

Analysis of the dynamics of physical development of cadets as a result of the application of crossfit equipment

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Abstract

Purpose: to investigate the impact of classes in the program of physical training of cadets of military institutions of higher education at the stage of primary training with the use of crossfit tools on the physical development of cadets.

Material & Methods: was organized and conducted. anthropometric study and calculation of indices of physical development of cadets. The study was conducted in the sanitary section of the National Academy of Ground Forces named after Hetman Petro Sahaidachny by medical personnel 30 minutes after the ascent.

Results: it was determined that conducting training sessions using crossfit equipment has a positive effect on strengthening the musculoskeletal system of cadets and improving their muscular system (especially the muscles of the back, legs and shoulder girdle). During the study of body weight, there were positive changes in the direction of weight reduction by 3.62 kg ($t=2.52$; $p<0.05$) at the end of the experiment; the average value of VL in EG improved compared to the initial data by 245.48 ml ($p<0.001$), and in EC – by 78.22 ml ($p<0.05$); the difference between the dynamometry indicators of the left and right hand of the EG at the first and fifth stages of the study was 3.18 kgc and had positive significant changes ($t=3.18$; $p<0.01$), the difference between the dynamometry indicators of the left and right hand of the CG was 2.19 kgf and had positive unreliable changes ($t=1.85$; $p>0.05$). As a result of the pedagogical experiment, it was determined that the dynamometry indicators of the right and left hands of EG and CG cadets at the end of the experiment differ significantly ($p<0.01$), which indicates the effectiveness of the physical training program. The chest circumference of the cadets at the beginning and at the end of the experiment has reliably stable results and is only 2.04 cm ($p>0.05$) and are reliable. As for the Quetelet index, there were positive changes towards improvement, namely: at the beginning of the experiment it was 4.85 g/cm ($t=0.69$; $p>0.05$), at the end – 25.80 g/cm ($t=4.09$; $p<0.001$), which emphasizes the positive impact of exercise and crossfit.

Conclusions: it has been proven that the application of a physical training program at the stage of primary training with the use of crossfit equipment ensures the positive development and strengthening of the musculoskeletal system of cadets, the improvement of their muscular system. Under the influence of systematic crossfit classes, the VL increases, the circumferences of the chest and shoulders increase, the volume of the waist decreases, and body weight stabilizes. These circumstances have a positive effect on the work capacity of cadets, improve their physical health, improve their well-being and increase their work efficiency.

Анотація

Артур Одеров, Сергій Романчук, Орест Лесько, Олег Ольховий, Віктор Романчук, Олег Небожук, Іван Пилипчак, Андрій Полтавець. Аналіз динаміки фізичного розвитку курсантів за результатами застосування засобів кросфіту. **Мета:** дослідити вплив занять за програмою фізичної підготовки курсантів військових закладів вищої освіти на етапі первинного навчання із застосуванням засобів кросфіту на фізичний розвиток курсантів. **Матеріали і методи:** було організовано

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та проведено. антропометричне дослідження та розрахунок індексів фізичного розвитку курсантів. Дослідження проводилося у санітарній частині Національної академії сухопутних військ імені гетьмана Петра Сагайдачного працівниками медичної служби через 30 хвилин після підйому. **Результати:** визначено, що проведення тренувальних занять із застосуванням засобів кросфіту позитивно впливає на зміцнення опорно-рухового апарату курсантів та удосконалення їх м'язової системи (особливо м'язів спини, ніг та плечового поясу). У процесі дослідження маси тіла відбулися позитивні зміни у бік зменшення ваги на 3.62 кг ($t=2.52$; $p<0.05$) наприкінці експерименту; середнє значення ЖЄЛ у ЕГ покращилося порівняно з вихідними даними на 245.48 мл ($p<0.001$), а в ЕК – на 78.22 мл ($p<0.05$); різниця між показниками динамометрії лівої та правої руки ЕГ на першому і п'ятому етапах дослідження становила 3.18 кгс та має позитивні достовірні зміни ($t=3.18$; $p<0.01$), різниця між показниками динамометрії лівої та правої руки КГ становила 2.19 кгс та мала позитивні недостовірні зміни ($t=1.85$; $p>0.05$). У результаті педагогічного експерименту визначено, що показники динамометрії правої та лівої рук курсантів ЕГ та КГ наприкінці експерименту достовірно відрізняються ($p<0.01$), що свідчить про ефективність програми фізичної підготовки. Щодо індексу Кетле, то відбулися позитивні зміни у бік покращення, а саме: на початку експерименту він становив 4.85 г/см ($t=0.69$; $p>0.05$), наприкінці – 25.80 г/см ($t=4.09$; $p<0.001$), що підкреслює позитивний вплив занять фізичними вправами та кросфітом. **Висновки:** доведено, що застосуванням програми фізичної підготовки на етапі первинного навчання із застосуванням засобів кросфіту забезпечено позитивний розвиток та зміцнення опорно-рухового апарату курсантів, удосконалення їх м'язової системи. Під впливом систематичних занять кросфітом збільшується ЖЄЛ, збільшуються окружності грудної клітки, зменшується об'єм талії, стабілізується маса тіла. Наведені обставини позитивно впливають на працездатність курсантів, покращують стан фізичного здоров'я, сприяють покращенню самопочуття та підвищенню ефективності роботи.

Introduction

To date, the Armed Forces of Ukraine have taken a significant step towards the gradual transition to the training of military specialists according to the standards of the armed forces of the leading NATO countries. The main difference of which is the non-implementation of organizational and personnel, military-technical and ideological changes, rethinking and justification of the process of formation of military-professional readiness of servicemen (Afonin V.M. et al., 2017; Oderov A. et al. 2022).

The most important element of the professional readiness of servicemen to perform the assigned tasks is their physical readiness, namely, the specific physical condition that allows the serviceman to fulfill the modern requirements of combat, which are conducted on the territory of our state and combat tasks in accordance with the assignment (Levchuk V.O., 2014; Fedak S., 2013).

At the same time, despite purposeful positive changes in the modernization of weapons and military equipment, the research of many scientists has proven that the performance of tasks in the combat zone is accompanied by significant physical stress (Starchuk O.O. et al., 2016; Fedak S., 2015; Neschadym M.I., 1998).

Recently, in Ukraine, there has been a steady trend to-

wards the deterioration of the physical health of young people (about 76%), which in turn has a negative effect on the intensification of the educational process, a decrease in physical activity, the imperfection of physical education, etc. (Petrova A. et al., 2022). It should be noted that today crossfit is steadily gaining momentum and popularity among modern youth. Thus, we believe that the introduction of CrossFit as an innovation for military institutions of higher education in the system of physical training is appropriate, as it will contribute to increasing the interest of cadets in physical education, increase motor activity and, as a result, improve the level of physical health of future defenders.

Regarding the use and application of crossfit in the practice of physical education, special physical training and sports with cadets of military institutions of higher education, we affirm that the list of issues of the work program of the educational discipline (a mandatory component of the program) provides for the study and improvement of exercises by means crossfit

Thus, the experience of conducting combat operations by military personnel on the territory of Ukraine proves that during the execution of combat missions to destroy the Russian enemy, raid actions are usually used, therefore, the success of combat missions largely depends on the physical readiness of military personnel (Collection of standards for combat training of the Ground Forces of the Armed Forces of Ukraine, 2002; Krasota, 2007; Loiko O.M., et al., 2013). All these events gave us the opportunity to propose, develop and test the effectiveness of the physical training program for cadets of military institutions of higher education for the first two years of study using Crossfit equipment, which, in turn, will ensure and accelerate the adaptation of cadets to the conditions of professional activity, increase the level of general physical fitness with an emphasis on the development of strength and endurance, will improve the physical development and functional state of cadets, increase the body's resistance to the adverse factors of military and professional training, develop moral and willpower and professionally important psychological qualities, form motivation for independent training in physical training and sports (Kyrpenko V., et al., 2015).

The purpose of the study: to analyze and investigate the impact of classes on the physical training program of cadets of military institutions of higher education at the stage of primary education with the use of Crossfit tools on the physical state of health.

Material and Methods of the research

The study was organized and conducted at the National Army Academy in the period from 2019 to 2021. It was conducted in five stages: the first stage - the beginning of primary military training - the beginning of the 1st semester (initial data); the second stage - the beginning of the first semester - the end of the first semester; the third stage - the beginning of the second - the end of the II semester; the fourth stage - the beginning of the third - the end of the III semester; the fifth stage - the beginning of the fourth - the end of the IV semester. The indicators that the cadets showed at the end of the research stage were taken for the analysis. For the reliability of the study, we formed experimental ($n=94$) and control ($n=94$) groups aged 17-24 using the method of equal pairs.

The following crossfit exercises were applied to the content of the program at the first stage: walking with forward and backward lunges; running with high knee lift; pulling up with a grip to the middle; jumping on one leg in motion; bending and

stretching of the arms in a lying position (hands at shoulder width): raising the legs, bent at the knees to the chest from the position of hanging on the crossbar; flexion and extension of the trunk; keeping the body in a horizontal position (bar) resting on the elbows; jumping up from a squat position.

The content of the program at the second and third stages - bending and extending the arms in a lying position with the palms apart in the lower position; pulling up on the crossbar with a narrow grip; jumping out of a full squat forward; keeping the body in a horizontal position (plank) while resting on the hands, burpee; squatting on two legs; running 60 m; lunge on one leg forward; simultaneous lifting of legs and trunk; touching the toes of the feet with the fingers from the position of lying on the back; flexion and extension of the trunk; jumping over a gymnastic bench with a high knee lift; kettlebell deadlift (16/24 kg) to the chin; raising straight legs lying on the back; swing a kettlebell (16/24 kg) with two hands above the head; flexion and extension of the trunk while holding the meatball on the chest; jumping on and off the bollard; jumping rope; 30 m run; holding a 5 kg meatball for 20 seconds; 1 km run; performing exercises as part of the crew, based on the transfer of the partner 400 m.

In the fourth and fifth stages - carrying a log 200 m, squatting with a log, lifting a log up from one shoulder and lowering it to the other, pulling a rope, jumping in and out of a trench, running in full equipment 800 m; overcoming a ditch 2 m wide, a labyrinth, a 2-meter fence; transfer of 10 ammunition boxes filled with sand 600 m; running 1500 m, bending and extending the arms in a supine position.

All participants of our study gave their informed consent to participate in the experiment. Research was conducted and performed in accordance with the ethical standards of the Declaration of Helsinki.

The research methods consisted in the organization and analysis of indicators of height, mass, body mass index, dynamometry of the right and left hands, static dynamometry, Ketele indices, vital and strength indices, index of static strength of the cadets in order to determine the sufficient level of the functional state of the cadets and readiness to perform tasks according to destination. The study was conducted in the sanitary section of the National Army Academy by medical personnel 30 minutes after liftoff. A height meter, medical scales, manual dynamometer, standing dynamometer, spirometer, centimeter tape were used.

The study was conducted in compliance with the requirements of the unified methodology of anthropometric studies (Marfell-Jones M. et. al., 2012). To assess the physical development of the participants, the indices were calculated:

The Quetelet weight-height index was used to determine the correspondence of body weight to height indicators, which was calculated according to the formula:

$IR = m \setminus h$ (where m is the cadet's weight in grams; h – cadet's height in centimeters) and evaluated according to the weight-height index rating scale (Pichugin MF. et. al., 2010).

Life index (hereafter \dot{Z}) determined by the formula: $\dot{Z} = GEL \setminus weight$ (ml) \ weight (kg). 50-60 ml/kg is considered average for young men. This indicator characterizes the work of the cadets' respiratory system.

The strength of the hands and individual muscle groups was studied by the dynamometry indicators of the left and right hands.

The dynamometry of the deadlift was determined using the strength index (the strength index = deadlift (kgf) \ weight (kg) x 100). The average indicator of standing strength for men

is 200-220%.

The methods of mathematical statistics were used in order to prove the regularities discovered in the research process. Mathematical and statistical calculations were carried out using computer programs, in particular "Excel", "SPSS", "STATISTICA 7" in the operating system "Windows Vista".

The application of the methods described above made it possible to organize a study, to check the indicators of EG and CG cadets, to prove the effectiveness of the implementation of the physical training program for cadets of military institutions of higher education at the stage of primary training with the use of crossfit equipment.

Results of the research

In order to study the influence of classes in the program of physical training of cadets at the stage of primary training with the use of crossfit tools on the physical development of cadets, we analyzed the obtained indicators.

In particular, the analysis of the growth indicators of EG and CG cadets allows us to note their increase during the entire pedagogical experiment, however, no significant difference was recorded ($p > 0.05$). In addition, the average value of the height of the cadets EG and CG does not reliably differ from each other during the entire period of the experiment ($p > 0.05$).

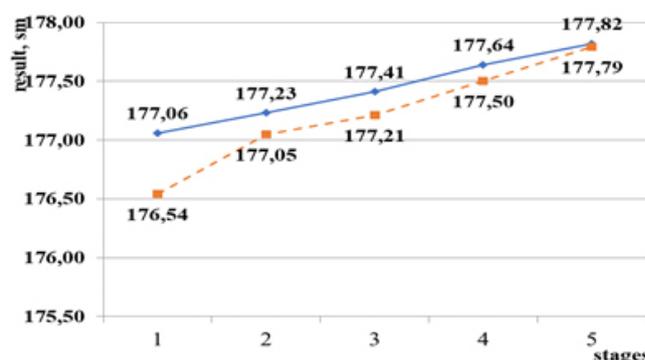


Fig. 1. Growth dynamics of EG and CG cadets during the experiment

— results of cadets of the CG;
- - - the results of the cadets of the EG.

Comparative analysis showed a significant difference in indicators only at the second stage (by 0.18 cm; $t=0.14$; $p > 0.05$) and on the fifth - 0.07 cm; $t=0.03$ $p > 0.05$ (. At the remaining stages, an unreliable difference in indicators was found.

A comparative analysis of body weight (fig. 2) showed that a significant difference between EG and CG indicators is observed only at the third stage of the study and is 2.83 kg ($t=2.20$; $p < 0.05$) and at the fourth stage - 2.89 kg ($t=2.28$; $p < 0.05$).

The difference between the cadets' body weight at the beginning and at the end of the experiment is only 2.08 kg ($p > 0,05$) and has seasonal fluctuations in range 1.64-2.40 kg.

The comparative analysis of the vital capacity of the lungs (fig. 3) showed the existence of a significant difference between the indicators of EG and CG only on the fourth (157.30 ml; $t=2.82$; $p < 0.01$) and at the fifth stages of the research (164.71 ml; ($t=2.92$; $p < 0.01$). At the remaining stages of the study, an unreliable difference in indicators was found.

The study of vital capacity of the lungs determined that during the experiment its indicators in EG cadets in the III and

IV semesters reliably improved ($p < 0.001$), and in CG there is no significant difference ($p > 0.05$).

At the end of the experiment, the average value vital capacity of the lungs in EG improved compared to the initial data on 245.48 ml ($p < 0.001$), and in EG – on 78.22 ml ($p < 0.05$), which emphasizes the positive impact of physical exercises and sports.

A comparative analysis of the dynamometry of the left hand showed (fig. 4) that a significant difference between the indicators of EG and CG is observed only at the fifth stage of the study and is 2.79 kgf ($t = 2.35$; $p < 0.05$).

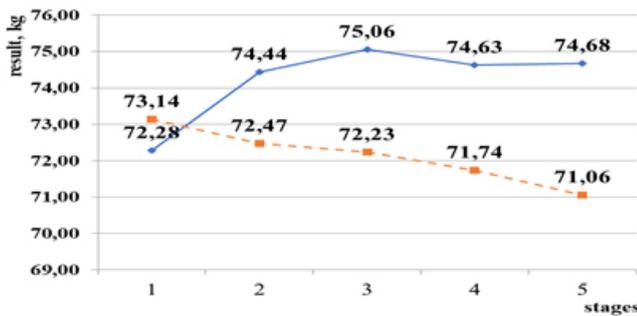


Fig. 2. Body mass dynamics of EG and CG cadets during the experiment

— results of cadets of the CG;
 - - - the results of the cadets of the EG.

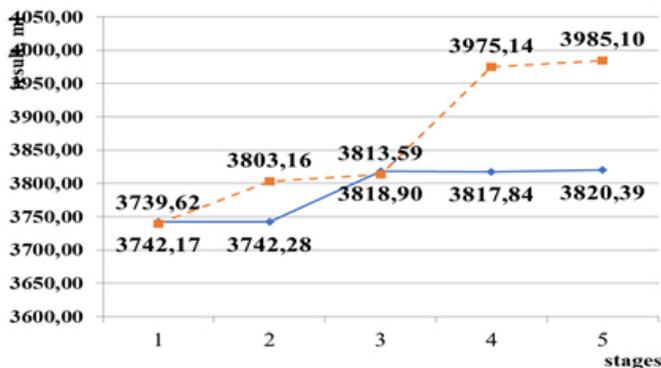


Fig. 3. Dynamics of the vital capacity of the lungs of EG and CG cadets during the experiment

— results of cadets of the CG;
 - - - the results of the cadets of the EG.

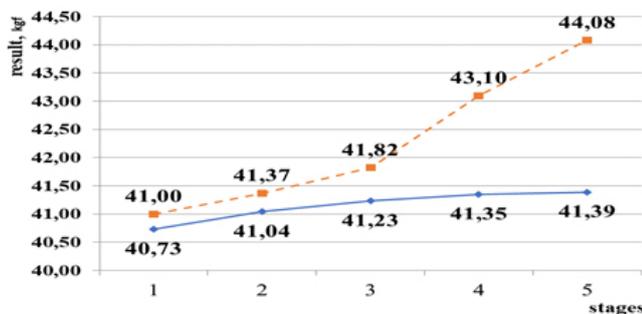


Fig. 4. Dynamics of left hand dynamometry indicators of EG and CG cadets during the experiment

— results of cadets of the CG;
 - - - the results of the cadets of the EG.

Our arm strength studies have proven the positive impact of crossfit training on arm strength development. A significant difference in the values of the indicators of CG and EG cadets is observed in the IV semester - the dynamometry indicators of the right hand of EG and CG cadets at the end of the experiment reliably differ by 2.38 41, ($p < 0.05$). The values of the muscle strength indicators of the right hand of EG cadets in the IV semester are significantly better than at the beginning of the experiment by 3.18 kgf ($p < 0.01$). As a result of the pedagogical experiment, it was determined that the dynamometry indicators of the right and left hands of EG and CG cadets at the end of the experiment are reliably different ($p < 0.01$), which testifies to the effectiveness of the program of physical training of cadets of military institutions of higher education at the stage of primary training with the use of crossfit tools.

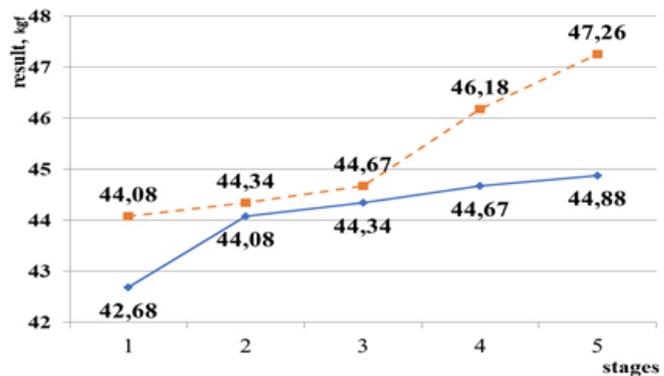


Fig. 5. Dynamics of dynamometry indicators of the right hand of EG and CG cadets during the experiment

— results of cadets of the CG;
 - - - the results of the cadets of the EG.

The dynamics of static dynamometry indicators (fig. 6) of EG and CG cadets has a progressive character throughout the experiment: in the IV semester, the average value of the indicator of back strength development in CG is significantly higher than the indicator at the beginning of the experiment by 2.26 kgf ($p < 0.05$), in EG - by 5.30 kgf ($p < 0.01$), which determines the effectiveness of the program of physical training of cadets of military institutions of higher education at the stage of primary training with the use of crossfit tools.

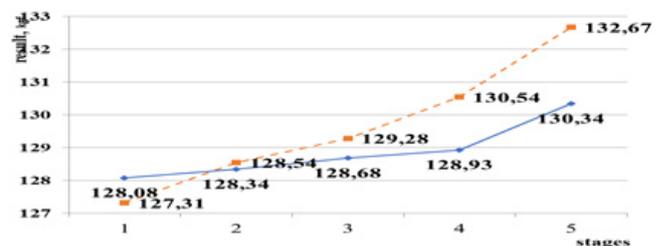


Fig. 6. Dynamics of static dynamometry indicators of EG and CG cadets during the experiment

— results of cadets of the CG;
 - - - the results of the cadets of the EG.

A comparative analysis of Kettle's weight-height index showed (fig. 7) a significant difference only at the fourth stage of the study and is 17.41 g/cm ($t = 2.72$; $p < 0.01$) and at the fifth stage - 25.80 g/cm ($t = 4.09$; $p < 0.001$). At the I-III stages, an unreliable difference between the indicators was found.

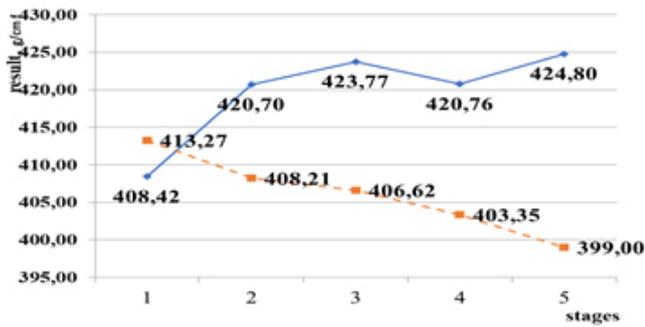


Fig. 7. Dynamics of indicators of the Quetelet index of EG and CG cadets during the experiment

— results of cadets of the CG;
 - - - the results of the cadets of the EG.

The dynamics of the Quetelet index of EG cadets is reliably stable ($p > 0.05$) at all stages except the 5th where $p < 0.01$. In CG cadets, the average value of the Quetelet Index reliably increases during the experiment by 16.04 g/cm ($p < 0.01$).

The comparative analysis of the vital index showed (Fig. 8) that the significant difference between EG and CG indicators is only at the fourth stage of the study - 4.88 ml/kg ($t = 3.97$; $p < 0.001$) and at the fifth stage of the study - 5.89 ml/kg ($t = 4.86$; $p < 0.001$).

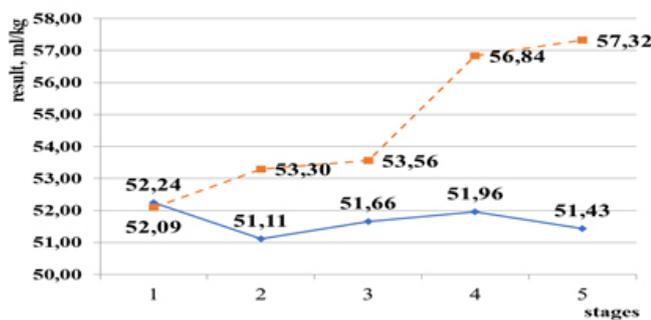


Fig. 8. Dynamics of the vital index of cadets EG and CG during the experiment

— results of cadets of the CG;
 - - - the results of the cadets of the EG.

The study of this indicator in EG and CG cadets allows us to note that before the start of the experiment in 1-2 semesters of study, they are reliably equal ($p > 0.05$), and in the 3rd-4th semesters, the indicators of the vital index of the cadets of the EG significantly exceed those of the CG by 4.88 ml/kg ($p < 0.001$) and 5.89 ml/kg ($p < 0.001$) in accordance. The dynamics of life index indicators of EG and CG cadets is positive. In EG, the reliability of the difference between the indicators at the beginning and at the end of the experiment is 5.23 ml/kg ($p < 0.001$), which indicates an increase in the functional capabilities of the cadets' respiratory system during crossfit classes at the initial training stage.

A comparative analysis of the static strength index showed (fig. 9) that the difference between the indicators of EG and CG at the 1st stage is 6.25 % ($t = 0.79$, $p > 0.05$), at the II stage - differ by 7.22 % ($t = 1.67$; $p > 0.05$), at the third stage, an unreliable difference was found ($t = 2.58$; $p < 0.01$), at the IV stage of the study - 12.09 % ($t = 2.70$; $p < 0.01$), at the V stage - 19.83 % ($t = 3.79$; $p < 0.01$).

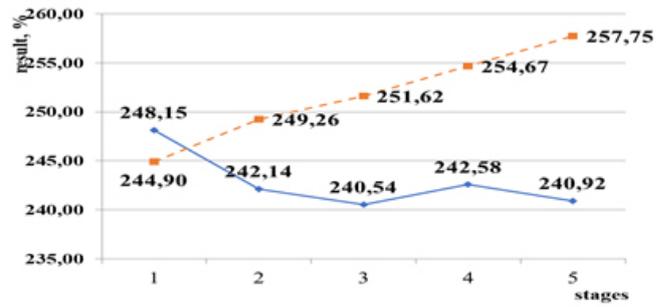


Fig. 9. Dynamics of changes in the static strength index of EG and CG cadets during the experiment period, (%)

— results of cadets of the CG;
 - - - the results of the cadets of the EG.

The study of the static strength index made it possible to determine that the indicators of EG and CG cadets at the beginning of the experiment were at the "below average" level. For CG cadets in the I-II semesters, the value of the static strength index is estimated as "below the average", and in the III-IV semesters - as "average". The indicators of EG cadets in the I-III semesters are at the average level, and in the IV semester - at the "above average" level for men.

Discussion

In scientific works of leading scientists of the field (Bazilevich NO., et al., 2017; Korchagin M. et al., 2020; Oderov A. et al., 2019) it is noted that the modern conditions of conducting military operations require a high level of development of general physical qualities and applied physical skills from a serviceman. Special attention is paid to the formation of general and special endurance of military personnel (Romanchuk S.V. et al., 2021).

Klymovych V., Oderov A. Romanchuk S. et al. prove that the performance of military duty by military personnel takes place in equipment, in certain climatic conditions, even in populated areas. All this requires systematic classes with weights, exercises with oxygen starvation, physical exercises in military equipment and similar in structure to the conditions of military service.

Increasing the level of physical training of military personnel allows them to more effectively perform the combat tasks assigned to them. The armies of many countries pay great attention to the development and implementation of various physical training programs. One of the leading places among them is occupied by programs that include crossfit elements (Grier T. et al., 2013; O'Connor, F.G. et al., 2017; Poston, W.S. et al., 2017).

In scientific works Grier, T., Canham-Chervak, M., McNulty, V., Jones, B.H., O'Connor, F.G., Deuster, P.A., Barrett, J., Kane, S.F. studied the impact of such programs on the injury rate of US Army servicemen and their physical fitness. The increase in the risk of injury practically does not differ between those who practiced according to a special program and those who did not use elements of CrossFit in their training. At the same time, the risk of injury was significantly lower among those who trained with weights.

Scientists N.Bazilevich, O.Tonkonog, O.Romanyuk, claim that crossfit products provide an opportunity to continue exercising for a long period of time, strengthen and improve the

overall physical endurance of the body, improve the work of the cardiovascular and respiratory systems, increase and improve the level of muscle strength, strengthen the joints, optimize weight, improve flexibility and acquire an athletic figure. Crossfit includes training in various formats, functional gymnastics, balance training, and various cyclical exercises. Functional multisport (crossfit) involves such methods of sports training as continuous, interval and competitive (Stepanova I. et.al., 2018; Pylypchak I., 2017).

Poston, W.S.C., Haddock, CK., Heinrich, KM., Jahnke, SA., Jitnarin, N. emphasize that high interval training has a number of advantages over traditional programs of physical training of military personnel. Rather than biasing the training toward maximal fitness, such as aerobic endurance, these workouts are designed to increase overall fitness. Other challenges associated with traditional approaches include: the relevance of fitness tests to current combat requirements; the perception that military physical education is aimed at passing tests for service suitability; combat training requires more than just aerobic endurance. All this determines the perspective of using training with crossfit elements.

Scientists O'Hara RB., Serres J., Traver KL., Vojta C., Eveland E. conducted a comparative analysis of non-traditional training programs for Air Force personnel. Data from the literature confirm the effectiveness of strength training with weights on the lower extremities, crossfit training, kettlebell training, and agility training. It was concluded that further study of these types of training is necessary.

Our comparative analysis of the dynamics of physical development of cadets confirmed the research of scientists Gaponenko H., Romaniuk O., Kovalchuk O. et.al. (2018), that crossfit is a training system that includes elements of weightlifting and athletics, bodybuilding, fitness, classical gymnastics, kettlebells and other sports, is an intense, diverse, interesting, useful training and has a positive effect on the work capacity of cadets, improves the state of physical health contribute to improving well-being and increasing work efficiency.

Available works (A.Petrova et al., 2022) prove the effectiveness of the use of crossfit, testify to the improvement of the physical fitness of schoolchildren and the level of physical health of high school students «below average». In terms of age, there is mainly an improvement in the results of boys in both the main and control groups. It was established that after the introduction of the CrossFit variable module, the level of physical health of the boys of the main groups studied increased by 1 point and began to equalize - 3 points, which corresponds to the «average» level. The exception is the 2017 data. boys who did not show an improvement in the indicators on the rating scale and they are equal to 3 points before the experiment, which corresponds to the «average» level of physical health. The results of the young men of the control groups, reflecting the level of physical health, remained unchanged compared to the initial data. Thus, the conducted studies testify to the positive impact of our CrossFit exercises on the level of physical health of 16-17-year-old students, which makes it possible to recommend to teachers to include the developed version of the «Crossfit» module in the educational process of physical education of high school students.

Research Okhrimenko I.M., Hrebeniuk M.O., Borovyk M.O., Kuzenko Y.I., Korak Y.O. was devoted to assessing the impact of crossfit classes on the health of cadets. At the end of the experiment, it was established that the level of physical health of cadets who attended Crossfit classes was significantly higher than that of cadets who were engaged in a standard

physical training program. The most pronounced effect was found on the functional capabilities of the cardiovascular, respiratory and muscular systems, stabilization of the body weight of the cadets of the experimental groups.

We have confirmed the results of scientific works Stepanova I., Dutko T., Zhorova O. and Yagodzinsky VP, Geiko OA, Zarchanskyi OA. regarding the possibility of increasing the effectiveness of the training process by using a system of non-specialized highly intensive training, namely crossfit. It has been established that this system has a positive effect on the level of physical fitness of servicemen, strengthens their motivation for physical culture and sports activities, promotes the mastery of certain knowledge of modern approaches to the organization of physical training, skills and abilities of independent training and leading a healthy lifestyle.

In our opinion, the use of crossfit exercises during the organization and conduct of forms of physical training will ensure high-quality and professional training of cadets, especially during preparation for participation in hostilities, conducting combat exercises in accordance with the appointment and the position held in the future.

Conclusions

Thus, the study of indicators of physical development of EG and CG cadets determined that conducting crossfit training sessions has a positive effect on strengthening the musculoskeletal system of cadets and improving their muscular system (especially the muscles of the back, legs and shoulder girdle). Under the influence of systematic crossfit classes, the vital capacity of the lungs increases, the circumferences of the chest and shoulders increase, the volume of the waist decreases, and body weight stabilizes. These circumstances have a positive effect on the work capacity of cadets, improve their physical health, improve their well-being and increase their work efficiency.

The value of the static strength index of EG and CG cadets increases significantly throughout the entire training period, however, the difference between the results at the beginning and at the end of the experiment in CG is 7.75 % ($p < 0.05$), and in EG – 23.93% ($p < 0.001$), which indicates a significant advantage of the physical training program for cadets of military institutions of higher education at the stage of primary training with the use of crossfit equipment over the existing physical training program for the development of back muscles in cadets at the stage of primary training.

The application of the program of physical training of cadets of military institutions of higher education at the stage of primary training with the use of crossfit equipment ensured the maintenance of a sufficient level of functional condition of cadets of military institutions of higher education for the performance of professional (combat) tasks.

Prospects for further research in this direction. In the next message, our research will be directed to the study of the functional state and dynamics of the level of physical health of the cadets of the experimental and control groups at the stage of primary training.

Author Contributions

Artur Oderov, Serhii Romanchuk – data collection/entry, data analysis/statistics, data interpretation;

Andrii Poltaets, Victor Romanchuk – study design/planning, data interpretation;

Oleh Olkhovyi – data analysis/statistics, data interpreta-

tion, fundraising;

Oleh Nebozhuk – data interpretation, fundraising;
Orest Lesko – data collection/entry, literature
analysis/search;
Ivan Pylypchak – data interpretation, fundraising.

Conflicts of Interest

The authors declare no conflict of interest.

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