



Efficiency of Physical Education of University Students Based on the Motivation Choice of the CrossFit Program

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Abstract

Introduction: The article presents the results of the study of changes in the level of physical fitness of students of a humanitarian university and military academy cadets based on the choice of the CrossFit program in the process of physical education. **Materials and Methods:** The young men (n=92), aged 17-18 years, (two experimental and two control groups) took part in the study of the level of physical fitness. The study was conducted for 12 weeks. Experimental groups were engaged in the CrossFit program. The motivation for choosing the CrossFit program by the participants in the experiment (n=48) was determined using a specially designed questionnaire 'The Motives for Participating in Exercises Measure' on the example CrossFit. **Results:** For cadets, the results of sit-up and push-up have a significant increase (p<0.05). A more significant increase is observed in squats with kettlebell (7kg) and burpee (p<0.01, p<0.001). The results of students in sit-up, push-up, burpee have a significant increase (p<0.05). For participants in the experiment, the most common motives for choosing the CrossFit program for physical education classes were the following: 'to adjust the body shape, make me more courageous and athletic, increase muscle'; 'to increase my activity and vitality'; 'to improve my endurance, performance, reduce fatigue during physical loads'. For students, motives for health promotion are of higher priority than for cadets. **Conclusions:** The result of the motivated use of the CrossFit program for 12 weeks was a significant improvement in the physical condition of the students and cadets.

Keywords: students, cadets, physical education, CrossFit program, motivation, higher education, physical activity

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INTRODUCTION

Regular physical activity has significant health benefits, ranging from reducing the risk of chronic diseases to improving health, which ultimately affects a person's quality of life [1,2]. At the same time, less and less physical activity is occurring in many countries. Globally, 23% of adults and 81% school-going adolescents are not active enough [3,4].

One of the reasons for the low physical activity of students is the lack of an optimal motivational complex [5]. Unfortunately, the process of losing motivation for physical activity begins at school age [6]. Scientists believe that the main factors reducing motivation are: intrinsic motivation; the use of extrinsic rewards as a motivational tool; a teaching style; curriculum content; a level of administrative support of the importance of physical education; an equipment of sports centres of educational institutions [6]. The researchers argue that the internal motivation of physical activity contributes to the formation of students' sense of responsibility and creative attitude to physical activity, which leads to positive changes in the indicators of physical fitness [6, 7].

Based on the above, as well as in accordance with scientific research [8] today for high education teachers, an actual problem is the search for innovative physical education technologies that would be healthier and meet the requirements of young people: effective, modern, creative, aroused interest and motivated systematic physical exercises. Scientists believe that to increase internal motivation it is important to enable students to make their own choices during physical education [9].

In recent years there has been an increase in the popularity of high intensity exercise programs and physical activities [10]. One of them is the CrossFit high-intensity interval training program. CrossFit is a non-specialized physical training program that provides the implementation of high-intensity functional exercises. Program exercises are constantly changing. It is based on elements from interval training, gymnastics, athletics, weight-lifting and power-lifting. CrossFit has emerged as a popular and effective lifetime physical activity choice for adults worldwide [4,11,12]. CrossFit can also be easily integrated with other health-related fitness activities in physical education and sport programmes using combinations of 'lowtech' exercises (i.e. requiring minimal equipment, organisation or space) [4]. It have gained a major foothold in the fitness industry. Instructors for physical training in the army, coaches for sports show interest in the program [13].

The deep analysis of the CrossFit system adapted for use in the military training system was performed by Gaponenko et al. [14]. The authors note that the CrossFit training system is acceptable for the law enforcement and the defences sector of Ukraine. The professional activities of these specialists require excellent physical qualities. Kislenko et al. [15] found that CrossFit in a physical training program at military schools has a positive effect on the level of physical fitness of cadets, increases motivation for physical education and sports activities, contributes to mastering the knowledge of modern approaches to the organization of physical training and skills and the skills of self-physical training. In addition, it increases the motor and emotional density of classes, makes them more diverse and interesting for students, giving space to individual opportunities and personal initiative, increasing motivation to engage in physical education. The authors Galimova et al. [16], Osipov et al. [17], recommend functional methods of training CrossFit programs to use in training activities of athletes of combat sports and in the process of physical and special training of police cadets and law enforcement officers.

School teachers and university professors ask: should these high-intensity activities have a place in middle and high school physical education? And if so, how can they be safely and appropriately incorporated? Or will vigorous activities such as these have a negative effect on students, discouraging them from future physical activity participation? [10,13]. Researchers claim that CrossFit is an effective program for increasing physical activity in schools and universities in different countries [4,5,12,18,19]. Implementing high-intensity, functional workouts from CrossFit that are scaled to each student's ability level, fitness becomes exciting, realistically challenging, but attainable. Challenges and motivates students to improve their fitness levels [12]. However, in most studies, the use of CrossFit in the educational process for physical training does not imply the right for students to choose a training program [4,12,18,19], and, thus, does not take into account the influence of a motivational factor in increasing physical activity.

It was hypothesised that the level of physical activity and physical fitness of university students will increase as a result of the inclusion in the curriculum for physical education of a variety of modern interesting fitness programs using the CrossFit example and a motivated choice of classes.

Therefore, the purpose of this study was to evaluate the effectiveness of using the CrossFit program as a physical activity based on a motivated choice in the process of physical education of students of the Yaroslav Mudryi National Law University (YMNLU) and cadets of the National Academy of the National Guard of Ukraine (NANGU).

MATERIALS AND METHOD

The study was conducted from February to May 2019 in three stages. At the first stage of research (the first two weeks of February 2019), participants were questioned, familiarized with the set of exercises of the CrossFit target program, and primary testing of the level of physical fitness of cadets and students took place. At the second stage of the study (mid-February - mid-May 2019), the target exercise program CrossFit developed by us was introduced into the physical education curriculum for students and cadets. The third stage (May 2019) was devoted to testing the effectiveness of the proposed program and processing the material obtained.

Study of motivation of participants in the experiment

The survey was focused on finding motives that contribute to the revitalization of young people in physical education, based on the CrossFit program. Only participants in the experiment took part in the survey: YMNLU students ($n_1 = 28$) and NANGU cadets ($n_2 = 20$) aged 17-18 years. All survey participants were informed about the procedures and the main purpose of the study. Respondents voluntarily took part in an anonymous survey.

The motivation to physical education classes using the CrossFit program was determined using a specially designed questionnaire 'The Motives for Participating in Exercises Measure' on the example CrossFit. The list of motives was formulated based on the study of already existing standard techniques [4,6,19] and according to the results of peer review, which was attended by Ukrainian teachers, psychologists, trainers. We carried out a factor analysis of the motives selected by the experts. As a result, 4 subscales of motives were obtained that encourage students to participate in fitness programs and thus increase their physical activity:

- 1 subscale – 'Motivation to engage in new types of physical activity (Innovation)';
- 2 subscale – 'Motivation to improve their own physical health (Health)';
- 3 subscale – 'Motivation to increase the level of physical fitness (Physical fitness)';
- 4 subscale – 'Motivation to improve interpersonal communication, increase self-esteem (Communication)'.

The questionnaire consisted of 20 statements of 5 in each subscale (Table 1). The survey was conducted on paper.

Respondents expressed their score of view on a 6-point Likert scale (from 0 to 5 points). The maximum value (5 scores) corresponded to the most significant motive for choosing the CrossFit program, the minimum value (0 score) was an absolutely insignificant motive (its absence) when choosing CrossFit classes. Scores 4, 3, 2, 1 - corresponded to the degree of importance when choosing classes CrossFit. The average value for each motive (subscale) was calculated by summing up the individual estimates of the respondents. For the data presentation we used basic descriptive statistics (frequency n , arithmetical mean M , standard deviation SD). For the assessment of the statistical significance of differences between groups of respondents (students and cadets) we used Student's t -test, the level of significance $p < 0.1$, $p < 0.05$, $p < 0.01$.

Table 1. The motives for participating in CrossFit exercises measure

Questionnaire		
'The Motives for Participating in Exercises Measure' on the example CrossFit		
Instruction:		
Dear student / cadet!		
The Department of Physical Education of the University (Academy) conducts an anonymous study of your motivation to engage in CrossFit in physical education classes. The following is a list of reasons why people engage in physical activities, sports and exercise. Considering that you have chosen CrossFit classes, carefully read each statement and evaluate it based on the following assessment principles:		
5 scores - the most important motive of CrossFit classes for you;		
0 score - absolutely insignificant motive when choosing CrossFit classes;		
scores 4, 3, 2, 1 - arrange according to the importance of motive for you when choosing a CrossFit class.		
Please evenly assign scores when determining the evaluation of motives, do not get carried away with extreme values!		
Thank you for your cooperation!		
Nr	Motive	Score
Subscale 1. Motivation to engage in new types of physical activity (Innovative)		
1.	Classes will allow me to broaden my horizons, gain knowledge about new types of physical activity (sports, fitness programs)	
2.	The motor experience acquired in the classes will allow me to learn the threshold of my physical abilities and ways to move on	
3.	Knowledge and motor skills acquired during the lessons, will share them with others	
4.	My opportunities for physical self-improvement will expand, interests will emerge to master new sports or physical activity (fitness programs)	
5.	The experience gained in the classes will allow me to create my own training program (a set of physical exercises), invent new exercises and continue to practice independently	
Subscale 2. Motivation to improve their own physical health (Health)		
6.	Classes will allow me to reduce the morbidity of the musculoskeletal system (to reduce pain in the spine, stiffness in the joints, improve posture)	
7.	Classes will improve my overall well-being, increase stress resistance	
8.	Classes will improve my mood	
9.	Classes will allow me to adjust the body shape, make me more courageous and athletic, increase muscle	
10.	Classes will increase my activity and vitality	
Subscale 3. Motivation to increase the level of physical fitness (Physical fitness)		
11.	Classes will allow me to become stronger	
12.	Classes will improve my speed, speed of movement	
13.	Classes will improve my endurance, performance, reduce fatigue during physical loads	
14.	My agility and coordination will improve	
15.	My muscles will become more elastic and the joints will become more mobile	
Subscale 4. Motivation to improve interpersonal communication, increase self-esteem (Communicative)		
16.	Classes will give me the opportunity to find new like-minded people and friends	
17.	Classes will allow me to overcome excessive modesty, improve my relationships with people around me	
18.	Classes will allow me to overcome laziness, develop willpower, increase self-confidence	
19.	Classes will allow me to provide help and support to my friends and take it from them	
20.	Classes will provide an opportunity to discuss the results of training, to speak out their opinions, to listen to expert advice	

Research of the dynamics of physical fitness of study participants

92 young men at the age of 17-18 took part in the studies of the level of physical fitness. 53 students of the YMNLU, of which the experimental ($n_1=28$) and control ($n=25$) groups were created. 39 cadets of the NANGU, of which the experimental ($n_2=20$) and control ($n=19$) groups were also created. For health reasons, all students were assigned to the main medical group and had no contraindications to high-intensity physical activity. All participants were informed of the procedures and the main purpose of the study. The procedures presented were in accordance with the ethical standards on human experimentation stated in compliance with the Helsinki Declaration.

For 12 weeks, students and cadets of experimental groups were engaged in the program CrossFit. The classes were conducted by qualified physical education teachers with experience of over 20 years. The program included two mandatory lessons per week: the first lesson was held under the guidance of teachers, in the second lesson, the experiment participants performed the task independently in the presence of teachers. The duration of each lesson is 80 min. 20-25 min were given for warm-up: the experiment participants performed aerobic exercise in the form of 12-15 min of running on average and ragged pace, 10-12 min performed a set of gymnastic exercises for the main muscle groups. The main part of the lesson contained the set of exercises Workout of the Day (WOD) CrossFit. The final part of the lesson consisted of stretching physical exercises. In addition, the experiment participants had the opportunity to perform their own WOD CrossFit exercises daily during morning exercises or self-study in the evening. Thus, the weekly cycle was 4-5 classes and, accordingly, 2-3 days of rest.

Students and cadets of control groups engaged in physical education 2 times a week according to the traditional curriculum. The program of student classes YMNLU included athletics exercises, basketball, table tennis, badminton. Cadets NANGU were engaged in hand-to-hand fighting and athletics exercises (middle and long distance running).

For cadets and students, we compiled a target program CrossFit for 12 weeks. A detailed outline of the programme is displayed in table 2. We followed the recommendations of [3, 4] on the intensity of training loads for the age group of 18 years and older. In drawing up the training program, we were guided by the tenets of the WOD concept: 1. Performing a certain work without taking time into account; 2. Doing a lot of work for a fixed time; 3. Performing fixed work for the minimum time.

The first two weeks of the WOD included up to 5 exercises of 2-3 rounds, the rule was observed: more exercises - less rounds, less exercises - more rounds. The next two weeks of the WOD included 4-6 exercises of 3-5 rounds. The 5-8th week of the WOD included 6-8 exercises of 5-6 rounds. The 9-10th week of the WOD included 8-10 exercises for 6-8 rounds. The 11-12th weeks WOD included 5 exercises with the maximum reps of rounds in 15 min.

To collect data on the level of physical fitness, we used a set consisting of five test exercises that were performed for 1 minute. As already mentioned, at the beginning of the study, two classes were aimed at acquaintance with the exercises set.

Exercise 1. *Jumping rope*. The number of jumps made by pushing two legs was recorded.

Exercise 2. *Sit-up* from a prone position, legs bent and arms straightened up and palms joined. Starting position: lying on your back, arms straightened up, palms joined, knees slightly bent, feet on the floor. The student carried out lifting to the sitting position, touching the floor surface between the feet with his hands, returned to the prone position, arms extended. The number of correctly executed movements was recorded.

Exercise 3. *Burpee*. Starting position – crouching emphasis. Leap to the prone position, jump back to the crouch position, jumping upwards with the movement of the hands upward. The number of repetitions correctly executed was recorded. An important condition was considered to perform a leap in support lying down and back with a push of two legs.

Exercise 4. *Push-up*.

Exercise 5. *Squats with kettlebell*, weight 7kg. Starting position – standing on two parallel gymnastic benches, kettlebell hold the handle with both hands. Squatting was performed with amplitude when the knee joint and gluteus muscle were in parallel with the surface of the gymnastic bench.

Table 2. Target CrossFit program for 12 weeks

Exercise	Reps /time	Rest time between rounds	Number of rounds
Week 1, Lesson 1			
sit-ups	maximum reps	60 s / 120 s	In the 1st round, the maximum reps was performed; in the 2nd round, ½ of the maximum
wall sprints	60 s		
pull-up	maximum reps		
jumping with rope	maximum reps		
doublet squats	maximum reps		
Week 1, Lesson 2			
toes to bar	60 s	60 s / 100 s	In the 1-2 rounds, the maximum reps was performed, in the 3rd round ½ of the maximum
push-up	60 s		
box jump	60 s		
jumping with rope	60 s		
sit-ups	60 s		
Week 2, Lesson 1			
squats with kettlebell, weight 7 kg or sandbag squats	60 s	45 s / 100 s	2-3
V-sit up	60 s		
stand in "plank" on hands	60 s		
burpee	60 s		
eight with weight	60 s		
Week 2, Lesson 2			
sit-ups	45 s	45 s / 100 s	2-3
overhead lunges	45 s		
plank side	45 s on each side		
wall ball (medicine ball 5 kg)	45 s		
shuttle run 6x10 m	1 rep		
Week 3-4, Lesson 1			
kippping pull-up	maximum reps for 45 s	45 s / 100 s	3-5
overhead lunges	maximum reps for 45 s		
box jump	maximum reps for 45 s		
V-sit up	maximum reps for 45 s		
eight with weight	maximum reps for 45 s		
shuttle run 6x10 m	1 rep		
Week 3-4, Lesson 2			
V-sit up	maximum reps for 35 s	40 s / 100 s	3-5
stand in "plank" on hands	maximum reps for 35 s		
burpee	maximum reps for 35 s		
eight with weight	maximum reps for 35 s		
squats with kettlebell, weight 7 kg or sandbag squats	maximum reps for 35 s		
shuttle run 6x10 m	1 rep		
Week 5-8, Lesson 1-2			
toes to bar	20 reps	40 s / 90 s	5-6
burpees bar-facing	25 reps		
thruster	20 reps		
shuttle run 10x10 m	1 rep		
wall ball (medicine ball 5 kg)	25 reps		
stand in "plank" on hands	60 s		
forward roll	10 reps		
sit-ups	30 s		
sit-up	60 s		
burpee	60 s		
push-up	60 s		
squats with kettlebell, weight 7 kg	60 s		

Table 2. Target CrossFit program for 12 weeks – continued.

Week 9-10, Lesson 1-2			
forward roll, backward roll	5 reps on each direction	30 s/ 60 s	6-8
plank side	30 s on each side		
burpee	30 s		
eight with weight	30 s		
overhead squat	30 s		
jumping with rope	30 s		
push-up	30 s		
sit-ups	30 s		
overhead lunges	30 s		
shuttle run 10x10 m	1 rep		
Week 11-12, Lesson 1-2			
jumping with rope	60 s	30 s	5
sit-up	60 s		
burpee	60 s		
push-up	60 s		
squats with kettlebell, weight 7 kg	60 s		

During acquaintance with the test exercise, errors in the technique of their implementation were corrected and eliminated. Typical errors: in Jumping rope, test participants performed very large hand turns, jumped high, flexed their legs at the knee joints strongly, jumps performed by pushing one foot, and lost their rhythm. In an exercise Sit-up, the students did not touch the floor while they were lying and sitting. In Burpee' exercise, in the position of rest, did not fully straighten the legs at the knee joints, did not hold the back straight in the lumbar spine. The test participants did not fully straighten the elbow joints while performing Push-up. In Squats with kettlebell, buttocks were lowered below the knees.

Before the start of the experiment, preliminary testing was carried out using the above exercises in this sequence. After the application of the experimental program CrossFit was re-tested. The statistical analysis of the results of the study was carried out using the program SPSS20. The reliability of differences in the results of the mean values in two interrelated samples was determined using Student's t-test. For the assessment of the statistical significance of differences we used the level of significance $p < 0.05$, $p < 0.01$, $p < 0.001$.

RESULTS

Exploring the initial performance of the control exercises, we found the identity of the experimental and control groups of students of the YMNLU and the cadets of the NANGU, the level of significance $p > 0.05$.

After the application of a targeted CrossFit program a significant increase in the studied parameters is tracked by students and cadets. The changes that have occurred for the cadets of the military academy are presented in table 3. The results of sit-up and push-up have a significant increase, the level of significance $p < 0.05$. A more significant increase in results is observed in the squats with kettlebell and burpee, $p < 0.01$, < 0.001 , respectively. In the results of jumping rope the indicators of minimum and maximum values decreased and, in general, an increase in the average group indicator was observed.

After the experiment was completed, no significant changes occurred in the control group of cadets (NANGU). At the same time, comparing the results of the control and experimental groups of cadets allows us to confidently talk about the effectiveness of the CrossFit program we used. We found significant differences with a significance level of $p < 0.05-0.001$ for all the studied control exercises (Table 4). It was interesting to reveal that the results of quite complex speed-strength exercises (burpee and squats with weight 7 kg) increased to a greater extent than the performance of simpler exercises. In the experimental group, in comparison with the control group, the indicators of min and max values significantly increased.

Table 3. The results of the performance of control exercises by cadets of the experimental group of the NANGU, (n=20)

Control exercise	before the experiment				after the experiment				Differences (Sig.)
	M	SD	Min	Max	M	SD	Min	Max	
jumping rope	99.17	18.92	71	135	141.5	8.18	130	154	2.05*
sit-up	33.08	2.42	29	37	42.25	2.77	39	45	2.48*
burpee	15.41	3.05	13	22	30.08	1.83	28	32	4.11***
push-up	32.08	4.66	25	39	43	2.33	42	50	2.09*
squats with kettlebell (7kg)	32.5	1.97	30	35	43.41	2.39	40	45	3.5**

Note: M – average, SD – standard deviation, Min – minimum value, Max – maximum value, p – level of significance < 0.05*; <0.01**, <0.001***

Table 4. The results of the control exercises of cadets of the experimental and control groups NANGU after the experiment

Control exercise	control group (n=19)				experimental group (n=20)				Differences (Sig.)
	M	SD	Min	Max	M	SD	Min	Max	
jumping with rope	95,58	17,41	70	120	141.5	8.18	130	154	2.30*
sit-up	30.08	4.66	20	36	42.25	2.77	39	45	2.20*
burpee	17.16	3.15	11	23	30.08	1.83	28	32	3.50***
push-up	32.5	4.07	27	39	43	2.33	42	50	2.20*
squats with kettlebell 7 kg	31.7	1.56	30	34	43.41	2.39	40	45	4.10***

Note: M – average, SD – standard deviation, Min – minimum value, Max – maximum value, p – level of significance < 0.05*; <0.001***

Table 5. The results of the performance of the control exercises by students of the experimental group of the YMNLU, (n=28)

Control exercise	before the experiment				after the experiment				Differences (Sig.)
	M	SD	Min	Max	M	SD	Min	Max	
jumping rope	79.52	15.35	50	104	122.74	14.64	106	155	2.03
sit-up	30.73	1.53	28	33	35.05	1.39	30	36	2.08*
burpee	17.81	2.14	14	20	27.36	2.98	17	30	2.60*
push-up	26.57	4.61	20	33	39.6	3.88	30	45	2.16*
squats with kettlebell (7kg)	26.05	2.20	22	29	32.84	2.53	28	35	2.02

Note: M – average, SD – standard deviation, Min – minimum value, Max – maximum value, p – level of significance < 0.05*

Table 6. The results of the control exercises by students of the experimental and control groups YMNLU after the experiment

Control exercise	control group (n=25)				experimental group (n=28)				Differences (Sig.)
	M	SD	Min	Max	M	SD	Min	Max	
jumping with rope	80.78	14.91	53	108	122.74	14.64	106	155	2.00*
sit-up	30.84	0.88	30	32	35.05	1.39	30	36	2.50*
burpee	18.55	2.06	15	22	27.36	2.98	17	30	2.40*
push-up	27.34	4.24	20	34	39.6	3.88	30	45	2.10*
squats with kettlebell (7kg)	26.31	1.91	21	29	32.84	2.53	28	35	2.00*

Note: M – average, SD – standard deviation, Min – minimum value, Max – maximum value, p – level of significance < 0.05*

Table 7. The motives for participating in CrossFit exercises measure (0 – not important, 5 – very important)

Motive	Students (n ₁ =28)		Cadets (n ₂ =20)		Significance of Differences	
	M	SD	M	SD	t-test	p
Subscale 'Innovative'						
Σ₁	3.49	0.46	3.72	0.51	1.60	-
1	3.50	0.80	3.90	0.90	1.59	-
2	3.70	0.70	3.90	0.70	0.98	-
3	3.10	1.00	3.50	1.10	1.9	-
4	3.60	0.80	4.10	0.90	1.99	0.10
5	3.60	0.80	3.30	0.90	1.19	-
Subscale 'Health'						
Σ₂	4.07	0.48	3.81	0.31	2.28	0.05
6	3.90	0.70	3.00	0.90	3.74	0.01
7	4.00	0.86	3.80	0.95	0.75	-
8	3.93	1.12	3.95	1.00	0.06	-
9	4.46	0.64	4.25	1.12	0.76	-
10	4.04	0.64	4.10	0.72	0.30	-
Subscale 'Physical fitness'						
Σ₃	3.81	0.53	3.96	0.41	1.10	-
11	3.86	0.89	4.25	0.72	1.68	0.10
12	3.82	0.67	3.85	1.31	0.09	-
13	4.04	0.74	4.60	0.60	2.89	0.01
14	3.96	0.64	3.70	0.98	1.04	-
15	3.39	1.07	3.40	1.05	0.03	-
Subscale 'Communicative'						
Σ₄	2.99	0.60	2.89	0.76	0.49	-
16	3.04	0.84	2.70	1.03	1.22	-
17	2.36	0.99	2.75	1.29	1.13	-
18	3.07	0.94	2.90	1.07	0.57	-
19	3.04	0.88	3.20	1.15	0.52	-
20	3.43	1.26	2.90	1.25	1.44	-
Σ_{total motives}	3.59	0.40	3.60	0.31	0.09	-

Note: M – average, SD – standard deviation, Student's t-test, p – level of significance, $\Sigma_1, \Sigma_2, \Sigma_3, \Sigma_4$ – total value of the motives by the subscales, $\Sigma_{total\ motives}$ – total value of motives by sampling.

Obvious differences between indicators before and after applying the target CrossFit program have occurred among students of the YMNLU (Table 5). The results of sit-up, push-up, burpee have a significant increase, the level of significance $p < 0.05$. In the results of jumping rope, the minimum and maximum values have decreased and, on the whole, there has been an increase in the average group indicator.

Comparison of the results of the control and experimental groups obtained after the completion of the experiment allows us to say that the CrossFit program helped to significantly improve the physical condition of students of the YMNLU experimental group compared to the control group (Table 6).

The results of studying the motives and subscales motives that determine the choice of students and cadets CrossFit program for physical education classes at the YMNLU and the NANGU are presented in table 7.

As a result, it was established that students and cadets chose the CrossFit program for physical education classes guided by such common most significant intrinsic motives: 'to adjust the body shape, make me more courageous and athletic, increase muscle' (4.46 ± 0.64 and 4.25 ± 1.12 respectively, $t=0.76$); 'to increase my activity and vitality' (4.04 ± 0.64 and 4.10 ± 0.72 respectively, $t=0.30$); 'to improve my endurance, performance, reduce fatigue during physical loads' (4.04 ± 0.74 and 4.60 ± 0.60 respectively, $t=2.89$). At the same time, students noted that for them choosing CrossFit classes is 'to

improve my overall well-being, increase stress resistance' (4.00 ± 0.86), and for cadets - "increase in strength" (4.25 ± 0.72) and 'increased opportunities for physical self-improvement' (4.10 ± 0.90).

The results of the study of the motivation of physical activity of students and cadets using CrossFit suggests that cadets are significantly higher than for students the choice of such motives: 'increasing opportunities for physical self-improvement, the emergence of interest to master new sports or physical activity (health programs)' ($t=1.99$, $p<0.1$); 'increase in strength' ($t=1.68$, $p<0.1$); 'improved endurance, performance, reduced fatigue during physical loads' ($t=2.89$, $p<0.01$). Students at a statistically significant level give more importance to the possibility of reducing the morbidity of the musculoskeletal system (reduce pain in the spine, stiffness in the joints, correct posture) ($t=3.74$, $p<0.01$) as a result of CrossFit classes. In general, for students, motives for health promotion are of higher priority than for students ($t=2.28$, $p<0.05$). Cadets, to a greater extent, focused on improving physical fitness.

DISCUSSION

Recently, the physical condition of students is a relevant subject of discussion of scientists in many domains of science. They believe that future military specialists should have a high level of physical fitness for the qualitative performance of the assigned service and combat tasks [14-18]. University students should also have good physical condition for high quality of life and professional longevity [1]. In search of optimal fitness programs suitable for use in educational institutions of the humanitarian and military profile, we turned to the CrossFit exercise system. The advantages of CrossFit when acting on adolescents are noted in the article by Eather [4], athletes described Smith et al. [11], Sibley [12] et al. Many security forces successfully use CrossFit training for military personnel [14-19].

On the other hand, there are some critical points which should be observed in relation to health prevention of students, when physical activity is too intensive [4,10]. The traditional CrossFit system involves the use of exercises with weights in greater quantities, than exercises with its own weight. In the program proposed by us, exercises with its own weight and with the use of weights were applied in the ratio of 60:40. We believe that the use of large weights is harmful for the body for this age group, and small weights are ineffective. In addition, mastering the correct technique for performing many weightlifting exercises takes quite a long time, and their implementation is associated with an increased risk of injury [21]. Therefore, the use of the weight of your own body as a burden is the most optimal tool and the results of the experiment confirm this. For example, Meinhardt et al. [22], Dorgo et al. [23] implemented strength training programs for 10-14 year old adolescents using weights and found no significant changes in the body. We conducted physical training classes with cadets and students using CrossFit exercises for 12 weeks. This period of time was enough for positive changes in the level of physical condition of young people. The results of the 'jumping rope' control exercise for the cadets increased and the increase was 42.6%. At university students the increase was 54.3%. This exercise is associated with the assessment of spatial-temporal and dynamic parameters of movement and requires prior training. High-speed leg work is important in the professional activities of future military and no less significant for the average person.

The strength of the core muscles increased among cadets by 27.7%, among students – by 14%. The high-intensity exercise 'burpee', in which the body abruptly changes from a vertical to a horizontal position and vice versa, implies good coordination of the neuromuscular apparatus. Over the period of the experiment, the performance of this exercise increased by 95% among cadets, by 53.6% among students. Private techniques aimed at the development of individual physical qualities give a positive effect. However, researchers note a significant duration of such programs – 6 months or more [24].

The performance of push-ups at the beginning of research is low both among cadets and students compared to the standards that are put before military personnel and students of higher education in Ukraine [25]. Researchers from all over the world constantly talk about the low level of physical fitness of students. This is usually attributed to the lack of state support for physical education in higher education [8,26], reduced motivation of young people to engage in active exercise and sports [27], deterioration in the quality of life. Nevertheless, we managed to improve the power conditions of the cadets - by 34%, students - by 49%.

Squatting with weight gain improved to a greater degree among the cadets - by 33.5%. We consider this to be characteristic of servicemen with considerable experience in carrying heavy loads [25,26]. For students, the average has improved by 26%.

The results of the study of the motivation of choice by students and cadets in the CrossFit program show such discussion positions. The inclusion of CrossFit in the program of physical education classes in higher education and the positive dynamics of physical fitness obtained in both experimental groups are fully explained by the self-determination theory Deci E. and Ryan R. [4, 26-30]. According to this theory, the leading needs for increasing the motivation of a person's physical activity are: the competence – the individual's need for the manifestation of abilities; the right to choose (autonomy) type of activity; the need to feel that one belongs to a place and (or) social group. At the same time, intrinsic motivation surpasses extrinsic motivation. Simply put, students who want to do physical activity are more effective than those who do it under constraint or for reward. Based on this theoretical position, our research was focused on studying the intrinsic motivation of students and cadets who wished to take part in the experiment.

Traditionally, putting the motive 'figure correction, masculinity, athleticism and increasing musculature' on the first place, young respondents demonstrated the most common point of view in society that the basis of motivation for training is the appearance [5,7,30]. It is no longer about having a healthy body that can actually do stuff that is practical to real life. As a rule, people who come to the gym identify the appearance and healthy body, which is fundamentally wrong. At the same time, the results of other leading motives are optimistic and confirm the opinion of scientists [29] that high self-esteem and the desire to become more competent in any domains, including in physical activity, contribute to increasing human motivation.

The least significant motive for choosing CrossFit classes for both groups of respondents revealed a motive associated with overcoming excessive modesty, improving relationships with other people (students 2.36 ± 0.99 , cadets 2.75 ± 1.29 , $t=1.13$). The insignificant motive for students is also 'the opportunity to provide help and support to friends and receive it from them' (3.04 ± 0.88), for cadets – 'the ability to find new like-minded people' (2.70 ± 1.03). In general, the 'Communicative' subscale, including motives aimed at socializing, improving interpersonal communication, increasing self-esteem, was the least significant for both groups of respondents (students 2.99 ± 0.60 , cadets 2.89 ± 0.76 ; $t=0.49$). Despite this, the researchers attributed the social aspect (being closer to friends and making new friends) to one of the most significant for increasing students' activity in physical education classes [30-32]. This contradiction with previous studies, in our opinion, points to potential reserves in the future to influence the process of forming a positive motivation of students' physical activity through the most significant social processes.

Analyzing the subscales of motives, it should be said that the most powerful incentives for participation in the CrossFit program for students and cadets are 'the ability to strengthen their own physical health' (the Health subscale) (4.07 ± 0.48 and 3.81 ± 0.31 , respectively, $t=2.28$) and 'improve the level physical fitness' (the Physical fitness subscale) (3.81 ± 0.53 and 3.96 ± 0.41 , respectively, $t=1.10$). We can explain this by the fact that cadets are more focused on high physical fitness due to the peculiarities of the future military profession. Thus, we can agree with the opinion of Joseph [5] that for young people at the age of 17-18 years old the motives of Health and Physical fitness are the leading predictors of intentions to participate in physical activity.

In conclusion, we can say that the overall motivation of physical activity of students and cadets who agreed to take part in the experimental physical education program based on CrossFit is almost the same (3.59 ± 0.40 and 3.60 ± 0.31 , respectively, $t=0.09$) and shows a fairly high level, no statistically significant differences were found. The assessment of the importance of most of the motives for choosing the CrossFit program for physical education classes in higher education was quite similar. This indicates that actions successfully carried out at a humanitarian university can produce similar positive results if they are conducted in higher military educational institutions.

CONCLUSIONS

The effectiveness of using CrossFit in higher education is beyond doubt. This allows you to optimize and diversify the combination of physical exercises, naturally increasing interest in systematic physical training at the university and higher military educational institutions; differentiated approach to the choice of exercise intensity is based on the level of initial physical fitness of the training participants; motivates to improve health, maintain physical fitness, play sports and build muscles, increase activity and vitality, the ability to cope with physical fatigue. The proposed program, planned for 12 weeks of classes, was designed for young people aged 17-18. Students and cadets who recently graduated from school did not have significant physical achievements. Having a low level of physical fitness of cadets and students at the beginning of the research, for 12 weeks of motivated use of the CrossFit program, we achieved a significant improvement in the physical condition of the students. Thus, the study conducted by us, allows us to talk about the effectiveness of training, built on the basis of a motivated choice of the target CrossFit program.

These results are important for physical education teachers, fitness professionals and athletes. The developed questionnaire in the future can be the basis for studying the motivation of people who choose a specific fitness program, physical activity or sport.

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