

Original Article

The possibility of increasing cadets' physical fitness level of the educational organizations of the Ministry of Internal Affairs of Russia with the help of optimal training effects via crossfit

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Abstract:

Actually, the studies indicate a negative decline dynamics of the main indicators of the physical development and health of the modern young people receiving higher education. In our studies, it was found that the existing physical training programs are not able to provide the optimal level of functional readiness of the military students and officers of the military universities as needed to perform the professional tasks. Moreover, the purpose of research is the search for the optimal training effects aimed at increasing the military students' level of physical and functional training at the universities of the Ministry of Internal Affairs of Russia. The participants of the research were the young men (17-18 years old) and they were the cadets of the 1st course of a higher education institution of the Ministry of Internal Affairs of Russia (n=28). All cadets had no medical contraindications and had similar indicators of the physical development. The duration of the study – 5 weeks. During this time, the cadets of the experimental group were using the burpee exercises during the physical training classes. It should be noted that the method of using burpee included a systematic reduction in the intervals of recovery time between the exercises. Fortunately, to assess indicators dynamics of the young men, the tests were used that characterize the physical fitness level of the young people. The data statistical analysis was performed using the Mann–Whitney U–test. The test results show a significant (P<0,05) advantage of the development level of the strength, speed-strength and functional abilities among the cadets of the experimental group. Indeed, it was revealed that the method of optimal training effects proposed by the authors contributes to a reliable (P<0,05) increase of some indicators of the physical development level of the young people in a relatively short (4-5 weeks) time interval.

Key words: physical fitness; cadets; police officers; functional training; power abilities; burpee.

Introduction

It is known that the technical progress and the revolution in the field of high technologies have eliminated many of the tasks solved by the man via physical activity. Unfortunately, the negative result was the increase in various injuries related to the household and professional activities of a person. Actually the scientists have noted the lack of physical condition of the organism of the modern man which is necessary for him to perform many motor actions. Such actions include movements that require different modes of muscle activity and coordination of various muscle groups as well as physical endurance. It should be noted that the specialists believe that functional training will help to prevent injuries and increase a person's physical readiness for a various types of work (Roy, 2014). This type of training is designed to improve the efficiency of both daily human activities and to increase the athletic performance. According to the experts high-intensity functional training is a process of developing strength, flexibility, coordination and endurance via performing a variety of exercises that involve multiple muscle groups and joints of the body (Greenlee et al., 2017). The positive effect of functional training to improve the physiological profile of persons of different gender and age is noted by the experts (Naghavi, Taheri, & Irandoust, 2018; Phillips, Williams, Greenhaff, Smith, & Atherton, 2017).

Thus, in any case the analysis of the scientific data shows that the training sessions using a mixed body energy supply (aerobic-anaerobic or anaerobic-aerobic) have a more effective effect on the level of functional

status of the athletes than training using the aerobic mode (Tomschi, et al., 2018). At the same time, it has been revealed that the optimal training combination of muscle strength and cardiorespiratory fitness is more effective in improving the athletic performance of the young athletes than single-mode training effects (Gäbler, Prieske, Hortobágyi, & Granacher, 2018). However, there are data proving that functional training does not have significant advantages in improving muscular fitness and strength characteristics compared to the traditional methods of training effects (Cassemiro et al., 2017; Weiss et al., 2010). For a significant increase in the results both types of training effects are important: traditional and functional (Beckham, & Harper, 2010).

Besides, there is a large number of studies examining in detail the various aspects of the impact of functional training on the body of the professional athletes in the scientific literature (Osipov et al., 2017; Granacher et al., 2016). However, it is impossible to use fully this data in the process of physical education of the young people who are not involved in the professional sports. There are significant differences between the young athletes and young people who are not involved in sports in the level of physical fitness, learning ability and risk of injury (Bergeron et al., 2015). It was also revealed that studies devoted to the study of the physiological adaptation of the body of the young people both athletes and individuals who are not professionally involved in sports to a functional training are quite rare and need to be supplemented. It should be noted that an increase in research in this area will help clarify specific relationships between physiological stimuli and specific training programs for the young people and will also contribute to the effective injury prevention (Legerlotz, Bohm, Marzilger, & Arampatzis, 2016). In this regard, a large number of exercises used in functional training, their intensity and complexity of implementation, the initial level of the physiological potential of trainees require the development of the detailed programs to improve the functional fitness of the young people (Winter, 2018).

Fortunately, the most functional training programs are a set of exercises performed with a high or maximum intensity for a given time in combination with certain rest intervals (Osipov, Kudryavtsev, Iermakov, & Jagiełło, 2018). The duration of each lesson is from 20 to 70 minutes. By the way the minimum duration of the entire program is about 4 weeks with mandatory 2-3 classes during each week. Also, the experts believe that compliance with these parameters will ensure the effectiveness of intensive functional training for all involved categories (Greenlee et al., 2017).

The most optimal time interval, the scientists consider 16-24 weeks of the study. It was revealed that in 16 weeks of workouts aimed at improving the functional fitness of the body, the aerobic characteristics and muscle component of the body mass of the participants are significantly increased (Furman, Miroshnichenko, Brezdeniuk, & Furman, 2018). Accordingly, it was determined that the training program (with a duration of at least 20 minutes) should include exercises that develop flexibility, cardiovascular fitness, muscle strength and muscular endurance (Ha, Lonsdale, Lubans, & Ng, 2017).

It should be noted that the analysis of scientific data revealed the problem of the lack of effectiveness of physical training programs for people studying at the military and police educational institutions (Crawley, Sherman, Crawley, & Cosio-Lima, 2016). The data shows that the existing physical training programs for the students even cadets and officers of military universities are not able to provide the high level of physical and functional fitness of the young people necessary for the performance of the professional tasks. The lack of special exercises in physical training was revealed (Fedak et al., 2016).

Experts indicate that physical training classes for the cadets and students of educational institutions of the Ministry of Internal Affairs of Russia are conducted according to one pattern that does not allow any significant changes to the structure of classes (Galimova, et al., 2018). The identified problem requires an immediate solution since the degree of physical fitness of military and police personnel is a key to the successful implementation of the professional tasks (Soroka, & Sawicki, 2014).

Some scientists strongly recommend adapting the training methods of intensive functional training (crossfit) for the physical education of the modern young people studying at the universities (Kokorev, Vyrikov, & Bodrov, 2018) taking into account the negative trends of deterioration of the physical development and health of young people (Artyukhov, & Kaskaeva, 2014). The use of elements of functional training (crossfit) in improving the quality of power percussion characteristics of servicemen and police officers was substantiated (Galimova et al., 2018).

Based on the data of the scientific review, the authors of the article identified the main purpose of the research - the search for optimal training effects aimed at increasing the level of physical and functional fitness of the young people, cadets and university students of the Ministry of Internal Affairs of Russia who are not involved in professional sports. In the course of the search, it was planned to use in the training process of cadets' methods and means of intensive functional training (crossfit).

Material & methods

Participants

However, it should be noted that the research participants are young people (young men – n=28) they are the cadets of the 1st course of the Siberian Law Institute of the Ministry of Internal Affairs of Russia. The

age of cadets is 17-18 years old. All participants underwent a medical examination and received permission from doctors to participate in research. In a random way, young people were divided into two groups: group No. 1 – control (n=14) and group No. 2 – experimental (n=14).

Research Design

Moreover, the training program for cadets of educational organizations of the Ministry of Internal Affairs of Russia in physical training provides for athletic gymnastics. However, in the general thematic plan for physical training, the total number of such classes is 8-10 classes during the school year. The program of classes includes exercises with various burdens (work with a barbell, weights, dumbbells) aimed at the development of strength abilities and muscular fitness of cadets. The duration of each lesson is 90 minutes. Components of the class: warm-up (doing general developmental and gymnastic exercises to prepare your body for active muscular activity) – 20 minutes, the main complex which is the consistent implementation of strength exercises for the development of the main muscle groups and strength abilities – 45-50 minutes and there is a set of exercises for the development of flexibility – 10 minutes. Another 5-10 minutes are allocated for building a group at the beginning and the end of a lesson and analyzing errors.

Thus, the curriculum of athletic gymnastics for the cadets of the control group (group No. 1) was based on the methods of developing basic physical qualities mainly based on the strength abilities approved by the educational organizations of the Ministry of Internal Affairs of Russia. The development of power abilities occurs by performing exercises with weights (barbell, weights and dumbbells) with a consistent increase in the shot weight. Also, the main complex of weightlifting exercises includes exercises performed without burdens: push-ups, pull-ups on the crossbar and jumps, etc.

In the curriculum of athletic gymnastics for the cadets of the experimental group (group No. 2) the exercises that effectively combine weightlifting and cardiorespiratory exercises were added to the main set of weightlifting exercises. This complex was the implementation of the burpee exercise in each session in combination with various rest intervals. The total duration of the complex was 20 minutes. The rest intervals between performing the burpee were reduced by 5 seconds every 2 classes. If in the first two classes the cadets performed a burpee for 2 minutes with a 30 second rest interval so in the final classes the rest interval between performing a burpee was 10 seconds. It was allowed to perform lightweight burpee variants (without push-ups, without jumping out, etc.) by the cadets whose physical fitness level did not allow the young people to complete the complex.

During the study, the following measurements and tests were used: Dineika test, timed inspiratory capacity, the complicated Romberg test, lung vital capacity measurement (LVC) was performed with an SS-34 spirometer (production – RF), heart rate measurement for 1 minute (HR). To assess the level of power abilities, the dynamometers were used: the wrist one – “DMER-120-05” and the torso – the “DS-500” (produced by the Russian Federation).

The following tests were used to assess the level of physical qualities development and motor abilities: pulling up on a crossbar, bending and unbending arms in the position - laying down (pushing from the floor) for 1 minute, lifting the body in the position - lying on the back for 1 minute, keeping the arms raised at right angles of the legs in position - hanging on the crossbar (Half level position) and shuttle running 10x10 m. The Harvard step test (HST) was used to assess the degree of fitness of the cadets. As you know, this test was specifically designed to assess the level of performance of the young people called up for service in the marines which allows it to be used to assess the physical fitness of people studying at institutes sponsored by the government agencies and military schools.

Statistical Analysis

Nevertheless, the statistical analysis of data obtained in the course of research was carried out using the SPSS20 program. When comparing the obtained data, the authors used the Mann-Whitney U-test. This statistical criterion for determining the reliability of differences in the studied parameters allows to determine quite accurately the degree of reliability of differences in the results between small samples by the number of participants.

Results

Thus, at the beginning of the research, the test results for students from the control group (group No. 1) and experimental group (group No. 2) did not have statistically significant differences for all tests. It should be noted that the indicators of physical fitness of the young people were quite average. In tests that determine the level of strength development, the results of the students from both groups were low. The main test results are presented in Table 1.

Table 1. Physical fitness indicators of cadets at the beginning of research

Tests	Groups		Authenticity
	Group №1	Group №2	
Romberg's test	42,11±2,12	43,05±2,14	P>0,05
Dineika test	38,36±3,15	37,74±2,83	P>0,05
Timed inspiratory capacity	44,42±1,81	45,17±1,62	P>0,05
Lung vital capacity	3,69±0,13	3,71±0,11	P>0,05
Heart rate	79,13±4,04	77,95±4,38	P>0,05
Harvard step-test	66,34±2,41	67,08±2,17	P>0,05
Dynamometer (manual)	48,21±2,34	48,16±2,13	P>0,05
Torso dynamometer	129,02±4,27	128,89±4,45	P>0,05
Turning up	45,86±0,36	46,04±0,34	P>0,05
Shuttle run	32,83±2,51	33,02±2,64	P>0,05
Lifting	10,46±2,28	10,62±2,31	P>0,05
Pushup	25,23±0,39	25,02±0,37	P>0,05
Half level position	9,20±0,25	9,26±0,18	P>0,05

According to the end of the research, the test results turned out to be somewhat better for the cadets of the experimental group. A significant ($P<0,05$) difference in the results of the cadets was identified in tests characterizing the development of speed-power and power abilities: shuttle run, push-ups from the floor for 1 minute and half level position. Revealed significant ($P<0,05$) differences in the results of manual dynamometry in favor of the cadets of the experimental group. Luckily, determining the HR, a significant difference ($P<0,05$) was found in the indications in favor of the cadets of the experimental group. At the same time, the Harvard step test index indicates a significant ($P<0,05$) advantage in the degree of fitness among the cadets of the experimental group. However, it should be noted that the indicators of HST for cadets of both groups are at an average level. In other tests, the indicators of the cadets of the experimental group are slightly higher than those of the cadets from the control group, but the differences in the obtained results are not significant. Only the torso dynamometry results of the cadets of the control group are somewhat higher than those of the cadets from the experimental group, but the differences in the results are not reliable. The main results of the final testing are presented in Table 2.

Table 2. Physical fitness indicators of the students based on the results of final testing

Tests	Groups		Authenticity
	Group №1	Group №2	
Romberg's test	45,41±2,17	46,82±4,46	P>0,05
Dineika test	40,17±3,26	40,48±3,58	P>0,05
Timed inspiratory capacity	46,11±2,12	46,83±2,05	P>0,05
Lung capacity	3,78±0,22	4,05±0,46	P>0,05
Heart rate	76,54±3,09	74,26±3,12	P<0,05
Harvard step-test	68,52±2,06	70,45±2,03	P<0,05
Dynamometer (manual)	49,17±2,21	50,44±2,46	P<0,05
Torso dynamometer	135,35±3,46	134,85±4,02	P>0,05
Turning up	48,92±2,32	49,05±2,41	P>0,05
Shuttle run	31,17±2,23	29,14±2,06	P<0,05
Lifting	11,62±2,79	12,51±2,53	P>0,05
Pushup	29,57±1,44	31,42±1,56	P<0,05
Half level position	10,21±0,42	11,92±0,66	P<0,05

Discussion

Moreover, the scientific literature describes the programs and methods of training effects aimed at improving the level of functional fitness and strength characteristics of adults as the athletes (Osipov et al., 2018) and non-athletes in sufficient detail. However, the experts note that the use of training programs for the adults is unacceptable among young people (Drenowatz, & Greier, 2018). Thus, the young people should avoid heavy workouts with large weights as there is a risk of serious injury (Shenouda, Wilson, & Fletcher, 2017). Consequently, the development of the power fitness of young people should occur by means of the use of methods of training effects that allow you to increase optimally the level of physical fitness involved in the absence of the risk of injury. Besides, at institutes sponsored by the government agencies and military schools of the Russian Federation, the physical training lessons for the military students and cadets who are conducted in

accordance with the requirements and instructions governing a strict order and a uniform pattern for conducting classes and not allowing any significant changes to the structure of the lesson (Galimova, et al., 2018). Whereas the classes aimed directly at developing power abilities and muscular fitness among cadets at the universities of the Ministry of Internal Affairs of Russia is small – 8-10 lessons during the year, there is a serious problem of insufficient physical fitness of future police officers to fulfill their professional duties. By the way the authors of the article suggest using burpee exercise complexes in combination with various rest intervals in athletic gymnastics to solve this problem. However, due to the fact that the burpee is the execution of simple physical exercises prescribed in the regulations for conducting physical training for the cadets, the use of such complexes does not contradict the instruction on the physical training of students at high schools of the Ministry of Internal Affairs of the Russian Federation. It should be noted that there is no risk of injury which is possible when performing exercises with large weights for the unprepared young people.

Nevertheless, the studies show that young people can significantly increase the level of strength development after 8-12 weeks of regular weight training at least 2 times a week (Dahab, & McCambridge, 2009). In our studies, a significant ($P<0,05$) increase in speed-power and strength abilities was found among the cadets from the experimental group in 4-5 weeks of regular training using the complex exercises of intensive functional training. Increasing the level of physical fitness of the cadets in a short period of time is important because the effectiveness of the physical training programs for the military students and cadets is significantly reduced in 8 weeks of training as it is indicated by A. Crawley (Crawley et al., 2016).

By the way S. Cocke points out that regardless of the format of the physical training program and regular classes contribute to an increase in the physical fitness indicators of the cadets of police and military schools. However, this author indicates that the direction of a particular training program contributes to the development of only some indicators of police fitness: strength, speed or endurance (Cocke, Dawes, & Orr, 2016). It should also be noted the significant duration of such programs - 6 months or more. In our studies, we have achieved a significant ($P<0,05$) increase in indicators characterizing the degree of speed-power development, strength and functional abilities in 5 weeks of training sessions. The results are important, as experts point to the need to develop the methodological foundations that improve the quality of cadets' exercises that require a comprehensive demonstration of various physical qualities and abilities (Anatskyi, Kolomiitseva, Cretu, & Potop, 2017).

However, the experts note that the increase of the physical fitness indicators determined by the tests: pulling up, push-ups, Genchi test and Timed inspiratory capacity increases among the young people during their studies at high schools. Besides the increase of these physical fitness indicators occurs over a sufficiently long (2-3 years) period of time with a sufficient level of weekly physical activity of the young people (Avdeeva, & Tulyakova, 2018). However, there are data showing that the enthusiasm for strength training leads to a decrease in the overall level of different physical activity of the young people in scientific literature (Ten Hoor, et al., 2018). The results of the tests that determine the cardiorespiratory fitness of the body (timed inspiratory capacity, lung vital capacity, heart rate and Harvard step test) the development of speed-strength and coordination abilities (Romberg's test, shuttle run), psychophysical fitness (Dineika test) indicate that the level of physical activity of the cadets did not decrease during the period conducting research.

Conclusions

In conclusion, we may say that the studies show the problem of deterioration of the physical fitness level of modern young people. However, the problem of insufficient physical fitness of the young people for the future professional activities has been revealed even at institutes sponsored by the government agencies and military schools. The solution to this problem, according to scientists, is the successful adaptation of the modern techniques of intensive functional training (crossfit) in the process of physical training of the cadets and military students. After all the studies related to this issue it was revealed that the purposeful use of crossfit-training exercises that effectively increase the level of strength and cardiorespiratory fitness of the body to the physical effects increases the level of speed-strength, weightlifting and functional abilities significantly of the future officers and police officers in a relatively short period of time (4-5 weeks).

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