

**THE CARDIORESPIRATORY SYSTEM STATE OF THE 10TH-11TH  
GRADE BOYS AFTER THE INTRODUCTION OF THE VARIABLE  
MODULE “CROSSFIT”**

**Anhelina Petrova**

**Tetiana Bala**

*Kharkiv State Academy of Physical Culture,  
Kharkiv, Ukraine*

**Purpose:** to determine the cardiorespiratory system state of the 10th-11th grade boys after the introduction of CrossFit exercises.

**Material and methods:** theoretical analysis and generalization of scientific methodological literature; biomedical methods for determining the physical health of pupils (spirometry, tonometry, pulsometer, Stange's test); pedagogical experiment and methods of mathematical statistics. The cardiorespiratory system state was determined by indicators of the regulation level of the cardiovascular system (Robinson's index) and the functional capabilities of the respiratory system, and the body's resistance to hypoxic phenomena (Skibinski's index). Resting heart rate (bpm-1), systolic blood pressure (mmHg), lung capacity (ml), breath retention time at inhalation (Stange's test) (s) were determined to calculate indicators. The obtained indicators were calculated for the formulas:  $HR \text{ (bpm-1)} \times BP \text{ Syst. (mmHg)}/100$  (Robinson's index);  $LC \text{ (ml)} \times \text{Stange's test (s)}/HR \text{ (bpm-1)}$  (Skibinski's index). The examined results were compared to the scale and evaluated with a certain number of scores. Statistical analysis: the research materials were processed using the licensed Excel program. In the research 52 pupils of the 10th-11th grades took part.

**Results:** it was established that the cardiorespiratory system state improved after the introduction of CrossFit exercises into the educational process on physical education of the 10th-11th grade boys.

**Conclusions:** the positive effect of CrossFit exercises on the state of cardiorespiratory system of 10th-11th grade boys of main groups was found.

**Keywords:** CrossFit, senior pupils, cardiovascular system, respiratory system, physical culture lessons, motor activity.

## **Introduction**

The deterioration of pupils' health state is the global problem nowadays. According to the Ministry of Health of Ukraine, for about 90% of children and adolescents have various health conditions [3; 10].

Specialists of the physical education industry note that the deterioration of pupils' health state is primarily due to a significant decrease in motor activity, imperfection of physical education at school, intensification of academic load, lack of free time, disregard of physical and labor education and expansion of modern media network [2; 4; 5; 10; 12].

A sedentary lifestyle is reflected by negative changes in activity of the cardiovascular system (strength of heart contractions weakens, arterial hypertension, ischemic heart disease develops and vegetal dystonia progresses); respiratory (vital capacity of lungs, maximum oxygen consumption, and etc. decrease) [10].

According to references, it was found that physical culture is important in the formation of healthy generation. However, a number of authors note that the system of physical education in educational institutions mainly function ineffectively [6; 11; 13; 18; 19]. It should be noted that the Ministry of Education and Science of Ukraine notes the need to supplement the State program of physical education for institutions of general secondary education with innovative, modern and interesting types of motor activities for pupils, which in turn will be able to optimize the educational process on physical education at school. Therefore, today, the question of the

inclusion of innovative technologies in the system of school physical education remains relevant.

In recent years, a number of researchers have devoted the considerable attention to the development of new approaches, which in turn will contribute to the modernization of the educational process on physical education [1; 3; 10-12]. The authors investigated the impact of various new means and technologies on the level of development of physical health, physical performance, and physical fitness in the process of physical education [3; 10; 11; 17; 20].

So, authors Bala, et al. (2018) determined the effect of cheerleading activities on functional state of the respiratory system of 10-16 year old adolescents; Masliak, et al. (2018) investigated physical health of 14-15 year old pupils under the influence of the multi-level differentiated learning exercise system; Masliak, et al. (2018) found the positive effect of cheerleading activities on functional state of the cardiovascular system of 10-16 year old adolescents; T. M. Bala, I. P. Masliak (2011) investigated the change in the level of health state of the 7<sup>th</sup>- 9<sup>th</sup> grade pupils under the influence of cheerleading exercises; I.P. Masliak (2017) established the influence of power aerobics on the cardiorespiratory system state of senior pupils. It should be noted that the question regarding the influence of CrossFit exercises on the cardiorespiratory system indicators of senior pupils in modern Ukrainian literature wasn't found by us, which proved the feasibility of conducting our research.

Today, CrossFit is gaining wide popularity among modern youth. It should be noted that the overwhelming feature of CrossFit is that it is possible to attract to classes different age and gender contingent and there are many variations in the combination of exercises [21].

Thus, we believe that the introduction of exactly CrossFit to the substantive side of the educational process of physical education is appropriate, because it will diversify physical education lessons, make them more interesting and effective, increase the interest of pupils to physical education and sports, increase motor activity and, as a result, improve the cardiorespiratory system state of pupils.

*Connection of the work with scientific programs, plans, topics.* 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).

**The purpose of the research** is to determine the cardiorespiratory system state of the 10<sup>th</sup>-11<sup>th</sup> grade boys after the introduction of CrossFit exercises.

### **Material and Methods of the research**

During the experiment, the following methods were used: theoretical analysis and synthesis of scientific methodological literature; biomedical methods for determining the physical health of pupils (spirometry, tonometry, pulsometer, Stange's test); pedagogical experiment and methods of mathematical statistics.

The cardiorespiratory system state was determined by indicators of the regulation level of the cardiovascular system (Robinson's index) and the functional capabilities of the respiratory system, and the body's resistance to hypoxic phenomena (Skibinski's index). Resting heart rate (bpm<sup>-1</sup>), systolic blood pressure (mmHg), lung capacity (ml), breath retention time at inhalation (Stange's test) (s) were determined to calculate indicators. The obtained indicators were calculated for the formulas:  $HR \text{ (bpm}^{-1}) \times BP \text{ Syst. (mmHg)}/100$  (Robinson's index);  $LC \text{ (ml)} \times \text{Stange's test (s)}/HR \text{ (bpm}^{-1})$  (Skibinski's index). The examined results were compared to the scale and evaluated with a certain number of scores.

*Statistical analysis:* the research materials were processed using the licensed Excel program. Calculated: arithmetic mean of the variation series ( $\bar{x}$ ) - for the characteristic of the population after individual parameters; representativeness error (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

studied parameters in main and control groups after the experiment using Student's parametric criterion (t) with the significance level not lower than 0,05.

The research was carried out on the basis of the comprehensive schools No. 146 and No. 57 in Kharkov during the 2017-2018 school years. In the research 52 pupils of the 10<sup>th</sup>-11<sup>th</sup> grades took part. All the children who took part in the research were almost healthy and were under the supervision of a school doctor. During the research the pupils of 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 the 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 lifting, 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 the 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”, etc.) [16].

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

### **Results of the research**

Considering the obtained results (Table 1), which show the cardiorespiratory system state, the absence of reliable differences between the indicators of pupils of control and main groups was found ( $p>0,05$ ).

Table 1

**Comparison of average parameters of the cardiorespiratory system of the 10<sup>th</sup>-11<sup>th</sup> grade boys of main and control groups before the experiment**

Indexes	Indicators		10 grade		Points per indexes		Normative valuation (points)	11 grade		Points per indexes		Normative valuation (points)
			n	$\bar{X} \pm m$	MG	CG		n	$\bar{X} \pm m$	MG	CG	
	Groups											
Robinson's	BP Syst. (mmHg)	MG	15	115,27±0,79	88,9	89,5	3	10	122,60±2,32	90,6	86,1	3
		CG	10	116,60±2,18				17	120,71±0,73			
		t	0,57					0,78				
		p	>0,05					>0,05				
	HR (bpm <sup>-1</sup> )	MG	15	77,13±2,34	1202	1231	2	10	73,90±1,27	1270	1519	2
		CG	10	76,80±3,13				17	71,41±1,41			
		t	0,09					1,31				
		p	>0,05					>0,05				
Skibinski's	LC (l)	MG	15	2,81±0,15	1202	1231	2	10	2,89±0,11	1270	1519	2
		CG	10	2,91±0,13				17	3,11±0,04			
		t	0,48					1,89				
		p	>0,05					>0,05				
	Stange's test	MG	15	33,00±2,08	1202	1231	2	10	32,50±1,72	1270	1519	2
		CG	10	32,50±1,42				17	34,88±1,73			
t		0,20		0,98								
p		>0,05		>0,05								

Analysis of the results that depict the cardiovascular system state (Robinson's index) in the age aspect showed that when comparing the obtained results of systolic blood pressure and heart rate at pupils of both research groups, there wasn't reliable differences in indicators with the overall tendency to improve the results with age ( $p > 0,05$ ).

Comparing the obtained results according to Robinson's index with the scoring scale presented by S. D. Polyakov and co-authors [14], it is determined that they meet the score of 3 points ("average" level) at senior pupils of both research groups.

Analysis of the results that depict the cardiovascular system state (Robinson's index) obtained after using CrossFit exercises (Table 2) revealed significant decrease in heart rate of the 10<sup>th</sup>-11<sup>th</sup> grade boys and increase in systolic blood pressure data at the 11<sup>th</sup> grade pupils of the main group (p<0,05-0,001). The exception is the results of the 10<sup>th</sup> grade pupils, where there is an unreasonable increase in systolic blood pressure indicators (p>0,05).

Table 2

**Comparisons of average parameters of the cardiorespiratory system of the 10<sup>th</sup>-11<sup>th</sup> grade boys of main groups before and after the experiment**

Indexes	Indicators		10 grade		Points per indexes		Normative valuation (points)	11 grade		Points per indexes		Normative valuation (points)
			n	$\bar{X} \pm m$	Before	After		n	$\bar{X} \pm m$	Before	After	
Robinson's	BP Syst. (mmHg)	Before	15	115,27 ± 0,79	88,9	80,8	3	10	122,60 ± 2,32	90,6	84,7	3
		After	15	117,13 ± 1,78				10	125,00 ± 1,59			
		t	1,01					3,09				
		p	>0,05					<0,05				
	HR (bpm <sup>-1</sup> )	Before	15	77,13 ± 2,34	10	73,90 ± 1,27						
		After	15	69,00 ± 1,46			10	67,80 ± 1,11				
Skibinski's	LC (l)	t	5,79		1202	2506	3	12,66		1270	2799	3
		p	<0,001					<0,001				
		Before	15	2,81 ± 0,15				10	2,89 ± 0,11			
		After	15	3,93 ± 0,08				10	4,10 ± 0,09			
	Stange's test	t	7,97		1202	2506	3	16,42		1270	2799	3
		p	<0,001					<0,001				
		Before	15	33,00 ± 2,08				10	32,50 ± 1,72			
		After	15	44,00 ± 1,39				10	46,30 ± 2,84			
		t	8,45					8,03				
		p	<0,001					<0,001				

Considering the data obtained after the experiment it was found in the age aspect that the nature of the differences didn't change significantly compared to the output data at pupils of the main groups.

Analysis of the results of the pupils of control groups obtained after the experiment found insignificant changes in cardiovascular regulation indicators. In the age aspect the tendency of differences after the experiment didn't change significantly compared to the initial researches.

When comparing the data of main and control groups obtained after the experiment, it was found that the indicators of main groups are significantly better than the results of the pupils of control groups ( $p < 0,05$ ). The exceptions are indicators of systolic blood pressure, where the differences in the obtained results are unreliable ( $p > 0,05$ ).

Comparing the repeat Robinson's index scores with the scoring scale, it is determined that the results improved at the pupils of main groups after the experiment, somewhat, however, this didn't appear in any way on the scoring scale, and they, as at the beginning of the research, equal the score of 3 points, which indicates "average" level of cardiovascular regulation. The data remained unchanged and correspond to the score of 3 points ("average" level) for the boys of control groups.

Analysis of the results, which characterize functional capabilities of the respiratory system, and the body's resistance to hypoxic phenomena (Skibinski's index), in the age aspect showed that the increase in vital capacity of lungs and Stange's test with age, and the decrease in heart rate at boys of the research groups are observed. It should be noted that these differences are unreliable in both primary and control groups ( $p > 0,05$ ).

Comparing the results obtained according to Skibinski's index with the assessment scale presented by S. D. Polyakov and co-authors [14], it is determined that indicators of pupils of all study groups correspond to the score of 2 points, which equals "below the average" level.

Analyzing the results obtained after using CrossFit exercises (Table 2), it was found that there was a reliable improvement in the investigated indicators at the boys of main groups ( $p < 0,001$ ). Considering the data obtained after the experiment, in the



age aspect, it was found that the nature of differences didn't change significantly compared to the initial data at the pupils of main groups.

Analysis of the results of pupils of control groups obtained after the experiment revealed insignificant changes in respiratory system indicators. The tendency remained unchanged compared to the initial data in the age aspect.

When comparing the data of main and control groups obtained after using CrossFit exercises, it was found that indicators of main groups are significantly better than the results of pupils of control groups ( $p < 0,05 - 0,001$ ).

Comparing the repeated results according Skibinski's index [14] with the assessment scale, it is determined that the data improved by 1 point, and began to meet the score - 3 ("average" level) at the 10<sup>th</sup> -11<sup>th</sup> grade boys of main groups. The rates of the 10<sup>th</sup> -11<sup>th</sup> grade boys of control groups remained unchanged in comparison with the data of the initial research and met the score - 2 ("below the average" level).

Thus, the conducted researches indicate the positive impact of CrossFit exercises we proposed on indicators that characterize the cardiorespiratory system state of the 10<sup>th</sup> -11<sup>th</sup> grade pupils, which makes it possible to recommend that physical education teachers include in the educational process on physical education of senior pupils, which we developed the variant module "CrossFit".

### **Conclusions/Discussion**

The results of the research found that CrossFit exercises in the process of physical education of the 10<sup>th</sup> -11<sup>th</sup> grade boys contributed to the improvement of the cardiovascular system. So, considering the changes in systolic blood pressure values obtained after the experiment, the significant increase in data the 11<sup>th</sup> grade pupils ( $p < 0,05$ ) and the significant increase in results of the 10<sup>th</sup> grade boys of main groups ( $p > 0,05$ ) were found. The above is confirmed by the results presented by A.S. Solodkov and Y.B. Solohub (2001), according to which blood pressure increases with age. In our opinion, the above changes in the body are explained by the increase in volume of blood that is thrown out by the heart in one contraction with age.

When examining the heart rate values obtained after applying CrossFit exercise, the reliable decrease ( $p < 0,001$ ) was established. The obtained results coincide with the data of I.Kh. Vakhitov and O.P. Martyanov (2010), which indicate the economy of heart functions and is consistent with the main patterns of the age development of adolescents in this period. So, the data of I.I. Zemtsova (2008) indicate that systematic exercise of prolonged, moderate intensity affects the decrease in heart rate.

Analysis of the results of pupils of control groups obtained after the experiment found insignificant changes in cardiovascular regulation indicators.

Studying the obtained indicators, after the introduction of the developed by us CrossFit variable module on physical education of senior pupils into the educational process, we can see the tendency to improve the functioning of the respiratory system. Considering the changes in indicators of vital capacity of lungs obtained after the experiment, there is the reliable increase in indicators of boys of main groups ( $p < 0,001$ ). The obtained results are consistent with the data of S.N. Blynkov, A.V. Krylova, S.P. Levushkin (2008), respectively, exercises on endurance and speed and power character have a positive effect on vital capacity of lungs of this age period. In our opinion, this is due to the fact that systematic exercises increase the functionality of the respiratory system, which in turn contributes to improving the indicators of vital capacity of lungs.

Analyzing the results, which reflect the body's resistance to hypoxic phenomena (Stange's test), after the experiment, the reliable increase in indicators at boys of main groups was established ( $p < 0,001$ ). The obtained data are consistent with research of L.M. Kukis (2008), which found the positive effect of sports games on indicators of anaerobic capabilities of the respiratory system of adolescents. This is due to the fact that as a result of systematic exercise, the level of oxygen consumption significantly increases, blood circulation improves, metabolism activates and the body's resistance to hypoxic phenomena increases.

When examining the boys of control groups obtained after applying CrossFit exercises, minor changes in the respiratory system performance were established.

The results are confirmed by a number of researches: so, I.P. Masliak (2017) notes that the use of power aerobics exercises in physical education of the 10<sup>th</sup> -11<sup>th</sup> grade pupils positively affected the functioning of the cardiorespiratory system; N.V. Moskalenko, D.S. Yeliseieva (2016) found that dance aerobics activities, body ball, athletic gymnastics and jogging positively influenced the morphofunctional indicators of senior pupils' body; O.V. Andreieva, I.O. Pidhayna (2019) determined the positive impact of classes with aqua-recreation elements on health indicators of 16-17 year old boys.

Thus, the conducted researches indicate the positive impact of the offered by us CrossFit exercises on the cardiorespiratory system state of the 10<sup>th</sup> -11<sup>th</sup> grade boys.

**The prospects for further research** in this direction may be to determine the extent to which CrossFit classes affect senior pupils' physical health.

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

**Financing sources.** This article didn't get the financial support from the state, public or commercial organization.

## **References**

1. Andreieva, O. V., Pidhaina, V. O. (2019), "Influence of classes with elements of water recreation on the health of young people aged 16–17", *Naukovyi chasopys NPU imeni M. P. Drahomanova*, Vyp. 3K (110), pp. 35–39. (in Ukr.).
2. Arefiev, V. H. (2014), "Adolescent health and physical activity", *Visnyk Chernihivskoho natsionalnoho pedahohichnoho universytetu*, Vyp. 118 (3), pp. 6–10 (in Ukr.).
3. Bala, T. M., Masliak, I. P. (2011), "Changing the level of physical health of students in grades 7–9 under the influence of cheerleading exercises", *Sportyvnyi visnyk Prydniprovia*, No. 2, pp. 21–23 (in Ukr.).
4. Bala, T. M., Tseluiko, N. M., Kostiuk, A. V., Arkhypova, A. V. (2018), "The state of the cardio-respiratory system and individual motor abilities of students aged

16–17", Materialy IV Vseukrainskoi naukovo-praktychnoi konferentsii "Aktualni problemy fizychnoho vykhovannia riznykh verstv naseleattia", pp. 14–21 (in Ukr.).

5. Blinkov, S. N., Kryilova, A. V., Levushkin, S. P. (2008), "The influence of the system of physical fitness work on the physical condition of rural schoolchildren", *Fizicheskaya kultura, vospitanie, obrazovanie, trenirovka*, No. 6, pp. 75–77 (in Russ.).

6. Bala, T. M., Petrova, A. S. (2019), "Analysis of the attitude of high school students to innovative motor activities in the system of school physical education", *Slobozhanskyi naukovo-sportyvnyi visnyk*, No. 4 (72), pp. 33–37 (in Ukr.).

7. Vahitov, I. H., Martyanov, O. P. (2010), "Dynamics of heart rate, stroke volume of blood and anthropometric indicators of basketball players in the process of many years of sports training", *Teoriya i praktika fizicheskoy kulturyi*, Vip. 7, pp. 86–88. (in Russ.).

8. Zemtsova, I. I. (2008), *Sportyvna fiziolohiia [Sports physiology]*, navchalnyi posibnyk, Kyiv, 206 p. (in Ukr.).

9. Kukis, L. M. (2008), "Russian bast shoes and its elements as an effective means of influence on children of secondary school age", *Fizicheskaya kultura: vospitanie, obrazovanie, trenirovka*, No. 5, pp. 17–20 (in Russ.).

10. Masliak, I. P. (2017), "Influence of aerobics of power orientation on a condition of cardiorespiratory system of schoolboys of senior classes", *Naukovyi chasopys NPU imeni M. P. Drahomanova*, Vyp. 1 (82), pp. 35–38 (in Ukr.).

11. Mameshyna, M. A. (2020), "Differentiation of the content of physical education classes taking into account the indicators of physical health and physical fitness of students of 7–9 grades", *Slobozhanskyi naukovo-sportyvnyi visnyk*, No. 6 (74), pp. 25–31 (in Ukr.).

12. Moskalenko, N. V., Yelisieieva, D. S. (2016), "The impact of innovative health promotion technology on the physical condition of high school students", *Naukovyi chasopys NPU imeni M. P. Drahomanova*, Vyp. 3K 1 (70), pp. 109–113 (in Ukr.).

13. Platonova, A. G., Podrigalo, L. V., Sokol, K. M. (2013), "The rationale for the use of motor activity of children as a criterion for the effectiveness of recovery and

recreation", *Pedagogika, psihologiya ta mediko-biologichni problemi fizichnogo vihovannya i sportu*, Vip. 11, pp. 72–76 (in Russ.).

14. Polyakov, S. D., Hrushev, S. V., Korneeva, I. T. (2006), *Monitoring i korrektsiya fizicheskogo zdorovya shkolnikov* [Monitoring and correction of physical health of students], *Metodicheskoe posobie*, Moskva, 96 p. (in Russ.).

15. Solodkov, A. S., Sologub, E. B. (2001), *Fiziologiya cheloveka. Obschaya. Sportivnaya. Vozrastnaya* [Human physiology. The total. Athletic. Age], *Uchebnik vysshih uchebnyih zavedeniy fizicheskoy kulturyi*, Moskva, 520 p. (in Russ.).

16. *Fizychna kultura v shkoli : navchalna prohrama dlia 10–11 klasiv zakladiv zahalnoi serednoi osvity* [Physical culture in school : curriculum for 10–11 grades of general secondary education] (2019), Kyiv : Litera LTD, 192 p.

17. Aghyppo, A., Kuzmenko, I., Masliak, I., Shesterova, L., Bala, T., Krivoruchko, N., Dorofeeva, T. (2018), "The influence of specially directed exercises on the functional state of the tactile analyser and physical fitness of 7–15 year old pupils", *Sport science international scientific journal of kinesiology*, pp. 70–77 (in Eng.).

18. Masliak, I. P, Mameshina, M. A (2018), "Physical health of schoolchildren aged 14-15 years old under the influence of differentiated education", *Pedagogics, psychology, medical-biological problems of physical training and sports*, Vol. 20 (2), pp. 92–98 (in Eng.).

19. Mameshina, M. (2016), "Condition of physical health of pupils of the 7th-8th classes of the comprehensive school", *Slobozhanskyi herald of science and sport*, Vol. 5 (55), pp. 47–52 (in Eng.).

20. Bala, T., Krivoruchko, N., Masliak, I., Stasyuk, R., Arieshyna, Y., Kuzmenko, I. (2018), "Influence of cheerleading classes on functional state of respiratory system of 10- 16 year old teenagers", *Journal of Physical Education and Sport*, Vol. 18 (4), pp. 1850–1855 (in Eng.).

21. Kolomiitseva, O., Prykhodko, I., Prikhodko, A., Anatskyi, R., Turchynov, A., Fushev, S., Hunbina, S., Garkavyi, O. (2020), "Efficiency of Physical Education of

University Students Based on the Motivation Choice of the CrossFit Program",  
Physical Activity Review, Vol. 8, pp. 26–38 (in Eng.).

Received: 20.05.2020.

Published: 26.06.2020.

### **Information about the Authors**

**Anhelina Petrova:** postgraduate student; Kharkiv State Academy of Physical  
Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.

**ORCID.ORG/0000-0001-6400-8624**

**E-mail:** petrovaangelina@ukr.net

**Tetiana Bala:** PhD (Physical Education and Sport); Kharkiv State Academy of  
Physical Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.

**ORCID.ORG/0000-0002-5427-6796**

**E-mail:** tanya.bala2206@gmail.com