedahohichni umovy formuvannia hotovnosti maibutnih uchyteliv fizychnoi kultury do profesiinoi diialnosti" [Pedagogical conditions of formation of the readiness of future physical education teachers for their professional activity] : dis. cand. ped. sciences: 13.00.04. Khmelnytsky State Pedagogical University named after Hryhorii Skovoroda. Pereiaslav-Khmelnytskyi. 228 p. [in Ukraine].
7. Навчальні програми для загальноосвітніх закладів: Фізична культура. 5-9 класи. Київ: Видавничий дім «Освіта», 2013. 24 с. *Navchalni prohramy dlia zahalnoosvitnykh zakladiv: Fizychna kultura. 5-9 klasy* [General Education Curricula: Physical Education]. Vydavnychiy dim «Osvita», Kyiv. 2013. 24 p. [in Ukraine].
8. Савіцька В. В. Готовність майбутнього соціального працівника до професійної діяльності як запорука її ефективності. Збірник наукових праць Уманського державного педагогічного університету. 2013. Ч. 2. С. 325–331. –URL : [https://nbuv.gov.ua/UJRN/znpudpu\\_2013\\_2\\_44](https://nbuv.gov.ua/UJRN/znpudpu_2013_2_44) Savitska, V. V. (2013), "Hotovnist maibutnoho sotsialnoho pratsivnyka do profesiinoi diialnosti yak zaporuka yii efektyvnosti" [Future social worker's readiness for professional activity as a guarantee of its effectiveness.]. *Collection of scientific works of Uman State Pedagogical University*. Vol. 2, p. 32. [in Ukraine].
9. Сисоева С. О., Кристопчук Т. Е. Методологія науково-педагогічних досліджень : підручник. Рівне : Волинські обереги, 2013. 360 с. Sysoieva, S. O., Krystopchuk T. Ye. (2013), *Metodolohiia naukovo-pedahohichnykh doslidzhen* [Methodology of scientific and pedagogical research]. Volynski oberehy, Rivne. 360 p. [in Ukraine].
10. Скворцова С. О. Динамічна модель процесу формування методичних компетенцій у майбутніх вчителів. Педагогіка формування творчої особистості у вищій і загальноосвітній школах: зб. наук. пр. Запоріжжя, 2011. Вип. 17 (70). –URL: <https://skvor.info/publications/articles/view.html?id=126> Skvortsova, S. O. (2011), "Dynamichna model protsesu formuvannia metodychnykh kompetentsii u maibutnykh vchyteliv" [A dynamic model of the process of forming the future teachers' methodological competences]. *Pedagogy of formation of creative personality in higher and secondary schools: collection of scientific works*. Zaporizhzhia. Issue 17 (70). – URL: <https://skvor.info/publications/articles/view.html?id=126> [in Ukraine].
11. Хоронжевський Л. Є. Підготовка майбутніх учителів фізичної культури до позакласної роботи з учнями загальноосвітньої школи засобами позашкільної практики. Зб. наук. пр. Хмельницького інституту соціальних технологій Університету "Україна". 2012. № 6. С. 173–178. – URL: [http://nbuv.gov.ua/UJRN/Znpkhist\\_2012\\_6\\_42](http://nbuv.gov.ua/UJRN/Znpkhist_2012_6_42) Khoronzhveskyi, L. Ye. (2012), "Pidhotovka maibutnykh uchyteliv fizychnoi kultury do pozaklasnoi roboty z uchniamy zahalnoosvitnoi shkoly zasobamy pozashkilnoi praktyky" [Preparation of future physical education teachers for extracurricular work with pupils of secondary school by means of extracurricular practice.]. *Collection of scientific works of Khmelnytsky Institute of Social Technology University of Ukraine*. № 6, pp. 173-178. – URL: [http://nbuv.gov.ua/UJRN/Znpkhist\\_2012\\_6\\_42](http://nbuv.gov.ua/UJRN/Znpkhist_2012_6_42) [in Ukraine].
12. Шиян Б. М., Єдинак Г. А., Петришин Ю. В. Наукові дослідження у фізичному вихованні та спорті : навч. посібник. Кам'янець-Подільський: ТОВ «Друкарня «Рута», 2012. 280 с. Shiyany, B. M., Iedynak, G. A., Petryshyn, Yu. V. (2012), *Naukovi doslidzhennya u fizychnomu vykhovanni ta sporti* [Scientific research in physical education and sports]. PE Oyum Publishing House, Kamianets-Podilskyi. 280 p. [in Ukraine].

Received for publication 22.01.2020

# CONSTRUCTION OF THE TRAINING PROCESS IN MICRO- AND MESOCYCLES OF TRAINING HIGHLY QUALIFIED ATHLETES SPECIALIZING IN JUDO

M. Chistyakova, O. Shishkin

Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine

corresponding author – M. Chistyakova: 1876543@i.ua

doi: 10.32626/2309-8082.2020-16.102-106

The substantiation of the peculiarities of training loads planning during the micro and mesocycles of elite judo athletes. *Methods.* Two hundred and 13 judo athletes. Athletes' age  $\bar{X} = 18,2$ ;  $S = 1,7$  years. The execution of the SJFT followed the original recommendations by Sterkowicz (1995). Data are presented as mean and standard deviation, and 95% confidence intervals. *Results.* Manifestation of special working capacity is cyclical. Thus, the best indicators of the performance are noted in the postmenstrual and especially in the postovulatory phase. During menstrual, premenstrual, ovulatory phases the indicators of special working capacity decline. According established changes in the manifestation of the special working capacity of elite judo athletes, depending on their hormonal status, we proposed the following structure of a basic mesocycle: microcycle I (retracting), aimed at the

development of endurance in the aerobic work; microcycle II (impact) – the development of special endurance; microcycle III (recovery) – restore athletes the physical and mental state; microcycle IV (impact) – the development of speed capabilities, endurance in the anaerobic work; V (recovery) – ensure optimal conditions for the restorative and adaptive processes of the athletes body. *Conclusions.* It was determined 5 variants of structure microcycles, differing in the ratio of the types of training, the orientation of the training sessions, the magnitude and intensity of the load, the means of the training process in accordance with changes in the special performance of athletes in different phases of the menstrual cycle are determined.

**Key words:** female athletes, judo, performance, menstrual cycle, mesocycle training.

## Introduction

Construction of the training process of highly qualified athletes, improving its quality and efficiency has always attracted the attention of domestic and foreign specialists [1; 8].

Quite a lot of theoretical and experimental material for solving this problem has been accumulated in judo [3; 10]. At the same time, the issues of scientific substantiation of the construction of the training process of athletes of this specialization, in particular the construction and content of its micro- and mesostructure, remain without due attention .

Traditionally, the training process of highly qualified athletes who specialize in judo is mainly based on the generally accepted method for men. In the process of training female athletes, do not take into account the morphological, functional and psychological characteristics of the female body, reserves to increase the special performance of their body, which negatively affects the health and, consequently, the sports result [3; 4; 5].

In this regard, a promising direction for solving the problem of the specifics of sports training of women specializing in judo is a scientific justification for the peculiarities of building the training process of athletes of this specialization in micro- and mesocycles of the preparatory period of the annual training cycle.

## Material and research methods

The aim is to substantiate the content of the training process in the basic mesocycle of the preparatory period for highly qualified athletes who specialize in judo. The study involved 13 highly qualified athletes specializing in judo, with menstrual function within the physiological norm. The average age was  $x = 18,2$ ;  $S = 1,7$  years, body length  $x = 163$ ;  $S = 1,6$  cm.

We used methods: analysis of scientific sources, pedagogical testing. Special workability was analyzed on the basis of specific loads of judo anaerobic orientated (Special judo Fitness test (SJFT) [11]) in the natural conditions of training athletes. Descriptive statistics were used to process the obtained data. Calculated the mean value of the indicators ( $X$ ), root mean square deviation ( $S$ ), the error of selecting the mean value ( $m_x$ ). Statistical reliability  $P = 95\%$  was accepted (error probability 5%, i.e. significance level  $p = 0,05$ ).

## Results of the research

In the last decade, the notion of the specifics of women's sports training has significantly expanded, which determines the possibility of more thorough and detailed development of ways to optimize the training process [2; 7]. It is shown [4; 6] that changes in hormonal status and, consequently, changes in neurohumoral regulation

of somatic and physiological functions of the body's systems cause cyclic changes in the special performance of athletes, the speed of their post-loading recovery, which should be taken into account when planning training loads in micro- and mesocycles of their training. Therefore, in order to identify the necessary criteria for the differentiation of training loads depending on the cyclic changes of hormonal state in the micro and mesocycles of training, we conducted a survey of the special workability of 13 highly qualified female athletes who specialize in judo. Special performance and urgent adaptive reactions were analyzed on the basis of specific loads of judo of anaerobic (SJFT test) orientation in the natural training conditions of athletes who specialize in judo.

It was found that the special workability of athletes changed in different phases of the menstrual cycle. Thus, the analysis of the dynamics of special workability, presented in Fig. 1 showed that during the performance of anaerobic exercise loads the best

indicators of special workability in the postmenstrual ( $SJFT_{index} - X = 12.3$ ;  $m_x = 0.3$ ) and post-ovulatory ( $SJFT_{index} - X = 12.0$ ;  $m_x = 0.2$ ) phases were obtained, more work was done, the best indicators of the number of repetitions of high-speed exercises were obtained.

The study found that the work of anaerobic nature in the menstrual phase was characterized by a reliable ( $p < 0.05$ ) decrease in the number of throwing movements of the SJFT test ( $X = 111.8$ ;  $m_x = 2.9$  and  $X = 24.8$ ;  $m_x = 0.6$ , respectively), indicating a decrease in speed and coordination capabilities of athletes who specialize in judo.

Testing data in this phase of the menstrual cycle showed reliably ( $p < 0.05$ ) the lowest indicators of special workability ( $SJFT_{index} - X = 12.9$ ;  $m_x = 0.3$ ).

Also reliably ( $p < 0.05$ ) decreased indicators in the premenstrual phase ( $SJFT_{index} - X = 12.7$ ;  $m_x = 0.2$ ). In the ovulation phase, during the operation of anaerobic orientation, the number of throwing movements significantly decreased ( $p < 0.05$ ) to  $X = 25.3$ ;  $m_x = 0.4$ .

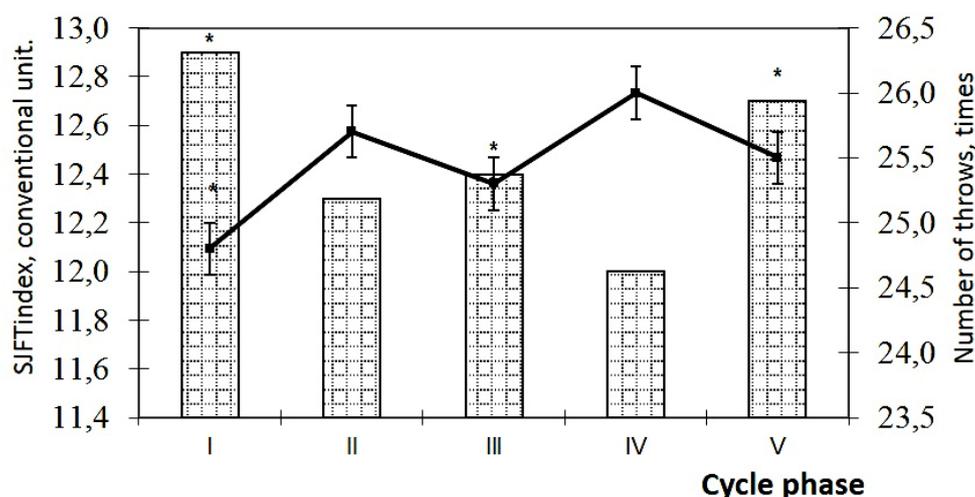


Fig. 1 Indicators of special workability of athletes specializing in judo, according to the SJFT test in different phases of the menstrual cycle:

 –  $SJFT_{index}$ ;  – number of throws;  
 \* – the difference is statistically significant at  $p < 0,05$

The presented data are taken into account when constructing the training process in the basic mesocycle of the preparatory period of training of highly qualified athletes who specialize in judo.

The content of loads in the basic mesocycle developed by us (on the example of the 28-day menstrual cycle) of the preparatory period of training of athletes, which consisted of five microcycles (Table 1), included the following.

In the first, retracting, microcycle (3–6th days of a menstrual cycle – a menstruation phase) we recommend a consecutive increase of work. We believe that the predominant focus of this microcycle is endurance during aerobic work, this will create functional preconditions for the next shock microcycle. The nature of the tasks involved in this microcycle was about to plan training sessions for small, medium and large loads. Intensity – from low to submaximal.

Table 1 – The structure of the basic mesocycle of the preparatory period of highly qualified athletes specializing in judo

Microcycle		Phase cycle		Focus of classes	Load magnitude
	days		days		
Retracting	1st	I	3 and	endurance at work of aerobic character	average
	2nd		4 and	endurance at work of aerobic character	average
	3rd		5th	special endurance	significantly
	4th		6th	endurance at work of aerobic character	small
Percussive	1st	II	7th	1 part – high-speed, 2 part - endurance at work of aerobic character	average
	2nd		8th	complex	great
	3rd		9th	endurance at work of aerobic character	small
	4th		10th	1 part – high-speed, 2 part - endurance at work of aerobic character	average
	5 th		11th	complex	significantly
	6 th		12th	endurance at work of aerobic character	average
R	1 th	III	13th	recreation	-
	2 th		14th	endurance at work of aerobic character	average
	3rd		15th	endurance at work of aerobic character	small
Percussive	1st	IV	16th	1 part – high-speed, 2 part - endurance at work of aerobic character	average
	2nd		17th	endurance at work of anaerobic character	great
	3rd		18th	endurance at work of aerobic character	small
	4th		19th	complex	significantly
	5 th		20th	complex	significantly
	6 th		21st	complex	small
	7 th		22nd	special endurance	average
	8 th		23rd	endurance at work of anaerobic character	great
	9 th		24th	complex	small
	10 th		25th	special endurance	average
R	1st	V	26th	endurance at work of aerobic character	average
	2nd		27th	endurance at work of aerobic character	average
	3rd		28th	complex	small
	4th	I	1st	endurance at work of aerobic character	small
	5 th		2nd	endurance at work of aerobic character	average

Notes: I – menstrual phase of the cycle, II – postmenstrual, III – ovulatory, IV – post-ovulatory, V – premenstrual  
R - recovery microcycle.

The second, percussive, microcycle coincides with 7–12 days of the menstrual cycle. In this phase of the cycle, we propose to shift the main emphasis of training to the development of special endurance, it is also advisable to develop speed capabilities. The maximum

amount of load in this microcycle falls on the 2nd and 5th training days with a focus on increasing the means of special endurance. Based on the data obtained, it is established that these days the body of athletes is able to respond adequately and fully to the load.

To develop special endurance, we used loads lasting 4–8 minute. Repetitions of series were not less than 6 (criterion of lengthening of loading – linear increase of heart rate during loading). Duration of rest – from 5 to 3 minutes (criterion - lowering the heart rate to 120–130 beats · Min<sup>-1</sup>). The intensity of the training loads occurred mainly in submaximal zone. To enhance renewal processes used classes of aerobic focus on 3–6 six days of microcycle that do not exceed the average and small size. Exercise intensity – low or moderate.

The third, restorative, microcycle corresponds to the ovulatory phase – the 13th-15th days of the menstrual cycle. The principles of compiling training tasks in this phase should be the most individual. It is advisable to use mainly aerobic exercises with light and medium loads.

The fourth, percussive, microcycle – 16-25 days of the menstrual cycle, which corresponds to the postovulatory phase of the cycle. This microcycle is characterized by a high total value of the training load (4 classes with a significant or large load), which is caused by a longer cycle duration – 10 days. The results of the research show that a significant increase in the total load and load intensity in this period will lead to a higher training effect, increase special workability. In this regard, in this microcycle, we planned classes with significant and heavy loads with an emphasis on the development of speed capabilities, endurance during anaerobic and aerobic work. To train speed - power qualities we used tasks with a lot of short repetitions, performed at maximum speed, and long rest pauses in such a sequence - acceleration not more than 15 seconds, recovering from 40 sec to 2 min. For the tasks of endurance development during the work of anaerobic nature, means with longer acceleration maximum from 20 s to 3 min and reduced rest intervals were used. The percussive microcycle ends with recovery.

Fifth, recovery, microcycle (premenstrual phase – 26-28th days of the menstrual cycle, the first 2 days of menstrual phase). A fundamental feature of this microcycle is the restoration of physical and mental potential of athletes. Therefore, in this micro cycle, the training loads did not exceed the medium and small values. The basis of the program in this microcycle were training sessions of mainly non-specific nature.

## Discussion

Based on the generalization of theoretical analysis data, which confirms the need to study the peculiarities of the construction of the training process of female athletes and the results of their own research, formulated provisions that became the basis for developing a basic mesocycle of the preparatory period of the training of athletes specializing in judo, the distinctive feature of which is the application of training sessions of different size, orientation and intensity

Thus, during the study, the data of theoretical positions [3; 4; 6; 7] on the need to build a training process of qualified athletes, taking into account the biological cyclical functions of the female body, which is the main condition for maintaining health and increasing sports workability, were confirmed.

## Conclusions

The analysis of special scientific and methodical literature and advanced practical experience of training athletes specializing in judo indicates the need for scientific substantiation for the construction of the training process of athletes in this specialization, taking into account the biological characteristics of the female body.

The results of pedagogical testing show changes in the special workability of athletes who specialize in judo, in the phases of the cycle and are characterized by: an increase in special performance in the postmenstrual ( $SJFT_{index} - X = 12.3; m_x = 0.2$ ) and post-ovulatory phases ( $SJFT_{index} - X = 12.0; m_x = 0.2$ ), decrease in special workability in: ovulatory, premenstrual phase and especially in a menstrual phase:  $SJFT_{index} - X = 12.9; m_x = 0.3$  ( $p < 0.05$ ).

The content of the basic mesocycle of the preparatory period of training of highly qualified athletes specializing in judo has been developed. Five variants of construction of microcycles are defined, which differ in the direction of training sessions, the size and intensity of loading, the means of the training process according to the special workability of sportswomen in different phases of a menstrual cycle .

*Conflict of interest.* The authors declare no conflict of interest.

## References

1. Платонов В. Н. Олимпийский спорт. Том 2. Киев : Олимп. литература, 2009. 736 с.  
Platonov, V. N. (2009), *Olimpiyskiy sport* [Olympic sport]. Olimp. literatura, Kyiv. 736 p. [in Russia].
2. Спортивная медицина: учебник / под ред. Л. Я.-Г. Шахлиной, Б. Г. Коган, Т. А. Терещенко, В. П. Тищенко, С. М. Футорног. Киев : Наукова думка, 2016. 452 с.  
*Sportyvna medytsyna* (2016) [Sports medicine]. L. Ya.-H. Shakhlina, B. N. Kohan, T. A. Tereshchenko, V. P. Tishchenko, S. M. Futorny. Naukova dumka, Kyiv. 452 p. [in Russia].
3. Тараканов Б. И. Приоритетные научные направления совершенствования системы подготовки женщин, занимающихся спортивной борьбой. Ученые записки университета им. П. Ф. Лесгафта. 2009. № 9 (55). С. 93–96.  
Tarakanov, B. I. (2009), "Prioritetnyye nauchnyye napravleniya sovershenstvovaniya sistemy podgotovki zhenshchin, zanimayushchikhsya sportivnoy bor'boym" [Priority research areas for improving the system of training women involved in wrestling]. *Scientific notes of the University. P. F. Lesgaft*. No. 9 (55). pp. 93–96. [in Russia].
4. Чистякова М. А. Морфофункциональная характеристика организма спортсменок высокой квалификации, специализирующихся в дзюдо. Спортивная медицина і фізична реабілітація. 2018. Вип. 1. С. 53–60.  
Chystyakova, M. A. (2018), "Morfofunktsional'naya kharakterystyka orhanyzma sport-smenok vysokoy kvalyfykatsyy, spetsyalizuyushchykhysya v dzyudo" [Morphofunctional characteristics of high qualification athletes specializing in judo]. *Sports medicine and physical rehabilitation*, Issue 1. pp. 53-60. [in Russia].
5. Чистякова М. А., Шишкин А. П. Проблемы и противоречия в вопросах гендерного равенства в спорте. Вісник Кам'янець-Подільського національного університету. Фізичне виховання, спорт і здоров'я людини. Кам'янець-Подільський : Кам'янець-Подільський національний університет імені Івана Огієнка, 2019. Вип. 12. С. 93–99  
Chystyakova, M. A., Shyshkyn, A. P. (2019), "Problemy y protyvorechyya v voprosakh hendernoho ravenstva v sporte" [Problems and contradictions in gender equality in sport]. *Bulletin of Kamyanets-Podilskyi Ivan Ogiyenko National University. Physical education, sports and human health*. Issue 12. pp. 93–99. [in Russia].
6. Шахлина Л. Г. Особенности функциональной адаптации организма спортсменок высокой квалификации к большим физическим нагрузкам. Спортивная медицина. 2012. № 1. С. 20–30.  
Shakhlina, L. G. (2012), "Osobennosti funktsional'noy adaptatsii organizma sportsmenok vysokoy kvalifikatsii k bol'shim fizicheskim zagruzkam" [Features of the functional adaptation of the body of highly qualified athletes to great physical exertion]. *Sports medicine*. No. 1. pp. 20–30. [in Russia].
7. Шахлина Л. Я.-Г., Ковальчук Н. В. Современное представление об особенностях спортивной подготовки женщин. Спортивная медицина і фізична реабілітація. № 1. 2018. С. 3–14.  
Shakhlina, L. Ya.-H., Kovalchuk N. V. (2018), "Suchasne uyavlennya pro osoblyvosti sportyvnoyi pidhotovky zhinok" [A modern view of the characteristics of women's sports training]. *Sports medicine and physical rehabilitation*, No. 1. pp. 3–14. [in Russia].
8. Bompa, T. O., Haff, G. G. (2009). *Periodization: Theory and Methodology of Training*. Human Kinetics.
9. Hecht, S. S., Arendt, E. (2014). *Training the female athlete. In Handbook of Sports Medicine and Science: The Female Athlete*. Human Kinetics.
10. Sikorski, W., Mickiewicz, G., Majle, B., Laksa, C. (1987). Structure of the contest and work. capacity of the judoist. *Proceedings of the International Congress on Judo*. Spala. pp. 58–65.
11. Sterkowicz, S. (1995). Test specjalnej sprawnosci ruchowej w judo. *Antropomotoryka*. No 12–13. pp. 29–44.

Надійшла 11.02.2020

# TECHNOLOGICAL APPROACH EFFICIENCY OF ATTRACTING STUDENTS TO HEALTHY MOTOR ACTIVITY

Yu. Yurchyshyn, V. Mysiv, T. Pogrebnyak, S. Potapchuk

Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine

corresponding author – Yu. Yurchyshyn: yuriyyurchyshyn@kpnu.edu.ua

doi: 10.32626/2309-8082.2020-16.107-110

*Objective:* to prove the effectiveness of the technological approach of engaging students in the process of physical education to health recreational physical activity in improving the performance of their physical condition. *Material:* the study involved 123 girls and 117 guys. *Results:* In the course of the experiment, the effectiveness of the technological approach of involving young people to wellness motor activity in the process of physical education was tested. It is established that the developed technology provides a significantly better (at the level of  $p < 0.05$  to  $p < 0.001$ ) result than the traditional implementation of the content of the current program in the following indicators: the level of expression at the end of the academic semester and year (current, final) indicators of physical condition, theoretical preparedness in the organization and implementation of health motor activity; the number of indicators that have improved during these periods; days missed on illness; the state, systematic and parameters of the student's motor activity during extra-curricular time. These and initial control were implemented during a special sport and recreational event by competitive method, operative – at each session to assess

the correspondence of physical activity to the student's current capabilities. *Conclusions:* the differences in results found in the experimental and control groups of girls and boys were associated with unequal amounts of motor activity of well-being, which in the experimental group during the academic year was marked by an increase due to the involvement of students in such extracurricular activities and optimizing the content of their practical activities in physical education achieved in experimental technology. At the same time, the low efficiency of engaging the students of the control group in the systematic health-promoting activity had a negative effect on the change of their physical condition. Testing of the designed technology during the second stage of the forming experiment proves its high efficiency in solving the set tasks, which allows to recommend the proposed development in the process of physical education of students.

**Key words:** educational technology, students, physical activity improving orientation, physical education.

## Introduction

Motor activity has always been the most important link of the adaptation of living organisms to the environment and in the process of evolution, it was formed as a biological need of man along with the needs of food, water, self-preservation, reproduction.

Today, healthy motor activity continues to be the only effective tool that far exceeds the capabilities of traditional medicine in strengthening health, prevention and even treatment of the most common diseases, as well as providing solutions to such important tasks as improving the quality of professional activities and good rest [6]. At the same time, a positive effect in improving health is ensured only by certain parameters of the specified activity when used systematically [5].

In institutions of higher education (HEI) the regularity of physical activity of students is ensured by compulsory physical education classes, which according to the relevant regulations [7] take place once a week. However, this number of classes, even with optimal parameters, does not allow to achieve the necessary health effect, and thus cause the need for additional motor activity in extracurricular time [1; 3]. Given the priority of homework, other diverse interests that are not related to this activity, the reality of its systematic implementation

is determined solely by the corresponding motivation of the student [2].

At the same time, there are almost no studies [4] aimed at developing technologies for involving HEI students in systematic health-improving motor activity. Studies that provide for the widespread use of modern means of transmission and receipt of the necessary information in solving this problem are absent at all.

## Purpose, tasks, material and methods

The aim is to prove the effectiveness of the technological approach of involving students in the process of physical education to health-improving motor activity in improving their physical condition. Research methods and organization. The following methods were used during the research: general scientific – analysis, comparison, generalization; medical-biological (life sciences), pedagogical, mathematical-statistical. Researched: the experimental group (EG) – 48 girls and 42 boys, the control group (CG) – 75 boys and 75 girls (Kamianets-Podilsky National University named after I. Ohienko), who studied in the second year during the one-year forming experiment. EG were engaged in the designed technology, in CG physical education took place traditionally using the content of the current program of physical education in HEI.

### Results of the study

The use of the designed technology during one year contributed to a significant improvement in the indicators of general physical performance, somatic health and physical fitness of students of the second year of study.

Thus, in the EG of girls changes in the absolute value of total physical performance increased by an average of 25 % ( $p < 0,05$ ), while in CG for the same period the change was only 3.6 % ( $p > 0,05$ ), that is, testified the manifestation of the indicator at the previously achieved level.

At the same time, the latter showed the opposite tendency of changes in relative (per 1 kg of body weight) values of total physical performance – they deteriorated

by 1.3 % ( $p > 0.05$ ), while in EG, on the contrary, improved by 13.6 % ( $p < 0.01$ ).

This result, given the absence of changes in the weight of girls in the experimental groups, in the first case showed an unfavorable trend, as weight gain outweighed the increase in physical performance, in the second, on the contrary – more intense growth of the latter than girls.

When comparing the values of these indicators in the EG and CG of girls at the end of the school year, there were even greater differences between them (Table 1), which allowed us to conclude about the high and low effectiveness of the content of physical education in improving the specified component of girls' physical condition during the second year training in the HEI.

**Table 1 – Change in physical performance indicators in research groups during the second stage of the forming experiment**

Indicator	Research group	At the beginning of the school year		At the end of the school year		Change		Certainty differences, t	
		$\bar{x}_1$	<i>m</i>	$\bar{x}_2$	<i>m</i>	<i>D</i> $\bar{x}$ (abs.)	<i>D</i> $\bar{x}$ (%)	during the year	at the end between EG and CG
<b>girls (EG – n=48, KG – n=75)</b>									
Absolute physical workability	EG	753,0	65,2	1004,5	60,8	251,5	25,0	2,82*	2,32*
	CG	765,3	69,5	794,2	67,1	28,9	3,6	0,3	
Relative physical workability	EG	13,6	0,67	15,8	0,73	2,2	13,6	2,16*	2,12*
	CG	14,7	1,15	13,4	0,84	-1,3	-9,8	0,92	
<b>boys (EG – n=42, KG – n=75)</b>									
Absolute physical workability	EG	890,7	61,4	1218,5	57,3	327,8	26,9	3,9**	3,34**
	CG	884,7	81,8	891,5	79,5	6,8	0,8	0,06	
Relative physical workability	EG	13,7	1,12	18,4	1,29	4,7	25,7	2,76*	3,97***
	CG	13,2	0,54	12,9	0,5	-0,3	-2,3	0,41	

Similar differences were found in the research groups of boys and the peculiarity was only in growth rate: in the EG absolute values of total physical workability increased by 26.9 % ( $p < 0.01$ ), in CG – only by 0.8 % ( $p > 0.05$ ), i.e. showed, respectively, a significant improvement in the indicator and its manifestation at the achieved level (Table 1).

Regarding the relative values of physical workability, their increase in EG by 25.7 % ( $p < 0.05$ ) and decrease in CG by 2.3 % ( $p > 0.05$ ) against the background of stabilization of body weight in the first group and a significant increase of body weight in the second group allowed to draw the same conclusion as in the case of girls.

When comparing the values of these indicators at the end of the school year, the difference between them

was noted at the level of  $p < 0.01$  to  $p < 0.001$  in favor of EG boys, which reasonably showed the high efficiency of the developed technology in solving the task of improving the overall physical workability of second-year students and the inefficiency of traditional organization and implementation of the content of the current program of physical education in the HEI.

Certain features (Table 2) marked somatic health, as another component of the physical condition, during the experiment.

Thus, the number of school days in which EG of girls did not attend classes due to illness, for the period September–June was, on average,  $4 \pm 0.28$ , while in CG – three times more, namely  $12 \pm 0.29$  days ( $p < 0,001$ ).

**Table 2 – The number of missed days of the school year due to illness in the research groups during the second stage of the forming experiment**

Gender	Research Team	Indicator Value		Reliability of difference, t
		$\bar{x}$	<i>m</i>	
Girls	EG	4	0,28	19,85***
	CG	12	0,29	
Boys	EG	6	0,42	15,85***
	CG	14	0,28	

The boys obtained a similar result, but with the following differences: in EG the number of days missed due to illness was  $6 \pm 0.42$ , in CG – more than twice as much –  $14 \pm 0.28$  ( $p < 0,01$ ). In other words, girls and boys, in which motor activity with improving orientation during the second semester in the first year and third and fourth semesters in the second year of study was provided with experimental content of practical classes and theoretical and methodological training in physical education, there were much better somatic health than their classmates, whose motor activity during classes involved the traditional organization and implementation of the content of the current program of physical education in HEI.

As for another component of the physical condition, namely the physical preparedness of students, here the changes in its indicators during the school year showed the following. In the EG of girls there was a significant improvement in all studied indicators, except for high-speed endurance, the change of which showed only a tendency to improve – the result in the 100 m run decreased by 0.4 % ( $p > 0.05$ ). The largest increase (within 11.9–31.5 %; from  $p < 0.01$  to  $p < 0.001$ ) was observed in static strength, general endurance, absolute muscle strength and flexibility.

In CG, the changes in these indicators differed from the following: only the value of the absolute muscle strength increased by 4.5 % in girls' group, and the explosive strength of the muscles of the lower extremities by 2.3 % ( $p < 0.05$ ); at the same time, the value of the general endurance indicator deteriorated by 6.7 % ( $p < 0.001$ ); other studied indicators were as at the previously achieved level.

Due to the different values of some indicators at the beginning, dynamics and increase during the year of physical fitness at the end of the experiment, significant

differences were found between the results in EG and CG. These differences were that the values of all indicators, except for high-speed endurance, in girls EG were much better (at the level of  $p < 0,01$  to  $p < 0,001$ ) than in girls CG.

Analyzing the data obtained in the EG of boys, we found that during the school year, their overall endurance improved by 20.2 %, static strength endurance – by 15 % ( $p < 0,001$ ), flexibility – 17.1%, absolute muscle strength – 7.3 % ( $p < 0,01$ ), explosive muscle strength of the lower extremities – 2,8 % ( $p < 0,05$ ).

The CG showed a completely different dynamics of these indicators: all indicators, except for static strength endurance, were marked only by a certain tendency to change, as the latter were insignificant, i.e. allowed to conclude that the values of indicators at the previously achieved level. As for the static strength endurance of the boys of this research group, it deteriorated by 25.3 % during the school year ( $p < 0.001$ ).

When comparing the values of indicators of EG and CG at the end of the experiment, we noted the advantage of the first over the second in all cases, except for high-speed endurance, which in both boys groups was at the same level of development – the average result was  $14 \pm 0.11$  and  $14,2 \pm 0.04$  s ( $p > 0.05$ ) respectively. In other words, in the EG of girls and boys compared to CG were better results related not only to the number of indicators of physical fitness that improved significantly during the school year, but also related to the number of indicators that eventually reached much better values.

Differences in the results found in EG and CG of girls and boys were associated with different volumes of motor activity of health orientation, which in EG during the school year was increased due to the involvement of students in such activities in extracurricular activities and optimization of the content of their physical education classes achieved in experimental technology. At the same time, the low effectiveness of the involvement of CG students in the systematic motor activity of health-improving orientation had a negative impact on the change in their physical condition, which is confirmed by the following data.

Thus, according to the two criteria used, the experimental development was much more effective than that used in the CG of girls and boys in solving the problem of improving their physical condition by means of physical culture.

### Discussion

Preserving and strengthening the health of young people in the digital age is a priority for the development of the modern state. That is why, at the highest level, together with the creation of technologies of economic, political and socio-cultural development, appropriate technologies of involvement in health-improving motor activity should be formed and offered.

Since physical culture occupies a leading place in the systematic implementation of student recreational motor activity, to solve the problem, it is necessary to improve the process, considering the low motivation of students to the designated activity, that was revealed previously [8], is due to the insufficient formation of motivational factors (procedural and efficient components), as they are decisive in the manifestation of a certain activity. These components of motivation are formed in the course of physical and intellectual activity, so the improvement of the process of physical education should be comprehensive, that is, to concern its practical-and-theoretical and methodological components.

### Conclusion

The effectiveness of the use of experimental technology is confirmed by changes in the level from  $p < 0.05$  to  $p < 0.001$  of the number of physical condition indicators (7 physical fitness, 2 and 1 related to general physical workability and somatic health respectively), which during the school year significantly improved: in EG of girls and boys there were 6 of them, while in CG – 2 and 1, respectively, but with a simultaneous deterioration of 2 and 3 indicators.

The number of indicators of physical condition, which at the end were marked by significantly higher values in a certain research group (in EG of girls there were 1,88; boys – 17; in CG - none ); others – practically did not differ in the experimental groups of girls and boys. Experimental technology is much more effective than the traditional organization of classes using the content of the current program of physical education of students.

*Conflict of interest.* The authors state that there is no conflict of interest

### References

1. Бар-Ор О., Роуланд Т. Здоровье детей и двигательная активность: от физиологических основ до практического применения. Киев : Олімп. л-ра, 2009, 528 с.  
Bar-Or, O., Rouland, T. (2009), *Zdorovye detey i dvigatel'naya aktivnost: ot fiziologicheskikh osnov do prakticheskogo primeneniya* [Children's health and physical activity: from physiological foundations to practical use]. Olimpiyskaya literatura, Kyiv. 528 p. [in Russia].
2. Декерс Л. Мотивация. Теория и практика. Москва : Гросс Медиа, 2007, 637 с.  
Dekers, L. (2007), *Motivatsiya. Teoriya i praktika* [Motivation. Theory and practice]. Gross Media, Moskva. 637 p. [in Russia].
3. Дутчак М. В. Спорт для всіх в Україні: теорія та практика : монографія. Київ : Олімп. л-ра, 2009. 279 с.  
Dutchak, M. V. (2009), *Sport dlia vsikh v Ukraini: teoriia ta praktyka: monohrafiia* [Sport for all in Ukraine: theory and practice]. Olimpiyskaya literatura, Kyiv. 279 p. [in Ukraine].
4. Захаріна Є. А. Формування мотивації до рухової активності у процесі фізичного виховання студентів вищих навчальних закладів : автореф. дис. на здобуття наук. ступеня канд. наук з фіз. вих. і сп. : 24.00.02 НУФВСУ. Київ, 2008. 21 с.  
Zakharina, Ye. A. (2008), *"Formuvannya motyvatsii do rukhovoi aktyvnosti u protsesi fizychnoho vykhovannya studentiv vyshchyykh navchalnykh zakladiv"* [Formation of motivation to physical activity in the process of physical education of students of higher educational establishments]: avtoref. diss. for the sciences degree of candidate in phys. education and sports: 24.00.02 National University in phys. education and sports of Ukraine. Kyiv. 21 p. [in Ukraine]
5. Иващенко Л. Я. Программирование занятий оздоровительным фитнесом. Київ : Науковий світ, 2008, 198 с.  
Ivaschenko, L. Ya. (2008) *Programmirovaniye zanyatiy ozdorovitelnyim fitnesom* [Health Fitness Programming]. Naukovyi svit, Kyiv. 198 p. [in Ukraine].
6. Платонов В. Н. Актуальные проблемы высшей школы и пути перестройки физкультурного образования. Теория и практика физической культуры. 1990. № 4. С. 5-10.  
Platonov, V. N. (1990), "Aktualnyie problemy vysshey shkoly i puti perestroyki fizkulturnogo obrazovaniya" [Actual problems of higher education and the ways of restructuring physical education]. *Teoriya i praktika fizicheskoy kulturyi*, № 4. pp. 5-10. [in Ukraine]
7. Про організацію вивчення гуманітарних дисциплін за вільним вибором студента. Наказ Міністерства освіти і науки України № 642 від 09.07.2009 р., Київ, 2009. 2 с.  
*Pro orhanizatsiiu vvyvchennia humanitarnykh dystsyplin za vilnym vyborom studenta* [On the organization of study of humanities at the student's free choice]. Nakaz Ministerstva osvity i nauky Ukrainy № 642 vid 09.07.2009 r. [in Ukraine]
8. Yurchyshyn, Y. V. (2014), Students' motivation building technology to motor activity of health improving direction during physical training. *Journal of Education, Health and Sport*. pp. 109–116. [in Ukraine]. <http://ojs.ukw.edu.pl/index.php/johs/article/view/2014%3B4%2814%29%3A109-116>

Received for publication 14.02.2020

---

## AUTHORS

- Afonin V.**, PhD of Pedagogical Sciences, Professor, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Aloshyna A.**, Full professor PhD of Physical Education and Sports Sciences, Lesya Ukrainka Eastern European National University, Lutsk, Ukraine.
- Andreychuk V.**, PhD of Physical Education and Sports Sciences, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Andryushchenko M.**, Senior Lecturer, Petro Mohyla Black Sea National University, Mykolaiv, Ukraine.
- Barashevsky S.**, Senior Lecturer, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Bobko Yu.**, Associate Professor, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Bondarenko I.**, PhD of Physical Education and Sports Sciences, Associate Professor, Petro Mohyla Black Sea National University, Mykolaiv, Ukraine.
- Bondarenko O.**, Lecturer, Petro Mohyla Black Sea National University, Mykolaiv, Ukraine.
- Butenko T.**, Senior Lecturer, Rivne State Humanities University, Rivne, Ukraine.
- Chaliy L.**, PhD of Pedagogical Sciences, Associate Professor, Rivne State University for Humanities, Rivne, Ukraine.
- Chistyakova M.**, PhD of Physical Education and Sports Sciences, Senior Lecturer, Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine.
- Demkiv A.**, Senior Lecturer, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Demyanchuk O.**, Senior Lecturer, Lesya Ukrainka Eastern European National University, Lutsk, Ukraine.
- Fedak S.**, PhD of Pedagogical Sciences, Associate Professor, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Fotynyuk V.**, Associate Professor, National Aviation University, Kyiv, Ukraine.
- Gatsko O.**, Senior Lecturer, Borys Grinchenko Kyiv University, Kyiv, Ukraine.
- Gnutova N.**, Senior Lecturer, Borys Grinchenko Kyiv University, Kyiv, Ukraine.
- Gorban G.**, PhD of Technical Sciences, Associate Professor, Petro Mohyla Black Sea National University, Mykolaiv, Ukraine.
- Gorbenko M.**, Associate Professor, Pereyaslav-Khmelnysky Hryhoriy Skovoroda State Pedagogical University, Pereyaslav-Khmelnysky, Ukraine.
- Guska M.**, Lecturer, Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine.
- Klyus O.**, PhD of Pedagogical Sciences, Lecturer, Department Chair, Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine.

- Konakova O.**, PhD of Technical Sciences, Associate Professor, Prydniprovsk State Academy of Physical Culture and Sports, Dnipro, Ukraine.
- Konoplyanik O.**, Senior Lecturer, Petro Mohyla Black Sea National University, Mykolaiv, Ukraine.
- Koval O.**, Lecturer, Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine.
- Kurasa G.**, Senior Lecturer, Petro Mohyla Black Sea National University, Mykolaiv, Ukraine.
- Kuzhel M.**, PhD of Psychological Sciences, Lecturer, Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine.
- Kuznetsov M.**, PhD of Physical Education and Sports Sciences, Senior Lecturer, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Leshchinskii O.**, Lecturer, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Lesko O.**, PhD of Physical Education and Sports Sciences, Associate Professor, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Loiko O.**, PhD of Physical Education and Sports Sciences, Professor, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Liashenko V.**, PhD of Physical Education and Sports Sciences, Senior Lecturer, National University of Food Technologies, Kyiv, Ukraine.
- Mamchur S.**, Senior Lecturer, Rivne State Humanities University, Rivne, Ukraine.
- Mayer V.**, Senior Lecturer, Petro Mohyla Black Sea National University, Mykolaiv, Ukraine.
- Muzyka N.**, Lecturer, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Mykytchuk O.**, PhD of Physical Education and Sports Sciences, Associate Professor, Prydniprovsk State Academy of Physical Culture and Sports, Dnipro, Ukraine.
- Mysiv V.**, PhD of Physical Education and Sports Sciences, Associate Professor, Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine.
- Omelchenko O.**, Senior Lecturer, Prydniprovsk State Academy of Physical Culture and Sports, Dnipro, Ukraine.
- Panchuk I.**, Senior Lecturer, Rivne State Humanities University, Rivne, Ukraine.
- Pankevych Ya.**, Lecturer, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Petrova N.**, Senior Lecturer, Borys Grinchenko Kyiv University, Kyiv, Ukraine.
- Pidgaina V.**, Postgraduate Student, National University of Physical Education and Sport of Ukraine, Kyiv, Ukraine.
- Piven O.**, PhD of Pedagogical Sciences, Associate Professor, Pereiaslav-Khmelnysky Hryhoriy Skovoroda State Pedagogical University, Pereiaslav-Khmelnysky, Ukraine.
- Pogrebnyak T.**, Lecturer, Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine.
- Polyakova A.**, PhD of Physical Education and Sports Sciences, Associate Professor, Prydniprovsk State Academy of Physical Culture and Sports, Dnipro, Ukraine.

- 
- Potapchuk S.**, Lecturer, Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine
- Prontenko K.**, Doctor of Pedagogical Sciences, Associate Professor, Zhytomyr Military S.P. Korolev Institute, Zhytomyr, Ukraine.
- Roljuk O.**, PhD of Physical Education and Sports Sciences, commander of the military lyceum, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Romaniv I.**, Senior Lecturer, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Romanchuk S.**, Full professor PhD of Physical Education and Sports Sciences, Hetman Petro Sahaidachnyi National Army Academy, Lviv, Ukraine.
- Savliuk S.**, Doctor of Physical Education and Sports Sciences, Professor, Rivne State Humanities University, Rivne, Ukraine.
- Shishkin O.**, Honored Wrestling Coach of Ukraine, Associate Professor, Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine.
- Sidak M.**, Master, National University «Zaporizhia Polytechnic», Zaporizhzhya, Ukraine.
- Skavronsky O.**, PhD of Physical Education and Sports Sciences, Associate Professor, Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine.
- Twelina A.**, PhD of Pedagogical Sciences, Senior Lecturer, Petro Mohyla Black Sea National University, Mykolaiv, Ukraine.
- Vakoliuk A.**, PhD of Pedagogical Sciences, Associate Professor, Rivne State Humanities University, Rivne, Ukraine
- Yurchyshyn Yu.**, PhD of Physical Education and Sports Sciences, Associate Professor, Kamianets-Podilsky Ivan Ohienko National University, Kamianets-Podilsky, Ukraine.



# BULLETIN

OF KAMIANETS-PODILSKYI NATIONAL  
IVAN OHIIENKO UNIVERSITY

PHYSICAL EDUCATION, SPORTS AND HUMAN HEALTH

COLLECTION OF SCIENTIFIC WORKS

ISSUE 16, 2020

The Editorial Board reserves the right to reject materials  
that do not meet the requirements for professional publications or make  
adjustments

The author and co-authors are responsible for the content and  
accuracy of the information