

Study of the State of Physical Fitness of Students of Medical Institutions of Higher Education by Means of Crossfit in the Process of Physical Education

Badanie stanu wydolności fizycznej studentów uczelni medycznych uprawiających crossfit na zajęciach wychowania fizycznego

DOI: 10.36740/ABAL202102105

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SUMMARY

Aim: Theoretically substantiate and experimentally test the method of using innovative technologies, aimed at improving the health of students in the process of physical education with the use of crossfit in medical institutions of higher education.

Materials and Methods: The research was carried out within the framework of the discipline "Physical Education", among students of 1-2 courses of medical specialties. In the experimental group, classes were held once a week for 90 minutes with the method of using crossfit for boys and girls, also there were additional extracurricular classes once a week (60 minutes). The control group was engaged in the usual program of physical education. Students of higher education institutions were offered a method of classes using crossfit tools.

Results: In the educational process in higher education institutions, physical education is a way to achieve strategic goals by preserving the health of young people. An important aspect of our study is the use of innovative technologies in physical education process through crossfit. Crossfit refers to strength training and has an extreme system of general physical training, based on the alternation of basic movements in different sports. The crossfit training system allows you to easily adapt it for people with different levels of physical fitness. Students of higher education institutions were offered a method of classes using crossfit tools in physical education process.

Conclusions: Thanks to the implemented methodology, the usage of functional all-around (crossfit), we proved that during our study, students who were engaged in the experimental method, improved their general physical condition, level of physical fitness and motivation to engage in physical culture and sports.

Key words: students, institutions of higher education, innovative technologies, crossfit, functional all-around

STRESZCZENIE

Cel: Celem pracy było opracowanie teoretycznych podstaw oraz zbadanie innowacyjnych metod służących poprawie stanu zdrowia studentów uczelni medycznych, tj. wdrożenie crossfitu na zajęciach wychowania fizycznego.

Materiały i metody: Badanie przeprowadzono w ramach zajęć z wychowania fizycznego wśród studentów I-II roku kierunku lekarskiego. W grupie eksperymentalnej zajęcia crossfitu odbywały się raz w tygodniu przez 90 minut oraz raz w tygodniu odbywały się zajęcia dodatkowe (60 minut). Grupa kontrolna realizowała zwykły program zajęć z wychowania fizycznego.

Wyniki: W procesie edukacji w szkołach wyższych wychowanie fizyczne jest sposobem na osiągnięcie strategicznych celów umożliwiających utrzymanie dobrego stanu zdrowia u młodych ludzi. Ważnym aspektem naszych badań było wykorzystanie innowacyjnych metod w procesie wychowania fizycznego, tj. wdrożenie crossfitu. Crossfit jest elementem treningu siłowego i ma charakter ekstremalnego ogólnorozwojowego treningu fizycznego, opartego na naprzemienności podstawowych ruchów w różnych zestawach ćwiczeniach. System treningu crossfit pozwala w łatwy sposób dostosować go do osób o różnym poziomie sprawności fizycznej.

Wnioski: Dzięki wdrożonej metodzie i jej wszechstronnej funkcjonalności (crossfit), udowodniliśmy, że w trakcie naszych badań studenci z grupy eksperymentalnej, poprawili swoją ogólną kondycję fizyczną, poziom sprawności oraz motywację do uprawiania kultury fizycznej i sportu.

Słowa kluczowe: studenci, uczelnie wyższe, innowacyjne metody, crossfit, wszechstronna funkcjonalność

INTRODUCTION

Investigating the problem of student youth health formation, we wanted to note that the current system of physical education in higher education is not effective enough to improve the health and physical fitness of students. The most optimal way to increase the effectiveness of physical fitness and physical condition of students is based on the introduction into the educational process of fundamentally new modern innovative technologies that best meet the individual characteristics of students on a motivational basis. Therefore, there are relevant innovative technologies of physical education, fitness and health, as well as ways to generate physical fitness, focused on personality-centered, integrated nature of education.

Such technologies include such functional all-around exercise as Crossfit, as technologies with ideological attitudes to a healthy lifestyle, an attractive competitive program and a variety of exercises to correct the physique [1].

Analyzing recent research and scientific publications on this issue, we conclude that research in this area is certainly of great interest, and their analysis allows us to look for new answers to address issues related to improving the process of physical education by improving the health of student youth[2].

Functional all-around (Crossfit), as stated by E.O. Rybakova, I.V.Novikova is characterized by intense short training, which include cardio and cardio with strength training [1,2], the specifics of which are a combination of weightlifting, gymnastics, running, exercises with your own weight, swimming, powerlifting, climbing, rope exercises [3, 4]. At the same time, today there is insufficient amount of integrated methods of physical education of students on the basis of crossfit, there is no adapted technique of crossfit within certain classes and theoretical and methodological substantiation of crossfit is insufficient.

Crossfit is a type of strength fitness, its peculiarity lies in an extreme system of general physical training, based on the alternation of basic movements in different sports (weightlifting, gymnastics, athletics, etc.). Modern crossfit has taken the form of a social movement and has spread around the world in a short time due to its high manufacturability, practicality and highly effective approach to fitness. Crossfit includes training for beginners, trained, professional athletes, women's crossfit, children's crossfit, as well as strength crossfit, crossfit for weight loss and others [4, 5]. The cross-fit training system allows you to easily adapt those who are engaged to different levels of physical fitness. The weight of devices, loading and intensity can vary, but construction of training process remains without changes. The training combines elements of weightlifting, gymnastics, powerlifting, jumping, running, rowing, rope climbing, swimming, kettlebell exercises, rock climbing, thanks to this, competitions can be easily held on the basis of school, high school, gym or on the open sports ground [3]. Therefore, crossfit training includes many strength and local strength exercises.

AIM

Theoretically substantiate and experimentally test the method of using innovative technologies, aimed at improving the health of students in the process of physical education with the use of crossfit in medical institutions of higher education.

Objectives of the study:

1. To generalize theoretical knowledge and practical experience in the organization and content of physical education of students of higher education medical institutions during practical classes.
2. To analyze the motivation and physical condition of students in relation to physical education classes and the possibility of applying crossfit exercises in physical education process in higher education institutions.
3. To establish the effectiveness of the impact of complex crossfit classes on the physical condition and level of physical fitness of students of higher education institutions.

MATERIALS AND METHODS

The research was carried out within the framework of the discipline "Physical Education", among students of 1-2 courses of medical specialties. Control and experimental groups were formed. In the experimental group, classes were held once a week for 90 minutes with the method of using crossfit for boys and girls, also there were additional extracurricular classes once a week (60 minutes). The control group was engaged in the usual program of physical education. The amount of crossfit exercises during class was 50% of the total number of hours, the last 50% included traditional sports, basic basics of athletic gymnastics, general physical training, elements of functional training, different types of running, work on cardio machines. Individual typological programs of balanced nutrition are also developed.

In the experimental group we adapted the structure and content of the process of physical training based on crossfit to the conditions of physical education; developed a method of initial training in functional all-around exercises; created special physical training in crossfit classes, which allowed students to perform at a high level of sports standards.

The Ethics Commission of the Ukrainian Medical Dental Academy has no comments on the methods used in this study.

RESULTS AND DISCUSSION

The structure of the lesson at the initial stage of crossfit training differs in that the emphasis is on improving overall physical fitness, formation of endurance, training in the technique of performing various exercises, while the direct performance of high-intensity complex (WOD) should not exceed 5-15 minutes. Thus, in the preparatory part students can perform different varieties of running, general and gymnastic exercises, jumping on a gymnastic bench 40 cm high, a combination of running with "push-ups", skipping rope, stretching 5-8 minutes. The main part is a series of strength, aerobic and mixed exercises, and a WOD complex. The content of the final part introduces exercises for the

abdominal muscles on a Roman chair 3-4 approaches 15-25 times, lunges with dumbbells 2-3 approaches 8-10 times, stretching, etc.

Crossfit training is best performed using repeated strength exercises with usage of own weight (pull-ups, squats, push-ups, exercises to develop abdominal muscles) in different variants and combinations. For those who are more prepared, weight training and weightlifting exercises should be included in training complexes. The content of crossfit training programs must include running for 60, 100, 400 m. Circular training according to the crossfit method increases the motor and emotional density of classes, makes classes more diverse and interesting for students, giving space to individual opportunities and personal initiative, thereby increasing the motivation to engage in physical culture.

Functional all-around is an elementary program of general physical training with specific components, which make the all-around program more diverse with movements from different sports. The crossfit technique developed by Greg Glassman gives a special appeal to all-around.

Initial training in athletic gymnastics (Table 1) → exercises on strength and cardio machines → gymnastic exercises with your own body weight and on sports equipment → basic exercises with a barbell (bodybar) → difficult coordination exercises (squats with a barbell, deadlift, push-ups with a barbell

or bodybar, dumbbells) → "Split" of the program → athletic gymnastics and functional training → aerobic and strength training → interval and circular method → combined influence method → WOD complexes in athletic gymnastics.

Athletic gymnastics is a vector of student personality development, as it provides a wide range of physical and intellectual development for boys and girls, their purposefulness, ability to achieve the set goals, to develop general cultural and communicative values, which is, undoubtedly, significant in educational process. The influence of strength gymnastic exercises can be both general (on the body as a whole) and local (on a group of muscles, part of the musculoskeletal system) [2].

Kettlebell sport → "Dash" → "Push" weights with a minimum weight → squatting → swings with a weight of the minimum weight → combination of kettlebell sport with athletic exercises → performing exercises on time → increase of kettlebell weight → competitive form of execution.

"Burpee" → "push-ups" → jumping up with a barbell over head → combination of sitting and lying down position with simultaneous "push-ups" → "Merged execution" of all phases of the exercise → "Burpee" 10 times → "Burpee" 15-20 times → 20 30 times → 30-40 times → 30-50 times → combined in fluence method → interval method → "Burpee" in a set of exercises (Table 1).

Table 1. Methods of initial training by Crossfit

Nº	Indicators	1st year	2nd year
1.	Orientation, theoretical and practical principles, features	Health and developmental orientation of classes, training in basic exercises, adaptation of the body to aerobic and strength exercises, control of Heart rate and Arterial pressure	Sports and developmental orientation, difficult coordination exercises, involvement in competitions, knowledge of crossfit programs
2.	Competitions	Competitions in the student group and among the course, available crossfit exercises, control of Heart rate and Arterial pressure.	Competitions among the course and university, complex crossfit exercises, non-standard types of encumbrances.
3.	Preparation for standards	Crossfit complexes with "pull-ups", flexion and extension of the arms in a supine position, preparation of swimming in the form of a separate swimming lesson and the time to overcome the 50m segment, running 3-6 minutes before cross running 2-3 km	Crossfit complexes of narrow orientation with special exercises and functional training, interval training, application of the combined effect method, running 6-10 minutes before cross running 2-3 km
4.	Teaching methods	Method of repeated efforts, isometric method, method of circuit training, method of strictly regulated exercise	Interval training method, combined effect method, circular training method, "flow" method of performing exercises
5.	Means of physical education	Swimming, general physical training, athletic gymnastics, athletics, aerobics (girls), elements of functional training 5-20 minutes, cardio training machines	Swimming, athletics, "tai-bo" training (elements of martial arts), elements of strength sports, functional training 15-25 minutes, competitive form of work on a rowing machine, running, shuttle running, etc.
6.	Control exercises	Control exercises, performance of a crossfit complex №1, control exercises on general physical training.	Control exercises, additional exercises of the student's choice (swimming 50m, weightlifting); execution of the Crossfit №1-2 complex, control exercises on general physical training
7.	"Burpee" as a basic crossfit exercise	Boys 10-30 times in 1 st semester, 30-50 times at the end of the year. Girls 10-20 times in 1 st semester, 20-35 times at the end of the year	Young men 30-55 times in 1 st semester, 40-60 times at the end of the year. Girls 20-30 times in 1 st semester, 35-55 times at the end of the year

Table 2. The results of physical fitness of boys and girls of the experimental group

Nº	Control exercises	Sex	Before ($\pm\sigma$)	After ($\pm\sigma$)
1.	Exercise "plank" (s), Complex static exercise - emphasis on forearms and feet	Male	56 \pm 9.7	137 \pm 10.6
		Female	35.2 \pm 9.4	75 \pm 10.2
2.	Flexion and extension of the arms in focus on the bars (times, males)/ "Back push-ups" from the bench (females).	Male	16.0 \pm 5.3	24.3 \pm 5.5
		Female	10.3 \pm 3.8	20.5 \pm 3.0
3.	Flexion and extension of the arms in the supine position (times)	Male	30.0 \pm 5.6	50.0 \pm 3.3
		Female	13.8 \pm 2.9	26.1 \pm 3.9
4.	Shuttle running 4 \times 10 m(s)	Male	11.1 \pm 0.7	10.0 \pm 0.8
		Female	12.7 \pm 1.0	11.6 \pm 0.6
5.	Lifting the barbell over your head for a certain time (males, times/min)/ Lifting bodybar 3 kg for a certain time(females)	Male	21 \pm 8.2	46 \pm 5.6
		Female	30.6 \pm 6.2	40.1 \pm 4.8
6.	Jumping from a squat position for 1 minute(times)	Male	31.9 \pm 4.1	53.2 \pm 3.9
		Female	17.1 \pm 2.8	28.3 \pm 5.1

Running at a slow pace helps to dilate small blood vessels (in the skin, digestive organs, liver, muscles), has a beneficial effect on the cardiovascular system. Thermoregulation and processes of excretion improve, the content of sugar in blood is supported thanks to its stocks in a liver, and carbohydrate reserves are enough for several hours, thus under these conditions the body is forced to consume mostly fat reserves [6]. Aerobic exercise is a functional basis for improving overall physical fitness.

The study showed that special classes on the use of crossfit effectively affected the physical fitness of students in the experimental group (Table 2), so in almost all control exercises students achieved significant differences in results ($P < 0.05$), especially in the exercise for static endurance of muscles with an emphasis on abdominal muscles, namely the "plank", in flexion and extension of the arms on the bars – an indicator of strength, in speed-power exercise – jumping, from a squat position. It should be noted that in girls' group not significant differences in results were achieved only in the shuttle run exercise, in other exercises we observed significant differences in results after one year (Table 2).

CONCLUSIONS

The analysis of literature sources showed that one of the main strategic tasks of the education system of Ukraine is the education of student youth with a responsible attitude to their own health.

It is established that one of the popular and very dynamic types of modern health system of physical education is the method of crossfit. Research on the impact of programs using crossfit on physical fitness and functionality of students is an important task of modern research in the field of physical education. The developed innovative method of application of functional all-around (crossfit) has proved its effectiveness, as evidenced by the results of physical fitness of students after the experiment. In addition, significant differences have been achieved in the

functional state of students and in the level of competencies in physical culture, as well as in the value relation to physical culture and sports.

Therefore, the development of new teaching methods, in this study it is a crossfit, which allows to increase interest in physical education, strengthen health and form an idea of a healthy lifestyle in student youth, is a timely and urgent task.

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The article is executed according to the theme of research work of the Department of physical education and health, physical therapy, ergotherapy with sports medicine and physical rehabilitation, Poltava

State Medical University: "Theoretical and methodological aspects of health improving technologies and increasing the level of physical fitness by means of physical education in the process of professional training of students of higher education institutions" (state registration number: 0120U100561).

Conflict of interest:

The Authors declare no conflict of interest

Received: 14.02.2021

Accepted: 22.03.2021

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Informacja prasowa

PRODROMUS CORAZ BLIŻEJ NEWCONNECT

Prodromus S.A. już od ponad dekady rozwija autorskie rozwiązania w zakresie robotyki rehabilitacyjnej. Spółka opatentowała i skomercjalizowała Prodrobota trenażera chodu przeznaczonego do terapii pacjentów pediatrycznych oraz kompatybilne do niego podnośnik dla pacjenta i infrastrukturę informatyczną, opierającą się na systemie biofeedbacku w czasie rzeczywistym. Na początku roku ochronę prawną w Polsce i wybranych krajach europejskich uzyskał Prodrobot Magna dla pacjentów dorosłych.

- Konsekwentnie realizujemy założone przez nas cele. Kolejne kamienie milowe to ekspansja na światowe rynki o wysokim potencjale - jesteśmy w trakcie pozyskiwania certyfikacji FDA i organizacji azjatyckich.
Dodatkowo zakładamy, że do końca roku uda się nam zadebiutować na rynku NewConnect
– mówi Bartłomiej Wielogórski, prezes spółki.

Polska Federacja Szpitali umieściła spółkę w prestiżowym raporcie "Top Disruptors in Healthcare", a zdaniem ekspertów z Global Market Estimates Prodromus to jedna z 10 najważniejszych spółek działających w sektorze rehabilitacji robotycznej na całym świecie. Rynek Zdrowia w czasie VI Kongresu Wyzwań Zdrowotnych nagrodził flagowe urządzenie firmy – Prodrobota – główną nagrodą w konkursie Start-Up-Med 2021.

Z kolei igus Polska Sp. z o.o. przyznał mu Złotego Manusa za innowacyjną aplikację z zastosowaniem polimerowych łożysk ślizgowych.

- Cieszy nas, że Prodrobot spotyka się z uznaniem pacjentów, a specjaliści branży medycznej doceniają unikalność i potencjał naszych wyrobów medycznych. Konstrukcja robota to lata prac badawczo-rozwojowych, udoskonalających prototyp. Mam nadzieję, że te wyróżnienia przełożą się na zwiększoną rozpoznawalność spółki i pomoc większej liczbie pacjentów
– dodaje konstruktor urządzenia, Grzegorz Piątek.

W dniach 21-24 czerwca 2021 r. Prodrobot zostanie zaprezentowany na jednym z największych i globalnie rozpoznawalnych targach branży medycznej na świecie - Arab Health w Dubaju. Oprócz demonstracji urządzenia w planach jest także nawiązanie biznesowych relacji z potencjalnymi dystrybutorami.

Prodromus produkuje i dostarcza wysokiej jakości urządzenia rehabilitacyjne aktualnie skierowane głównie do dzieci, z systemem biofeedbacku w czasie rzeczywistym. Opatentowana autorska technologia jest rozwijana od dekady, a prawie 40 Prodrobotów pomaga pacjentom w 10 krajach w Europie i w Azji.