### Список використаних джерел:

- 1. Staker H.C., Horn M. B. Classigying K-12 blending learning. Innosight Institute. 2012. P. 20.
- 2. Антонюк Л.Л. Аналітичне дослідження системи освіти. Монітор конкурентоспроможності. 2008. № 1–2. С. 40–45.
- 3. Гатанов Ю.Б. Модель структуры интеллекта Дж. Гилфорда. URL: https://web.archive.org/web/20120415194010/http://trainingcity.ru/interest/articles/model strukturyi intellekta dzh. gilforda.html.
- 4. Кравченко Л.М., Маєвська О.М. Європейський досвід формування художньо-практичної компетентності особистості. *Мистецтво та освіта: науково-методичний журнал.* 2017. № 3 (85). С. 6–10.
- 5. Мачача Т.С., Юрженко В.В. Стратегії розвитку технологічної освіти в середній загальноосвітній українській школі: наскрізність змісту і структури. *Український педагогічний журнал*. 2017. № 2. С. 58–68.

#### **References:**

- 1. Staker H.C., Horn M. B. (2012). Classigying K–12 blending learning. *Innosight Institute*. 20.
- 2. Antonjuk L.L. (2008). Analitychne doslidzhennja systemy osvity [Analytical study of the education system]. *Monitor konkurentospromozhnosti*, 1–2, 40–45 [in Ukrainian].
- 3. Gatanov Iu.B. Model struktury intellekta Dzh. Gilforda [Model of the structure of intelligence by J. Guilford]. Retrivered from: https://web.archive.org/web/ 20120415194010/http://trainingcity.ru/interest/articles/model\_strukturyi\_intellekta\_dzh. gilforda.html [in Russian].
- 4. Kravchenko L.M., Maievska O.M. (2017). Yevropejs'ky'j dosvid formuvannya xudozhn'o-prakty'chnoyi kompetentnosti osoby'stosti [European experience in forming the artistic and practical competence of the individual]. *Art and Education: Scientific and Methodological Journal*, 3 (85). 6–10 [in Ukrainian].
- 5. Machacha T.S., Yurzhenko V.V. (2017). Stratehii rozvytku tekhnolohichnoi osvity v serednii zahalnoosvitnii ukrainskii shkoli: naskriznist zmistu i struktury [Strategies for the development of technological education in ukrainian secondary school: extension in content and structure]. *Ukrainskyi pedahohichnyi zhurnal*, 2, 58–68 [in Ukrainian].

DOI https://doi.org/10.51647/kelm.2020.5.3.2

### ZMIANA POZIOMU ZDROWIA FIZYCZNEGO UCZNIÓW W WIEKU 16-17 LAT POD WPŁYWEM ĆWICZEŃ CROSSFIT

### Anhelina Petrova

wykładowca Katedry Teorii i Metodyki Wychowania Fizycznego Charkowskiej Państwowej Akademii Kultury Fizycznej (Charków, Ukraina) ORCID ID: 0000-0001-6400-8624 petrovaangelina@ukr.net

### Tetiana Bala

kandydat nauk z wychowania fizycznego i sportu, docent, docent Katedry Teorii i Metodyki Wychowania Fizycznego Charkowskiej Państwowej Akademii Kultury Fizycznej (Charków, Ukraina) ORCID ID: 0000-0002-5427-6796 tanya.bala2206@gmail.com

Adnotacja. W artykule przedstawiono wyniki badań podstawowych odzwierciedlających poziom zdrowia fizycznego uczniów szkół średnich w grupach podstawowych i kontrolnych. Stwierdzono, że u dzieci w wieku 16 lat, obu badanych grup i dziewcząt w wieku 17 lat, w grupie kontrolnej, dane odpowiadają poziomowi "poniżej średniego", a wyniki chłopców w wieku 17 lat, obu grup i dziewcząt w wieku 17 lat w grupie podstawowej wskazują poziom "średni". Dokonano analizy porównawczej uzyskanych danych w aspekcie wieku i płci przed i po eksperymencie. Ustalono, że w aspekcie wieku obserwuje się głównie poprawę wyników z wiekiem, równo u dzieci w wieku szkolnym w grupie podstawowej, jak i kontrolnej. Ze względu na płeć, ogólnie rzecz biorąc, wyniki chłopców dominują nad wynikami dziewcząt w obu badanych grupach. Biorąc pod uwagę wskaźniki po wdrożeniu modułu zmiennego "Crossfit", uczniowie szkół średnich stwierdzili, że poziom zdrowia fizycznego poprawił się u chłopców w wieku 16 lat do poziomu "średniego", u dziewcząt w wieku 16 lat i chłopców w wieku 17 lat do poziomu "powyżej średniego". U dzieci w wieku szkolnym w grupach kontrolnych wyniki pozostały niezmienione w porównaniu z danymi początkowymi.

Słowa kluczowe: uczniowie szkół średnich, zdrowie, zajęcia z kultury fizycznej, moduł zmienny, aktywność ruchowa.

### THE CHANGE IN THE LEVEL OF PHYSICAL HEALTH OF 16–17-YEAR-OLD PUPILS UNDER THE INFLUENCE OF CROSSFIT EXERCISES<sup>1</sup>

#### Anhelina Petrova

Senior Lecturer at the Department of Theory and Methods of Physical Education Kharkiv State Academy of Physical Culture (Kharkiv, Ukraine) ORCID ID: 0000-0001-6400-8624 petrovaangelina@ukr.net

### Tetiana Bala

Ph. D. in Physical Education and Sports, Associate Professor,
Associate Professor at the Department of Theory and Methods of Physical Education
Kharkiv State Academy of Physical Culture (Kharkiv, Ukraine)
ORCID ID: 0000-0002-5427-6796
tanya.bala2206@gmail.com

**Abstract.** The article presents the results of primary researches reflecting the level of physical health of pupils of high school age in the main and control groups. It was found that the data correspond to "below the average" level in 16-year-old pupils of both study groups and 17-year-old girls of the control group, and the results of 17-year-old boys of both groups, and 17-year-old girls of the main group indicate the "average" level. The comparative analysis of the obtained data in the age and sex aspects was made before and after the experiment. It is determined that there is mainly an improvement in results with the age both in main groups and control groups in the age aspect. In general, the primacy of the results of boys over the data of girls in both study groups is reflected by the sex sign. Considering the indicators of high school pupils after the introduction of the Crossfit variant module, it was revealed that the level of physical health improved to the "average" level in 16-year-old boys, and to "above the average" level in 16-year-old girls and 17-year-old boys., Mostly, the results remained unchanged in pupils of control groups, compared to the initial data.

Key words: pupils of high school age, health, physical education lessons, variable module, motor activity.

## ЗМІНА РІВНЯ ФІЗИЧНОГО ЗДОРОВ'Я УЧНІВ 16–17 РОКІВ ПІД ВПЛИВОМ ВПРАВ КРОСФІТУ

### Ангеліна Петрова

викладач кафедри теорії та методики фізичного виховання Харківської державної академії фізичної культури (Харків, Україна) ORCID ID: 0000-0001-6400-8624 petrovaangelina@ukr.net

### Тетяна Бала

кандидат наук з фізичного виховання і спорту, доцент, доцент кафедри теорії та методики фізичного виховання Харківської державної академії фізичної культури (Харків, Україна) ORCID ID: 0000-0002-5427-6796 tanya.bala2206@gmail.com

Анотація. У статті представлені результати первинних досліджень, що відображають рівень фізичного здоров'я учнів старшого шкільного віку основних та контрольних груп. З'ясовано, що у школярів 16 років обох досліджуваних груп та дівчат 17 років контрольної групи дані відповідають «нижче середньому» рівню, а результати юнаків 17 років обох груп та дівчат 17 років основної групи вказують на «середній» рівень. Зроблено порівняльний аналіз отриманих даних у віковому та статевому аспектах до та після експерименту. Визначено, що у віковому аспекті здебільшого спостерігається покращення результатів із віком у школярів як основних, так і контрольних груп. За статевим характером загалом спостерігається превалювання результатів юнаків над даними дівчат в обох досліджуваних групах. Під час розгляду показників учнів старших класів після впровадження варіативного модуля «Кросфіт» виявлено, що рівень фізичного здоров'я покращився в юнаків 16 років до «середнього» рівня, у дівчат 16 років та хлопців 17 років до «вище середнього» рівня. У школярів контрольних груп здебільшого результати залишились незмінними порівняно з початковими даними.

**Ключові слова:** учні старшого шкільного віку, здоров'я, уроки фізичної культури, варіативний модуль, рухова активність.

The research was conducted in accordance with the Thematic Plan of the research work of Kharkiv state academy of physical culture for 2016–2020 under the theme "Improvement of physical education in various educational institutions" (the state registration number 0115U006754) and for 2020–2026 "Improvement of the physical education process of different segments of the population" (the state registration number 0120U101110).

**Introduction.** The problem of maintaining and improving the health of children at different ages is one of the most important today. The analysis of scientific and methodological literature indicates that the number of pupils with diseases of the respiratory, cardiovascular, and nervous systems, disorders of the musculoskeletal system has increased in recent years. As a result, the percentage of children, who belong to a special medical group for health reasons, increases (Arefiev, 2014: 6; Solohub, 2017: 121).

Modern scientists note that the main reasons for this trend are hypodynamia, nervous-emotional and mental tension of educational activities, suboptimal labor and recreation ratio, irrational nutrition, bad habits, and environmental conditions (Moskalenko, Ieliseieva, 2016: 109; Mameshina, Masliak, 2017: 312).

Physical education professionals demonstrate that physical education plays an important role in health promotion. However, some authors argue that modern lessons don't compensate for deficits in motor activity, they aren't interesting enough to pupils of all ages, due to traditions and limited choice of motor activity (Bala, 2015: 3; Masliak et al., 2018: 452; Petrova, Bala, 2020: 20). Therefore, an urgent issue of the theory and practice of physical education is the optimization of the content side of lessons in institutions of general secondary education.

Analyzing the scientific and methodological literary sources, it can be noted that today some scientists pay considerable attention to improving and developing the educational process of physical education by introducing innovative means, methods, and approaches. So, authors of H. Shchavel et al. (2016) determined the effect of outdoor games on the body functionality of secondary school-age children; Y. Borysova et al. (2017) revealed a positive effect of capoeira classes on the physical fitness and somatic health of 15–16-year-old children; V. Ashanin et al. (2017) dealt with the issue of optimizing the means of physical education in the preparation of 15–17-year old pupils and students using information technologies; M. Mameshina & I. Masliak (2017) determined the level of physical health of 7–8 grade pupils under the influence of a multilevel system of exercise of differentiated learning; I. Masliak et al. (2018) investigated the effect of cheerleading classes on the functional state of the respiratory system of 10–16-year-old adolescents; I. Masliak (2017) established the influence of power aerobics on the state of the cardiorespiratory system of high school pupils. At the same time, the work regarding the impact of CrossFit exercises on the level of physical health of 16–17-year-old pupils wasn't revealed in the information field available to us.

It should be noted that today CrossFit is rapidly gaining popularity among the youth of our country and is aimed at increasing the level of physical fitness, as well as improving the functioning of the main systems of the body (Sibley, 2012: 42; Smith et al., 2013: 31–59; Kolomiitseva et al., 2020: 26).

Thus, the above indicates that the introduction of CrossFit exercises in the physical education of general secondary education institutions is appropriate, as it will promote the interest of pupils in physical education, which in turn will increase motor activity and improve the physical health of pupils.

**The main part. The purpose** of the research is to determine the degree of change in the level of physical health of 16–17-year-old pupils under the influence of CrossFit exercises.

Research tasks: 1. To establish the level of physical health of 16–17-year-old pupils before the experiment. 2. To consider the study indicators of high school pupils of both groups in age and sex aspects. 3. To determine the impact of CrossFit exercise on the level of physical health of 16–17-year-old pupils.

Materials and methods. The research was carried out on the basis of the comprehensive schools № 146 and № 57 in Kharkiv during the 2017–2018 school years. 113 pupils of 16–17 years old took part in it, of which 2 main and 2 control groups were formed. The main groups included 59 pupils: the first group – 16-year-old boys and girls (n = 27), the second group – 17-year-old boys and girls (n = 32); the control groups included 54 pupils: the first group – 16-year-old boys and girls (n = 21) and the second group – 17-year-old boys and girls (n = 33).

All children who took part in the research were almost healthy and were supervised by a school doctor.

The following research methods were used to solve the tasks: theoretical analysis and synthesis of scientific and methodological literature; biomedical methods for determining the physical health of pupils (spirometry, tonometry, pulsometry, Stange test); pedagogical experiment and methods of mathematical statistics.

During the research, pupils of the control groups were engaged only in the generally accepted state program on physical education for 10–11 grades of general secondary education institutions, and the educational process on physical education of pupils of the main groups was supplemented by the developed by us CrossFit variant module. CrossFit classes were held twice a week, according to the school schedule. The content of which included theoretical information, special physical training (elements of gymnastics, athletics, and weightlifting, kettlebell, general development exercises) and technical training (specially selected exercises for CrossFit "Burpee", "Box Jump", "Farmer's Walk", "Good morning", "Bear crawl", "Floor wipers", "Burpee bench jump" etc.) At the end of the research of the CrossFit module, pupils performed a complex of exercises, which consisted of special and technical elements of CrossFit, for a minimum period of time and with a noted number of rounds ("Cindy", "Annie", "Fran" and etc.) (Physical culture at school, 2019).

Pupils' age, sexual and anatomical-physiological features were taken into account during the classes. Load and dosing increased gradually, taking into account the pupils' capabilities. CrossFit exercises were also included in the preparatory part of the lesson of other variable modules, in the system of organized breaks and were given in the form of homework.

To determine the level of physical health of 16–17-year-old pupils, the indicators proposed by Polyakov et al., 2006 were used, namely: Quetelet index 2 – characterizes the degree of harmoniousness of physical development and bodybuilding (body weight (kg), body length (m²)); Robinson index – characterizes the state of regulation of the cardiovascular system (systolic blood pressure (mmHg), heart rate at rest (bpm¹)); Ruffier index – characterizes

the reaction of the cardiovascular system to standard physical activity (heart rate at rest and after load (bpm $^{-1}$ )); Skibinski index – characterizes the functionality of the respiratory system (vital capacity of lungs (l), breath-holding time at inhalation (Stange test) (s), heart rate at rest (bpm $^{-1}$ )); Shapovalova index – the specific intensity of the work performed (body weight (g), body length (cm), the number of body lifts, sitting for 1' (number of times)). The obtained values were calculated by the formulas: body weight (kg)/body length (m $^2$ ) (Quetelet index 2); HR (bpm $^{-1}$ ) × AP syst. (mmHg)/100 (Robinson Index); VCL (ml) × Stange test (s)/HR (bpm $^{-1}$ ) (Skibinski index); body weight (g)/body length (cm) × the number of body lifts, sitting for 1' (number of times)/60 (Shapovalova index);  $4 \times (P_1 + P_2 + P_3) - 200/10$  (Ruffier index). The examined results were compared to the scale and evaluated with a certain number of points.

Statistical analysis. The research materials were processed using the licensed program Excel. Calculated: arithmetic mean of the variation series  $(\bar{\chi})$  – for the characteristic of the population by individual parameters; representativeness mistake (m) – for determining the deviation of the arithmetic mean from the corresponding parameters of the general population; reliability of differences (p) – was calculated in order to establish the homogeneity of control and main groups, the degree of differences in indicators in the age aspect and changes in the average values of the study parameters in main and control groups after the experiment using the parametric Student criterion (t) with a significance level not lower than 0,05.

**Results and discussions.** Considering the obtained results characterizing the level of physical health, it was found that there are unreliable differences between the indicators of pupils of control and main groups (p > 0.05).

The analysis of results characterizing the harmonious structure of the body (Quetelet index 2) in the age aspect showed that mainly, there is a significant increase in body weight and body length with the age in 16-17-year old pupils of both in main groups and control groups (p > 0,05). The exception is the results of girls, according to body weight, which reflects the opposite trend, that is, indicators decrease with age. At the same time, the reliable nature of differences is traced only in the main groups (p < 0,05).

When comparing the obtained data of body weight and body length in the sexual aspect, it was found mainly a reliable increase in the results of boys over the data of girls (p < 0.05-0.001). It should be noted that there are differences of unreliable nature in 16-year-old pupils of the control group by indicators of body weight (p > 0.05).

Research of cardiovascular-reflective results (Robinson Index) in the age aspect showed that when comparing the obtained results of systolic blood pressure and heart rate in pupils of both study groups, there was mainly a lack of reliable differences in indicators with a general tendency to improve results with age (p > 0.05). It should be noted that there is a significant improvement in the results with age according to the blood pressure of boys of main groups and girls of control groups (p < 0.05-0.01).

Considering the obtained data of systolic blood pressure and heart rate by sex sign, it was revealed that the indicators of boys are slightly higher than the results of girls in both study groups, but aren't statistically reliable (p > 0.05). The exception is the data of 16-year-old pupils of the main group and 16–17-year-old pupils of the control group on indicators of systolic blood pressure, which reflects the opposite trend, that is, the indicators of girls aren't reliably higher than the results of boys (p > 0.05).

When analyzing the results characterizing the cardiovascular system response to standard physical exercise (Ruffier index) in the age aspect, it was found that there was mainly an improvement with the age of heart rates at rest and after the dosed load in 16–17-year old pupils of both study groups. At the same time, reliable differences are observed for all the examined indicators of boys of main groups and according to the results of heart rate for the first 15 s after loading in boys of control groups (p < 0.05-0.001). The exception is the data of heart rate at rest and after the dosed load of girls of main groups, where the opposite trend is noted, that is, with the age there isn't a reliable deterioration in the results (p > 0.05).

Examining the obtained indicators by sex sign, it was found that according to 16-year-old pupils of both study groups, there are mainly better results in girls than in boys. However, according to the indicators of 17-year-old pupils, in general, the opposite trend is noted, that is, boys have better results than girls. It should be noted that differences of unreliable nature are displayed for all the investigated indicators (p > 0.05).

The analysis of results characterizing the functional capabilities of the breathing system and the resistance of the body to hypoxic phenomena (Skibinski index) in the age aspect showed that pupils aged 16-17 years of both study groups, showed an increase in the vital capacity of lungs and Stange test with the age. It should be noted that these differences aren't reliable both in main and control groups (p > 0.05).

In the sexual aspect, the prevalence of the results of boys over the data of girls was revealed both in main and control groups (p > 0.05). At the same time, the reliable nature of the differences is reflected only in the indicators of the vital capacity of lungs in pupils of both study groups (p < 0.01-0.001).

Considering the obtained results characterizing the specific intensity of the performed work (Shapovalova index), the improvement in the investigated results with the age was revealed. It should be noted that statistically significant differences are observed only in 16-17-year old girls of the main groups (p < 0.001).

Determining the level of physical health of high school pupils before conducting the pedagogical experiment, according to the indicators of Quetelet index 2, Robinson index, Ruffier index, Skibinsky, and Shapovalova indexes, it was found that the data of 16-year-old pupils of both study groups and 17-year-old girls of the control group corresponding to "below the average" level, equal to -2; results of 17-year-old boys of both groups, and 17-year-old girls of the main group indicate the "average" level, which indicates the score -3 points.

Considering the data obtained after the experiment (Table 1), it was revealed that all indicators that reflect the level of physical health mainly significantly improved in pupils of main groups of different ages (p < 0.05-0.001). It should

be noted that the unreliable nature of differences are observed in indicators of body weight in 17-year-old pupils, systolic blood pressure in 16-year-old boys and 17-year-old girls, heart rate in 15 s at rest in 17-year-old boys (p > 0.05).

The analysis of the repeat data in the age aspect didn't show significant change with the original data. At the end of the experiment, pupils of control groups also had changes in the level of physical health, but they aren't significant and, as a rule, are unreliable. The exception is the body length of 16-17-year-old pupils and the body weight of 17-year-old boys, where a reliable increase in indicators is observed (p < 0.01-0.001).

Table 1
The comparison of physical health average indicators of 16–17-year old pupils in main groups before and after the experiment

			10 grade		11 grade	
Indicators			Boys $(n = 15)$ Girls $(n = 12)$		Boys $(n = 10)$ Girls $(n = 22)$	
		Groups	$\overline{\chi} \pm \mathbf{m}$	$\overline{x} \pm \mathbf{m}$	$\overline{x} \pm \mathbf{m}$	$\overline{x} \pm \mathbf{m}$
		Before the experiment	$67,00 \pm 1,45$	$62,00 \pm 1,90$	$70,00 \pm 1,92$	$57,00 \pm 1,28$
Body weight (kg)		After the experiment	$69,00 \pm 1,53$	59,92 ± 1,71	$70,20 \pm 2,21$	$56,95 \pm 0,79$
			6,48	2,69	0,21	0,06
р			p < 0,001	p < 0,05	p > 0,05	p > 0,05
		Before the experiment	$168,27 \pm 1,02$	$161,00 \pm 1,88$	$170,10 \pm 2,15$	$162,45 \pm 1,23$
Body length (cm)		After the experiment	$170,27 \pm 0,86$	$163,25 \pm 1,80$	$172,10 \pm 1,90$	$164,00 \pm 1,20$
t		1	6,83	10,34	4,74	6,58
p			p < 0,001	p < 0,001	p < 0,01	p < 0,001
AP sysť.		Before the experiment	$115,27 \pm 0,79$	$118,33 \pm 2,12$	$122,60 \pm 2,32$	$121,41 \pm 2,19$
(mmHg)		After the experiment	$117,13 \pm 1,78$	$118,75 \pm 2,14$	$125,00 \pm 1,59$	$121,64 \pm 2,20$
t		The two the transfer	1,01	2,80	3,09	1,31
р			p > 0,05	p < 0,05	p < 0,05	p > 0,05
VCL (l)		Before the experiment	$2,81 \pm 0,15$	$2,25 \pm 0,08$	$2,89 \pm 0,11$	$2,26 \pm 0,06$
		After the experiment	$3,93 \pm 0.08$	$2,60 \pm 0,05$	$4,10 \pm 0,09$	$2,65 \pm 0,05$
t		Titter the experiment	7,97	6,44	16,42	11,68
р			p < 0,001	p < 0,001	p < 0,001	p < 0,001
Stange test (s)		Before the experiment	$33,00 \pm 2,08$	$30,83 \pm 3,26$	$33,10 \pm 2,04$	$31,45 \pm 1,48$
		After the experiment	$44,00 \pm 1,39$	$34,83 \pm 3,42$	$46,30 \pm 2,84$	$35,00 \pm 1,35$
		After the experiment	8,45	9,01	7,77	9,88
р			p < 0,001	p < 0,001	p < 0,001	p < 0,001
HR at rest (bpm <sup>-1</sup> )		Before the experiment	$77,13 \pm 2,34$	$74,50 \pm 2,23$	$73,90 \pm 1,27$	$72,05 \pm 1,36$
		After the experiment	$69,00 \pm 1,46$	$71,30 \pm 2,23$ $72,00 \pm 2,00$	$67,80 \pm 1,11$	69,14 ± 1,15
		After the experiment	5,79	4,38	12,66	6,39
р			p < 0,001	p < 0,01	p < 0,001	p < 0,001
HR in 15 s (number of times)	P -	Before the experiment	$22,13 \pm 0,32$	$20,33 \pm 1,11$	$19,70 \pm 0,42$	$20,73 \pm 0,44$
		After the experiment	$21,33 \pm 0,32$ $21,33 \pm 0,39$	$19,00 \pm 1,34$	$19,70 \pm 0,42$ $19,30 \pm 0,82$	$19,50 \pm 0,53$
	t	After the experiment	4,00	3,75	0,61	5,64
			p < 0,01	p < 0,01	p > 0,05	p < 0,001
	p	Before the experiment	$30,40 \pm 0,48$	$30,50 \pm 1,55$	$27,30 \pm 0,82$	$29,45 \pm 0,72$
	P <sub>2</sub>	After the experiment	$29,73 \pm 0,46$	$28,17 \pm 1,53$	$26,10 \pm 0,82$	$27,50 \pm 0,61$
	t	After the experiment	3,57	8,21	2,34	4,56
			p < 0,01	p < 0,001	p < 0,05	p < 0,001
	P <sub>3</sub> -	Before the experiment	$23,73 \pm 0,36$	$22,58 \pm 1,06$	$22,00 \pm 0,47$	$23,41 \pm 0,70$
		After the experiment	$\frac{23,79 \pm 0,30}{21,60 \pm 0,38}$	$20,58 \pm 1,17$ $20,58 \pm 1,17$	$20,70 \pm 0,86$	$23,41 \pm 0,70$ $21,27 \pm 0,65$
	t	Titor the experiment	8,34	3,46	2,62	7,21
	р		p < 0,001	p < 0,01	p < 0,05	p < 0.001
Body lifts siting		Before the experiment	$40,20 \pm 1,33$	$26,42 \pm 1,22$	$44,30 \pm 1,98$	$38,32 \pm 1,79$
per 1 min (number		1				
of times)		After the experiment	$52,20 \pm 1,48$	$46,50 \pm 1,62$	$48,90 \pm 1,80$	44,09 ± 1,82
t			21,09	17,15	6,27	13,24
p			p < 0,001	p < 0,001	p < 0,001	p < 0,001

When comparing the data of main and control groups obtained after the use of CrossFit exercises, it was found that the indicators of pupils of the main groups are significantly better than the results of pupils of the control groups. Reliable differences are observed according to heart rate, lung capacity in 16–17-year-old boys (p < 0,05; 0,001), Stange test in 16–17-year-old boys and 17-year-old girls (p < 0,05–0,001), the number of body lifts per 1' in 16-year-old pupils and 17-year-old girls (p < 0,01–0,001), systolic blood pressure in 17-year-old boys (p < 0,05).

Determining the level of physical health of 16–17-year-old pupils of the main groups, after the introduction of the variable CrossFit module, it was revealed that the data improved by 1 point and began to equal the score – 3 points in high school boys, in 16-year-old boys and the score – 4 points, in 17-year-old boys, which indicates the "average" and "above the average" levels, respectively. The results became 2 points better and correspond to the score – 4 points in 16-year-old girls, which indicates "above the average" level. It should be noted that the indicators of 17-year-old girls also improved significantly, but this didn't affect the rating scale, that is, the score is 3 points, the "average" level as at the beginning of the research. Mostly, the results remained unchanged, compared to the initial data in pupils of control groups.

Thus, the conducted researches indicate the positive impact of CrossFit exercises we proposed on the level of physical health of 16–17-year-old pupils, which makes it possible to recommend that physical education teachers include the variant module "CrossFit" in the educational process for physical education of high school pupils.

Discussion. The analysis of the data obtained after the experiment, in general, indicates a reliable increase in mass and growth indicators of pupils of both study groups (p < 0,05–0,001). The obtained results of body length, in our opinion, are explained by the fact that with the transition to the II stage of the pubertal period, the growth gradient changes from distal to proximal, that is, body length increases due to body growth in length; and these data are confirmed by A. Shchankyn, 2015, he notes that in this age period the growth rate of proximal body parts increases and continues until the end of the II stage of the pubertal period. The obtained data are consistent with J. Wilmore & D. Costill, 2003; V. Zilov & V. Smirnov, 2008; I. Zemtsova, 2008, according to which at this age period there is a process of ossification and growth of bones and an intense increase in body length is reduced.

It should be noted that the obtained body weight data, confirmed by the results of J. Wilmore & D. Costill, 2003, note that high school-age pupils rapidly increase muscle weight and account for 40% of the total body weight as in adults. Thus, the results are explained by the natural processes of changing the morphological and functional features of the body.

Research of the results, which reflect the functional state of the cardiovascular and respiratory systems, indicates that after the introduction of CrossFit exercises in the educational process of physical education, the increase in blood pressure indicators, the decrease in heart rate, and the increase in lung capacity and breathing time in primary school-age pupils. It should be noted that the above data are predominantly valid differences (p < 0,05–0,001). The results are confirmed by some researches: for example, I. Masliak, 2017 notes that under the influence of power aerobics there is a tendency to improve functional capabilities of the cardiorespiratory system; N. Kryvoruchko, 2015 indicates that physical development indicators improved in university students of the I–II level of accreditation under the influence of cheerleading exercises; N. Moskalenko & D. Ieliseieva, 2016 found that the introduction of innovative technologies that provided for independent classes in classical aerobics, fitball aerobics, athletic gymnastics, and recreational running positively affected the physical state of 16–17-year-old pupils; according to O. Andreieva & V. Pidhayna, 2019 classes with water recreation elements positively affect the physical health indicators of 16–17-year-old boys.

Thus, the conducted researches indicate the positive impact of CrossFit exercises proposed by us on the level of physical health of 16–17-year-old pupils.

**Conclusions.** The results of primary researches indicate "below the average" level of physical health in 16-year-old pupils of both study groups, and 17-year-old girls of the control group, equal to the score -2 points; the indicators of 17-year-old boys of both groups, and 17-year-old girls of the main group indicate the "average" level, reflecting the score -3 points.

In the age aspect, there is mainly an improvement in results with the age in pupils both main and control groups. In the sex aspect, the prevalence of the indicators of boys over the data of girls in both study groups is reflected in general.

It was established that the level of physical health in high school boys improved by 1 point and became equal to the score – 3 points, in 16-year-old boys and the score – 4 points, in 17-year-old boys, which indicates the "average" and "above the average" levels, respectively, after the introduction of the CrossFit variant module. The results became 2 points higher and correspond to the score – 4 points in 16-year-old girls, which indicates "above the average" level. At the same time, the indicators of 17-year-old girls also improved significantly, but this didn't appear on the rating scale, that is, the score is equal to – 3 points, the "average" level, as at the beginning of the research. Mostly, the results remained unchanged, compared to the initial data in pupils of control groups.

### **Bibliography:**

- 1. Арефьєв В. Здоров'я підлітків і рухова активність. *Вісник Чернігівського національного педагогічного університету.* 2014. Вип. 118 (3). С. 6–10.
- 2. Андрєєва О., Підгайна В. Вплив занять з елементами акварекреації на показники здоров'я юнаків 16–17 років. *Нау-* ковий часопис Національного педагогічного університету імені М.П. Драгоманова. 2019. Вип. 3К (110). С. 35–39.
- 3. Оптимізація засобів фізичного виховання при підготовці учнів та студентів 15–17 років з використанням інформаційних технологій / В. Ашанін та ін. *Вісник Чернігівського національного педагогічного університету*. Серія «Педагогічні науки». 2017. Вип. 143. С. 3–7.
- 4. Бала Т. Показатели уровня физического здоровья мальчиков средних классов после применения упражнений чирлидинга. *Науковий часопис Національного педагогічного університету імені М.П. Драгоманова*. 2015. Вип. 12 (67). С. 3–5.
- 5. Борисова Ю., Шкарупіло П. Вплив занять капоейрою на фізичну підготовленість і соматичне здоров'я дітей 15–16-ти років. *Спортивний вісник Придніпров'я* : науково-практичний журнал. 2017. № 1. С. 113–117.

- 6. Вілмор Дж., Костілл Д. Фізіологія спорту: навчальне видання. 2003. 654 с.
- 7. Зилов В., Смирнов В. Физиология детей и подростков: учебное пособие. 2008. 572 с.
- 8. Земцова І. Спортивна фізіологія : навчальний посібник. 2008. 206 с.
- 9. Криворучко Н. Вплив вправ чирлідингу на показники фізичного розвитку студенток ВНЗ І–ІІ рівня акредитації. *Молода спортивна наука України*: збірник наукових праць з галузі фіичного. виховання, спорту і здоров'я людини. 2015. Вип. 19. Т. 2. С. 119–124.
- 10. Мамешина М., Масляк І. Рівень фізичного здоров'я учнів 7–8 класів під впливом багаторівневої системи фізичних вправ диференційованого навчання. Вісник Кам'янець-Подільського національного університету імені Івана Огієнка. Фізичне виховання, спорт і здоров'я людини. 2017. Вип. 10. С. 312–322.
- 11. Москаленко Н., Єлісєєва Д. Вплив інноваційної технології зміцнення здоров'я на фізичний стан старшокласників. *Науковий часопис Національного педагогічного університету імені М.П. Драгоманова*. 2016. Вип. 3К 1 (70). С. 109–113.
- 12. Масляк І.П. Вплив аеробіки силової спрямованості на стан кардіореспіраторної системи школярів старших класів. Науковий часопис Національного педагогічного університету імені М.П. Драгоманова. 2017. Вип. 1 (82). С. 35–38.
- 13. Поляков С., Хрущев С., Корнеева И. Мониторинг и коррекция физического здоровья школьников : методическое пособие. 2006. 96 с.
- 14. Сологуб О. Особливості фізичного стану підлітків в умовах сьогодення. *Гірська школа Українських Карпат :* науково-методичний журнал. 2017. № 16. С. 121–124. DOI: 10.15330/msuc.2017.16.121-124.
- 15. Фізична культура в школі : навчальна програма для 10—11 класів закладів загальної середньої освіти. Київ : Літера Лтд., 2019. 192 с.
- 16. Щавель X., Михаць Т., Свистун Ю. Вплив рухливих ігор на функціональні можливості організму дітей середнього шкільного віку. *Спортивний вісник Придніпров'я* : науково-практичний журнал. 2016. № 1. С. 230–234.
- 17. Щанкин А. Связь конституции человека с физиологическими функциями : монография, 2015. 105 с.
- 18. Functional state of cardiovascular system of 10–16-year old teenagers under the influence of cheerleading classes / I. Masliak et al. *Journal of Physical Education and Sport.* 2018. № 18 (1). P. 452–458.
- 19. Efficiency of Physical Education of University Students Based on the Motivation Choice of the CrossFit Program / O. Kolomiitseva et al. *Physical Activity Review.* 2020. Vol. 8. P. 26–38. DOI: 10.16926/par.2020.08.04.
- 20. Petrova Anhelina, Bala Tetiana. The cardiorespiratory system state of the 10–11'th grade boys after the introduction of the variable module "Crossfit". *Slobozhanskyi Herald of Science and Sport*. Kharkiv: KhSAPC, 2020. Vol. 8. № 3. P. 20–33. DOI: 10.15391/snsv.2020-3.002.
- 21. Sibley B. Using Sport Education to Implement a CrossFit Unit. *Journal of Physical Education, Recreation & Dance.* 2012. № 83 (8). P. 42–48. DOI: 10.1080/07303084.2012.10598829.
- 22. Crossfit-based high-intensity power training improves maximal aerobic fitness and body composition / M. Smith et al. *Journal of Strength and Conditioning Research*. 2013. № 27 (11). P. 3159–3172. DOI: 10.1519/JSC.0b013e318289e59f.

### **References:**

- 1. Arefiev, V.H. (2014). Zdorovia pidlitkiv i rukhova aktyvnist [Adolescent health and motor activity]. *Visnyk Chernihivskoho natsionalnoho pedahohichnoho universytetu*. Vyp. 118(3). S. 6–10. [in Ukrainian].
- 2. Andrieieva, O.V., Pidhaina, V.O. (2019). Vplyv zaniat z elementamy akvarekreatsii na pokaznyky zdorovia yunakiv 16–17 rokiv [The influence of classes with water recreation elements on health indicators of 16–17-year old boys]. *Naukovyi chasopys NPU imeni M.P. Drahomanova*. Vyp. 3K (110). S. 35–39. [in Ukrainian].
- 3. Ashanin, V.S., Filenko, L.V., Filenko, I.Iu., Poltoratska, H.S. (2017). Optymizatsiia zasobiv fizychnoho vykhovannia pry pidhotovtsi uchniv ta studentiv 15–17 rokiv z vykorystanniam informatsiinykh tekhnolohii [Optimization of means of physical education in training 15–17-year-old pupils and students using information technologies]. *Visnyk Chernihivskoho natsionalnoho pedahohichnoho universytetu. Seriia : Pedahohichni nauky.* Vyp. 143. S. 3–7. [in Ukrainian].
- 4. Bala, T.M. (2015). Pokazateli urovnia fizicheskogo zdorovia malchikov srednikh klassov posle primeneniia uprazhnenii chirlidinga [Indicators of the physical health level of secondary school boys after applying cheerleading exercises]. *Naukovii chasopis Natcionalnogo ped. universitetu imeni M.P. Dragomanova*. Vip. 12(67). S. 3–5. [in Russian].
- 5. Borysova, Yu., Shkarupilo, P. (2017). Vplyv zaniat kapoeiroiu na fizychnu pidhotovlenist i somatychne zdorovia ditei 15–16-ty rokiv [The influence of capoeira classes on the physical fitness and somatic health of 15–16-year-old children]. *Sportyvnyi visnyk Prydniprovia : naukovo-praktychnyi zhurnal*. №1. S. 113–117. [in Ukrainian].
- 6. Vilmor, Dzh.Kh., Kostill, D.L. (2003). Fiziolohiia sportu [Physiology of Sports]. Navchalne vydannia. 654 s. [in Ukrainian].
- 7. Zilov, V.G, Smirnov, V.M. (2008). Fiziologiia detei i podrostkov [Physiology of children and adolescents]. *Uchebnoe posobie*. 572 s. [in Russian].
- 8. Zemtsova, I.I. (2008). Sportyvna fiziolohiia [Sports physiology]. *Navchalnyi posibnyk*. 206 s. [in Ukrainian].
- 9. Kryvoruchko, N. (2015). Vplyv vprav chyrlidynhu na pokaznyky fizychnoho rozvytku studentok VNZ I–II rivnia akredytatsii [The impact of cheerleading exercises on the physical development indicators of university students of the I–II level of accreditation.]. *Moloda sportyvna nauka Ukrainy : zb. nauk. pr. z haluzi fiz. vykhovannia, sportu i zdorovia liudyny*. Vyp. 19. T. 2. S. 119–124. [in Ukrainian].
- 10. Mameshyna, M.A., Masliak, I.P. (2017). Riven fizychnoho zdorovia uchniv 7–8 klasiv pid vplyvom bahatorivnevoi systemy fizychnykh vprav dyferentsiiovanoho navchannia [The level of physical health of 7–8 grade pupils under the influence of a multilevel system of physical exercises of differentiated education.]. *Visnyk Kamianets–Podilskoho natsionalnoho universytetu imeni Ivana Ohiienka. Fizychne vykhovannia, sport i zdorovia liudyny.* Vyp. 10. S. 312–322. [in Ukrainian].
- 11. Moskalenko, N.V., Yelisieieva, D.S. (2016). Vplyv innovatsiinoi tekhnolohii zmitsnennia zdorovia na fizychnyi stan starshoklasnykiv [The impact of innovative technology for health promotion on the physical condition of high school pupils]. *Naukovyi chasopys NPU imeni M.P. Drahomanova*. Vyp. 3K 1(70). S. 109–113. [in Ukrainian].

- 12. Masliak, I.P. (2017). Vplyv aerobiky sylovoi spriamovanosti na stan kardiorespiratornoi systemy shkoliariv starshykh klasiv [The influence of power aerobics on the state of the cardiorespiratory system of high school pupils]. *Naukovyi chasopys NPU imeni M.P. Drahomanova*. Vyp. 1(82). S. 35–38. [in Ukrainian].
- 13. Poliakov, S.D., Khrushchev, S.V., Korneeva, I.T. (2006). Monitoring i korrektciia fizicheskogo zdorovia shkolnikov [Monitoring and correction of the physical health of schoolchildren]. *Metodicheskoe posobie*. 96 s. [in Russian].
- 14. Solohub, O. (2017). Osoblyvosti fizychnoho stanu pidlitkiv v umovakh sohodennia [Features of the physical condition of adolescents in the conditions of today]. *Hirska shkola Ukrainskykh Karpat : naukovo-metodychnyi zhurnal*. № 16. S. 121–124. DOI: 10.15330/msuc.2017.16.121-124 [in Ukrainian].
- 15. Fizychna kultura v shkoli : navchalna prohrama dlia 10–11 klasiv zakladiv zahalnoi serednoi osvity [Physical education at school: a curriculum for 10–11 grades of general secondary education institutions]. Kyiv : Litera LTD. 2019. 192 s. [in Ukrainian].
- 16. Shchavel, Kh., Mykhats, T., Svystun, Yu. (2016). Vplyv rukhlyvykh ihor na funktsionalni mozhlyvosti orhanizmu ditei serednoho shkilnoho viku [The influence of outdoor games on the functionality of the body of secondary school-age children]. Sportyvnyi visnyk Prydniprovia: naukovo-praktychnyi zhurnal. №1. S. 230–234. [in Ukrainian].
- 17. Shchankin, A.A. (2015). Sviaz konstitutcii cheloveka s fiziologicheskimi funktciiami [Connection of the human constitution with physiological functions]. *Monografiia*. 105 s. [in Russian].
- 18. Masliak, Irina, Bala, Tetiana, Krivoruchko, Natalia, Shesterova, Ludmula, Kuzmenko, Irina, Kulyk, Nina, Stasyuk, Roman, Zhuk, Vyacheslav (2018). Functional state of cardiovascular system of 10–16-year old teenagers under the influence of cheerleading classes. *Journal of Physical Education and Sport*. 18 (1). P. 452–458.
- 19. Olha, Kolomiitseva, Ihor, Prykhodko, Anna, Prikhodko, Ruslan, Anatskyi, Artem, Turchynov, Serhii, Fushev, Svitlana, Hunbina, Oleg, Garkavyi (2020). Efficiency of Physical Education of University Students Based on the Motivation Choice of the CrossFit Program. *Physical Activity Review*. Vol. 8. P. 26–38. DOI: 10.16926/par.2020.08.04.
- 20. Petrova, Anhelina, Bala, Tetiana (2020). The cardiorespiratory system state of the 10th–11th grade boys after the introduction of the variable module "Crossfit". *Slobozhanskyi Herald of Science and Sport. Kharkiv : KhSAPC*. Vol. 8. № 3. P. 20–33. DOI: 10.15391/snsv.2020-3.002.
- 21. Sibley, B.A. (2012). Using Sport Education to Implement a CrossFit Unit. *Journal of Physical Education, Recreation & Dance.* 83 (8). P. 42–48. DOI: 10.1080/07303084.2012.10598829.
- 22. Smith, M.M., Sommer, A.J., Starkoff, B.E., Devor, S.T. (2013). Crossfit-based high-intensity power training improves maximal aerobic fitness and body composition. *Journal of Strength and Conditioning Research*. 27 (11), 3159–3172. DOI: 10.1519/JSC.0b013e318289e59f.

DOI https://doi.org/10.51647/kelm.2020.5.3.3

# TRANSFORMACJA WYMAGAŃ ZAWODOWYCH DO NAUCZYCIELI PRYWATNYCH SZKÓŁ PODSTAWOWYCH W UKRAINIE (LATA 1990 – 2010)

### Olha Pylypiv

nauczyciel szkoły podstawowej Spółki z ograniczoną odpowiedzialnością "Szkoła Wolnych i Nieobojętnych" (Lwów, Ukraina) ORCID ID: 0000-0002-8424-2255 olgapylypiv@gmail.com

Adnotacja. Procesy demokratyczne na Ukrainie (lata 1990-2010), zmiany gospodarcze i społeczne, zatwierdzenia nowych przepisów dotyczących edukacji spowodowały rozwój szkół ogólnokształcących o różnych formach własności, co doprowadziło do transformacji wymagań zawodowych dla nauczyciela. Analiza teoretyczna i uogólnienie źródeł wskazują na zainteresowanie współczesnych ukraińskich naukowców wspomnianym problemem naukowym. Artykuł podkreśla genezę powstawania i rozwoju inicjatyw ustawodawczych państwa w kontekście rozwoju systemu edukacji szkolnej opartego na paradygmacie zorientowanym osobowo, w przeciwieństwie do wiedzy normatywnej (która istniała w czasach sowieckich). W nurcie tych zmian ujawniono cechy transformacji w odniesieniu do wymagań zawodowych wobec nauczyciela szkoły podstawowej (klas podstawowych) prywatnej formy własności. Wyjaśniono różnice charakteryzujące działalność nauczycieli szkół podstawowych prywatnej formy własności, a mianowicie: bliskie związki z rodzicami uczniów, indywidualizacja procesu uczenia się, poleganie na indywidualnym rozwoju osobistym dziecka. Przedstawiono doświadczenia nauczycieli szkół podstawowych prywatnej szkoły ogólnokształcącej "Katolicka Szkoła św. Bazylego Wielkiego". W tej szkole innowacje pedagogiczne w pracy nauczycieli są ściśle powiązane z tradycyjnym rozwojem moralnym i duchowym dzieci.

**Słowa kluczowe:** przygotowanie nauczyciela, wymagania zawodowe, nauczyciel szkoły podstawowej, szkoły podstawowe, źródła prawne, źródła normatywne.