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THE EFFECT OF SPORTS CLUB PARTICIPATION ON THE STUDENTS' SOMATIC HEALTH

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Abstract

The implementation of female crossfit for girls and football classes for boys as a part of the sports club participation appears to be prospective for the optimization of the physical education in higher educational institutions and for the somatic health of students. ***The purpose of the research*** is to estimate the effect of crossfit and football classes as a part of the sports club participation on the morphofunctional parameters of the physical development and the somatic health of students. ***The results of the research.*** It is specified that during the main pedagogical experiment we were observing essential differences in functional parameters of the physical development for students in the experimental group: the growth of lung capacity ratio – by 5,94–8,70 %, handgrip strength – by 5,76–12,60 %, declining resting heart rate by 1,62–5,28 % comparing to the students of the control group where the changes were not significant. In the dynamics of morphological parameters, there were no changes. The comparative analysis of the basic and finite data of the somatic health parameters proved the efficiency of experimental methods. Influenced by them, the students of the experimental groups significantly improved their data: the correlation of lung capacity to body mass – by 3,87–9,61 %, the correlation of handgrip strength to body mass index – by 3,68–13,54 %, Robinson's index – by 1,78–6,23 % and Ruffier's index – by 12,85–16,52 %. The changes in parameters of basic and finite data of the somatic health index of the experimental groups were essentially different from the same parameters of the students in the control groups. **Conclusions.** Sports club participation in a female crossfit for girls and football classes for boys has a great impact on the physical fitness of student youth specifically on improving morphofunctional parameters of their physical development and the level of the somatic health.

Key words: physical education, crossfit, football, morphofunctional parameters, somatic health.

Валерій Григор'єв. Вплив секційних занять із фізичного виховання на соматичне здоров'я студентів. ***Актуальність.*** Перспективу оптимізації процесу фізичного виховання у ВНЗ та покращення соматичного здоров'я студентів убачаємо у впровадженні занять жіночим кросфітом для дівчат та занять футболом для хлопців у межах секційної роботи. ***Мета дослідження*** – оцінити вплив занять кросфітом та футболом у рамках секційної роботи з фізичного виховання на морфофункціональні показники фізичного розвитку та соматичного здоров'я студентів. ***Результати роботи.*** Установлено, що за період основного педагогічного експерименту ми спостерігали суттєві відмінності у функціональних показниках фізичного розвитку в студентів експериментальних груп: зростання життєвої ємності легень на 5,94–8,70 %, сили кисті (на 5,76–12,60 %), зниження частоти серцевих скорочень у спокої (на 1,62–5,28 %), порівняно зі студентами контрольних груп, у яких зміни були не значними. У динаміці змін морфологічних показників та артеріального тиску таких відмінностей ми не спостерігали. Порівняльний аналіз вихідних і кінцевих даних соматичного здоров'я підтвердив ефективність експериментальних методик. Під їх впливом студенти експериментальних груп значно покращили свої дані: підвищився життєвий індекс (на 3,87–9,61 %), силовий індекс (3,68–13,54 %), покращилися індекс Робінсона (на 1,78–6,23 %) та індексу Руф'є (12,85–16,52 %). Зміни в показниках вихідних і кінцевих даних індексів соматичного здоров'я експериментальних груп студентів достовірно відрізнялися від аналогічних показників студентів контрольних груп. ***Висновки.*** Секційні заняття з жіночого кросфіту для дівчат і з футболу для юнаків чинять значний вплив на фізичний стан студентської молоді, а саме покращують морфофункціональні показники їхнього фізичного розвитку та рівень соматичного здоров'я.

Ключові слова: фізичне виховання, кросфіт, футбол, морфофункціональні показники, соматичне здоров'я.

Валерий Григорьев. Влияние секционных занятий по физическому воспитанию на соматическое здоровье студентов. ***Актуальность.*** Перспектива оптимизации процесса физического воспитания в вузах и улучшение соматического здоровья студентов усматривается во внедрении занятий женским кроссфитом для девушек и футболом для юношей в рамках секционной работы. ***Цель исследования*** – оценить влияние занятий кроссфитом и футболом в рамках секционной работы по физическому воспитанию на морфофункциональные показатели физического развития и соматического здоровья студентов. ***Результаты работы.*** Установлено, что за период основного педагогического эксперимента мы наблюдали существенные различия в функциональных показателях физического развития у студентов экспериментальных групп: рост жизненной емкости легких (на 5,94–8,70 %), сила кисти (на 5,76–12,60 %), снижение частоты сердечных сокращений в покое (на 1,62–5,28 %),

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по сравнению со студентами контрольных групп, в которых изменения были не значительными. В динамике изменений морфологических показателей артериального давления таких различий мы не наблюдали. Сравнительный анализ исходных и конечных показателей соматического здоровья доказал эффективность экспериментальных методик. Под их влиянием студенты экспериментальных групп значительно улучшили свои данные: повысился жизненный индекс (на 3,87–9,61 %), силовой индекс (3,68–13,54 %), улучшились индекс Робинсона (на 1,78–6,23 %) и индекса Руфье (12,85–16,52 %). Изменения в показателях исходных и конечных данных индексов соматического здоровья экспериментальных групп студентов достоверно отличались от аналогичных показателей студентов контрольных групп. ***Выводы.*** Секционные занятия по женскому кроссфиту для девушек и по футболу для юношей имеют существенное влияние на физическое состояние студенческой молодежи, а именно улучшают морфофункциональные показатели их физического развития и уровень соматического здоровья.

Ключевые слова: физическое воспитание, кроссфит, футбол, морфо-функциональные показатели, соматическое здоровье.

Introduction. The process of the physical education of the student youth plays an important role in forming a harmoniously developed and competitive personality. As it is known health and the development of necessary physical qualities are directly connected with the physical activity of students which, unfortunately, decreases both during the school time and during university education.

In scientific works (M. O. Nosko, O. O. Danilov, V. M. Maslov, 2011) it is suggested that one of the most perspective trends in the optimization of the physical fitness of students is the enrollment in sports club work such as crossfit and football which are among the most popular sports in youth nowadays due to the curriculum in physical education at universities [6].

In spite of the fact that football is rather popular among students and there is a variety of scientific research in the field of football (Ie. I. Maliar, 2007, O. M. Oksiom, O. V. Shumakov, 2007, D. V. Bondariev, 2008), it is necessary to point out that due to the external and internal reasons football as an efficient means to improve physical fitness, health and constant interest in physical culture has not taken the appropriate place in the physical education curriculum in higher educational institutions [3; 5; 7].

In the experts' opinion (A. Z. Zynnaturnov, I. I. Panov, 2014), crossfit at physical education lessons will promote the complex development of physical and mental qualities [4]. The scientists think (N. O. Bazylevych, O. S. Tonkonoh, 2017) that crossfit, as a new sport, might be a strong stimulus to practice sports regularly but there is still lack of the scientific works in this area. The mentioned above makes it necessary to solve the problem and experimentally prove the influence of crossfit on the physical fitness of students [2].

That's why the research on crossfit or football is meaningful. Some effective their techniques can be done in sports club work to develop physical qualities and functional capabilities of students. This is a relevant task the solving of which will promote the physical activity of students and their health.

The Purpose of the Research is to estimate the effect of crossfit and football classes as a part of the sports club participation on the morphofunctional parameters of the physical development and the somatic health of students.

Materials and Methods of the Research. The research on morphofunctional parameters and the level of the somatic health of students was carried out in Kherson State University in the period since September 2015 up to June 2016. The second-year students took part in this research. There were students who attended traditional physical education lessons (control $group_1$ (CG) – 22 female students, CG_2 – 20 male students) and students who attended experimental physical education lessons such as female crossfit sports club (experimental $group_1$(EG) – 18 female students) and football sports club (EG_2 – 6 male students).

We determined morphofunctional parameters of the physical development (height, body mass, lung capacity, handgrip strength, heart rate, systolic arterial blood pressure (ABP) and diastolic ABP); quantitative parameters of the somatic health (SH) (H. L. Apanasenko's method) [1].

Results of the Research. Discussion. The main task of the teaching methods was to keep and improve the health and physical fitness of students by doing female crossfit for girls and football for boys.

The process of practical implementation of female crossfit and football presupposes the unity of learning, recreational and educational tasks, adherence to such common didactic principles as the principle of awareness and action, visualization, availability, individuality, gradualness and consistency, systematic approach to training, the realization of which promotes the efficiency of the physical education process.

A general structure of crossfit training lessons was worked out by us. Sets of exercises involved individual selection of means according to the objective at hand. The schedule of lessons, intensity and the volume of training load, the dynamics of the parameters of the body functional system were taken into

account. To realize these tasks, we selected exercises taking into account the physical fitness of the girls, the level of their physical condition and work capacity. Training lessons were elaborated on the basis.

We made use of the following exercises: stationary jogging, squats, push-ups, the Burpee complex exercises, set-ups, dynamic lunges, etc. An interval training was chosen as a main one during the first period; then the circuit training was used as a continuous one.

The boys were offered to participate in football sports club as a part of physical education lessons. The main organizational form of teaching and the educational process was football lessons where 40 % of the time was devoted to football techniques and tactics and 60 % – to physical fitness. In the process of the improvement of students' physical fitness by means of technical and tactical actions, various means of teaching were used (general preparatory and specific preparatory) that promoted an efficient problem–solving of learning, recreational and educational tasks.

The criteria for estimation of efficiency of proposed methodical approaches were the accuracy and rates of the positive changes of the students' physical fitness at the end of the formative experiments.

The analysis of the parameters of the morphofunctional development influenced by experimental methods is given in charts 1–2.

Chart 1. Showsbasic data (BD) and finite data (FD) of the experimental and control groups. Analyzing these data of the morphological parameters it is possible to confirm that during the experiment positive but not significant changes were observed in all parameters as in EG as in CG. But it should be said that some we did not observe any accurate differences between parameters. As an exception, it is possible to mention chest volume parameters in the female EG where FD was higher than BD (t=2,13, при $p \leq 0,05$). The absence of accurate difference between morphological parameters can be explained by ending of the natural physical development but not by the effects of the experimental methods on the quantitative changes which are minimal. We leave open the possibility of qualitative changes such as body mass parameters: those students who participated in sports club activities had fat loss and gain muscle mass without significant changes in their body mass (tabl. 1).

The analysis of paces and overall average rates of the functional shape is presented in chart 2.

In accordance with the data, the accurate difference of the physical fitness growth in EG influenced by the proprietary methodology is observed. Whereas such tendencies are not observed for students in CG. Let's analyze the changes of lung capacity ratio (LCR) in detail.

Table 1

The Dynamics of the Students' Morphological Parameters in the Experimental and Control Groups During the Main Pedagogical Experiment

Parameters	Sex	Stage of the Research	Experimental Groups nFemale = 18; nMale = 16			Control Groups nfemale = 22; nMale = 20		
			Mx ± Smx	%	t, p	Mx ± Smx	%	t, p
Height, *cm*	F	BD	165,1±1,0	0,01	0,07	165,5±0,9	0,01	0,08
		FD	165,2±0,9		≥0,05	165,6±0,8		≥0,05
	M	BD	176,2±1,0	0,28	0,37	175,9±1,1	0,28	0,34
		FD	176,7±0,9		≥0,05	176,4±1,0		≥0,05
Body Mass, *kg*	F	BD	56,74±1,23	0,81	0,28	55,83±1,06	1,19	0,43
		FD	56,28±1,12		≥0,05	56,49±1,14		≥0,05
	M	BD	71,91±0,76	1,98	1,60	69,69±1,34	1,51	0,59
		FD	73,34±0,64		≥0,05	70,74±1,18		≥0,05
Chest Volume, *cm*	F	BD	85,78±0,72	2,41	2,13	86,14±1,02	0,51	0,45
		FD	87,85±0,66		≤0,05	86,58±0,97		≥0,05
	M	BD	92,87±1,14	1,83	1,07	93,45±1,34	1,42	0,72
		FD	94,57±1,12		≥0,05	94,78±1,27		≥0,05

The LCR overall average rate at the beginning of the experiment was 3149±40,8 ml in a female EG whereas at the end – 3423±44,9 ml (growth by 8,7 %). In the female CG the basic data of LCR was 3165±38,7 on average and the finite data – 3056±40,9 ml (reduction by 3,57 %). The similar effect of the experimental method was observed for LCR in the male group. The basic data of LCR was 4140±52,9 ml on average and the finite data – 4386±35,7 ml (growth by 5,94 %). In the male CG, we also observed some

growth of LCR but the changes were considered to be inaccurate. The basic data was 4064±56,4 ml on average and the finite data – 4120±53,2 ml (growth 1,37 %). The accurate difference between BD and FD of LCR was found out only in EG of students (p≤0,01–0,001), whereas in CG – the differences were inaccurate (p≥0,05).

The experimental methods had a positive effect on the handgrip dynamometry (tabl. 2). In both female and male EG, the finite data of this parameter was 31,67±0,48 kg and 38,23±0,42 kg. The growth was by 12,6 % and 5,75 % correspondently.

These results were accurate as to the basic data of the handgrip strength in these groups (p≤0,01–0,001). In CG we observed inaccurate (p≥0,05) reduction of the finite data: the female group from 28,30±0,45 kg up to 28,24±0,40 kg by 0,21 % and inaccurate (p≥0,05) growth as well: the male group from 35,90±0,65 kg up to 36,12±0,60 kg by 0,61 %.

Table 2

The Dynamics of Students' Functional Parameters in the Experimental and Control Groups During the Main Pedagogical Experiment

Parameters	Sex	Stages of the Research	Experimental Groups nFemale = 18;nMale. = 16			Control Groups nFemale = 22; nMale = 20		
			Mx ± Smx	%	t, p	Mx ± Smx	%	t, p
LCR, *ml*	F	BD	3149±40,8	8,70	4,51 ≤0,001	3165±38,7	3,57	1,94 ≥0,05
		FD	3423±44,9			3056±40,9		
	M	BD	4140±52,9	5,94	3,86 ≤0,01	4064±56,4	1,37	0,72 ≥0,05
		FD	4386±35,7			4120±53,2		
Handgrip strength, *kg*	F	BD	28,12±0,43	12,6	5,54 ≤0,001	28,30±0,45	0,21	0,10 ≥0,05
		FD	31,67±0,48			28,24±0,40		
	M	BD	36,15±0,54	5,75	3,06 ≤0,01	35,90±0,65	0,61	0,25 ≥0,05
		FD	38,23±0,42			36,12±0,60		
Heart rate, *beats/min.*	F	BD	70,32±0,54	1,62	1,63 ≥0,05	68,28±0,56	2,17	1,85 ≥0,05
		FD	69,18±0,46			69,76±0,58		
	M	BD	70,40±0,65	5,28	4,83 ≤0,001	69,70±0,62	1,08	0,90 ≥0,05
		FD	66,68±0,41			70,45±0,56		
ABP syst. *mmHg*	F	BD	120,40±0,65	0,17	0,25 ≥0,05	118,94±0,56	1,32	2,03 ≤0,05
		FD	120,20±0,47			120,51±0,54		
	M	BD	120,40±0,76	0,99	1,26 ≥0,05	120,37±0,78	0,41	0,47 ≥0,05
		FD	119,22±0,56			120,86±0,72		
ABP diast. *Mm HG*	F	BD	68,12±0,54	1,00	0,47 ≥0,05	67,78±0,56	0,38	0,34 ≥0,05
		FD	67,78±0,48			68,04±0,52		
	M	BD	70,24±0,66	0,97	0,81 ≥0,05	70,04±0,76	0,48	0,32 ≥0,05
		FD	69,56±0,54			70,38±0,78		

The comparative analysis of the finite data parameters of the cardiovascular system performance in EG and KG allows determining accurate high growth rate only in the male EG in heart rate parameters (p≤0,001) and in the female CG ABP syst. (p≤0,05). Though it is necessary to point out that in the male group we observed an accurate reduction of the heart rate that is a normal phenomenon for adapting to training loads which are natural for football. Whereas in the female CG – the growth of ABP syst. That is unnatural in this age period. All other parameters did not show any statistically significant differences as in EG as in CG (p ≥0,05).

For the unbiased evaluation of the effect of the experimental methods on morphofunctional parameters and on the somatic health parameters, we made a repeated examination by means of H. L. Apanasenko's method.

Chart 3 gives the comparison of the basic data and the finite data in EG and CG where we found out both accurate differences and their absence.

As the data of this chart prove, the experimental training programmes had some positive effect on the somatic health of the students.

According to the height–weight ratio in the female EG, we observed the reduction of an overall average rate by 0,85 % from 343,67±8,42 gr/cm до 340,67±7,24 gr/cm, that is connected with crossfit sports club participation.

In the female CG we, vice versa, we observed some growth of this parameter that is connected with body mass gain within the period of the first and the second examinations. In the female CG an overall average rate was 337,34±8,12 gr/cm, but at the end – 341,12±8,28 gr/cm (growth by 1,12 %) (tabl. 3). As to the male students, we observed height–weight ratio growth within the period of the first and the second examinations in both groups (by 1,67 % – in the male EGand by 1,21 % – in the male CG), though the difference was inaccurate ($p \geq 0,05$).

The clearer picture which can give some positive characteristics to the experimental methods can be seen in the comparative analysis of the functional parameters that show the somatic health: the correlation of lung capacity to body mass, the correlation of handgrip strength to body mass index, Robinson's index and Ruffier's index. Let's take a look at the changes in the correlation of lung capacity to body mass parameters in all groups. The basic data of the correlation of lung capacity to body mass in the female EG was 55,49±1,12 ml/kg on average and the finite data – 60,82±0,87 ml/kg, that was accurate ($p \leq 0,01$). Whereas the finite data in the female CG was even worse than the basic data –by 4,57 % but they were not accurate ($p \geq 0,05$) – 54,09±1,06 ml/kg (BD – 56,68±0,96 ml/kg). As to the male groups, there were some positive and accurate changes ($p \leq 0,05$) only in the male EG (BD – 57,57±0,72 ml/kg, FD– 59,80±0,60 ml/kg, the growth – 3,87 %).

In the male CG, the basic and the finite data were almost at the same level (worse by 0,14 %) (tabl. 3). Thus we can confirm that experimental methods which were used separately in both female and male groups had a positive effect on the correlation of handgrip strength to body mass index.

Table 3

The Dynamics of the Parameters of the Students' Somatic Health of the Experimental and Control Groups During the Main Pedagogical Experiment

Parameters	Sex	Stages of the Research	Experimental Groups nFemale = 18;nMale = 16			Control Groups nFemle = 22; nMale = 20		
			Mx ± Smx	%	t, p	Mx ± Smx	%	t, p
Height-weight ratio, *gr/csm*	F	BD	343,67±8,42	0,87	0,27	337,34±8,12	1,12	0,33
		FD	340,67±7,24		≥0,05	341,12±8,28		≥0,05
	M	BD	408,16±9,14	1,67	0,59	396,24±8,36	1,21	0,37
		FD	415,07±7,07		≥0,05	401,06±9,80		≥0,05
Correlation of lung capacity to body mass, *ml/kg*	F	BD	55,49±1,12	9,61	3,78	56,68±0,96	4,57	1,82
		FD	60,82±0,87		≤0,01	54,09±1,06		≥0,05
	M	BD	57,57±0,72	3,87	2,39	58,32±0,82	0,14	0,07
		FD	59,80±0,60		≤0,05	58,24±0,71		≥0,05
Correlation of handgrip strength to body mass index, *%*	F	BD	49,56±0,86	13,54	5,68	50,69±1,20	1,38	0,43
		FD	56,27±0,82		≤0,001	49,99±1,12		≥0,05
	M	BD	50,27±1,12	3,68	1,11	51,51±0,98	0,87	0,36
		FD	52,12±1,23		≥0,05	51,06±1,19		≥0,05
Robinson's idex, relative value unit(RVU)	F	BD	84,66±1,24	1,78	0,89	81,21±1,17	3,52	1,83
		FD	83,15±1,18		≥0,05	84,07±1,05		≥0,05
	M	BD	84,76±1,37	6,23	2,54	83,90±1,50	1,49	0,55
		FD	79,48±1,58		≤0,05	85,15±1,70		≥0,05
Ruffier's index, *RVU*	F	BD	11,75±0,36	12,85	3,14	11,87±0,41	1,52	0,33
		FD	10,24±0,34		≤0,01	12,05±0,38		≥0,05
	M	BD	11,44±0,32	16,52	4,50	11,55±0,38	1,21	0,24
		FD	9,55±0,29		≤0,001	11,69±0,43		≥0,05

Further, we examine the results of the correlation of handgrip strength to body mass index in EG and CG. We can confirm that the experimental method had a positive effect on the correlation of handgrip strength to body mass index in the female group who practice crossfit. The crossfit programme involves enough amounts of strength and strength-speed exercises. In the female EG, an overall average rate of the correlation of handgrip strength to body mass index was 49,56±0,86 % at the beginning. At the end we found out accurate high rates ($p \leq 0,001$) – 56,27±0,82 % (the growth by 13,54 %). As to the male EG, some

positive changes for the better were observed but the difference of the correlation of handgrip strength to body mass index was inaccurate (p≥0,05). The basic data was 50,27±1,12 % on average and the finite data increased by 3,68 % – 52,12±1,23 %. In CG we observed some reduction of the correlation of handgrip strength to body mass index at the end of the experiment. It could be caused by not enough changes of such parameters of the physical development as handgrip and body mass. The decline was found out at the level of 1,38% for the female students ND 0,87 % for the male students(p≥0,05) (tabl. 3).

Let's look at the parameters of the somatic health which are connected with the functional shape of the cardiovascular system. It is necessary to point out that we observed positive changes in both experimental groups especially clear it can be seen in the male group.

In the female group, the basic data of Robinson's index was 84,66±1,24 RVU on average and the finite data improved by 1,78 % – 83,15±1,18 RVU but the result was inaccurate (p≥0,05). In the male EG, Robinson's index was better and accurate within the period of the beginning and the end of the experiment. Thus, at the beginning of the experiment an average group rate was 84,76±1,37 RVU and at the end, it was better by 6,23 % – 79,48±1,58RVU (p≤0,05).

In CG we observed some decline of Robinson's index between the first and the second examinations. Thus, in the female CG the finite data of the Robinson's index reduced by 3,52 % (from 81,21±1,17 RVU до 84,07±1,05 RVU), and in the male group – by 1,49 % (from 83,90±1,50 RVU до 85,15±1,70 RVU).

The experimental methods had a positive effect on the Ruffier's index (tabl. 3). In the males and females, EG the finite data of this parameter was 10,24±0,34 RVU and 9,55±0,29 RVU on average. The improvement was by 12,85 and 16,52 % correspondently and the result was accurate as to the basic data of the Ruffier's index in these groups (p≤0,01–0,001). In CG we observed inaccurate (p≥0,05) decline of the finite data: in the female group from 11,87±0,41 RVU up to 12,05±0,38 RVU – by 1,52 % and in the male group – from 11,55±0,38 RVU up to 11,69±0,43 RVU – by 1,21 % (tabl. 3.). As to the efficiency of the applied methods for the somatic health improvement, it is necessary to point out that all of them, except height–weight ratio, had a positive effect on the parameters which were researched (p≤0,05–0,001).

Thus, the results of the research on the changes in the somatic health during the formative pedagogical experiment confirm the current hypothesis: female crossfit in a female group and football in a male group as physical education lessons have a positive effect on their physical fitness improvement.

Conclusions and Future Research Direction. Female crossfit sports club participation in the female EG and football sports club participation in the male EG have proved to have a great effect on the physical fitness: they improve the morphofunctional parameters of the physical development and the somatic health level. The performed research does not cover all the problems connected with the modernization of the physical education of students at higher educational institutions. That's why the perspective for further study is to work out and implement innovative approaches to basic models or to combine various forms of physical education; to evaluate their recreational potential.

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