

## Pedagogical model for developing skills required by cadets of higher education institutions of the Aerospace Forces to organize their kettlebell self-training

ALEXANDER BOLOTIN<sup>1</sup>; VLADISLAV BAKAYEV<sup>2</sup>; SERGEY VAZHENIN<sup>3</sup>

<sup>1, 2</sup> Institute of Physical Education, Sports and Tourism, Peter the Great St. Petersburg Polytechnic University, RUSSIA

<sup>3</sup> Mozhaisky Military Space Academy, RUSSIA

Published online: March 25, 2016

(Accepted for publication February 26, 2016)

DOI:10.7752/jpes.2016.01028

### Abstract:

The paper describes a pedagogical model for developing the skills cadets of higher education institutions of the Aerospace Forces need to organize their own kettlebell workouts. This allowed optimizing the physical training of cadets studying at higher education institutions of the Aerospace Forces by organizing it on the basis of:

- 1) comprehensive approach to planning tasks related to the physical enhancement of cadets;
- 2) elaborating on tasks related to the organization of all forms of kettlebell workouts;
- 3) choosing the optimal content of the physical training with due regard to the specifics of kettlebell workouts;
- 4) choosing the most effective kettlebell training techniques and organizational forms that would help to solve the problem of improving the learning capacity of cadets;
- 5) implementing the individual, functional and differentiated approaches to the process of physical training and the kettlebell workout;
- 6) establishing the pedagogical conditions necessary for the successful solution of the given tasks.

**Keywords:** self-organized kettlebell training, cadets, higher education institution of the Aerospace Forces, pedagogical model, efficiency and endurance.

### Introduction

A sharp aggravation of the present military and political situation at the global level and the emergence of new threats to the national security of Russia call for new approaches to maintaining high levels of the combat readiness among the graduates of higher education institutions of the Aerospace Forces [12]. Under current conditions, these young people have to take on great responsibility for ensuring national safety. They are entrusted with important tasks that focus on the neutralization of enemy missile attacks. For the most part, military missions involve being on combat alert duty, the success of which is determined by a high level of stamina of officers in the Aerospace Forces. Therefore, it stands to reason that increasing the fitness level and stamina of graduates of higher education institutions of the Aerospace Forces remains one of the priorities throughout the training which aims to prepare them for effective combat alert duty and military service as a professional career [4,7,8, 9,12].

A level of the professional military endurance of graduates of higher education institutions of the Aerospace Forces must meet the standards stemmed from the specifics of combat alert duty. This type of combat duty requires speed and precision, timeliness and reliability, a long attention span despite fatigue, and task routineness [3-10]. In such a context, the physical training of Aerospace Forces officers should be directed at maintaining high levels of their stamina and endurance. Russian and foreign researchers have placed a great emphasis on the importance of incorporating kettlebell exercises into this training [1,2,3].

In view of this, the objective of the physical training of cadets of higher education institutions of the Aerospace Forces should be changed to include provisions related to the development of the skills required to self-organize kettlebell workout routines to maintain high levels of stamina and endurance. The physical training of cadets at higher education institutions of the Aerospace Forces should be oriented to developing the skills necessary for self-organizing kettlebell workouts while on combat alert duty to maintain high levels of stamina and endurance. However, military studies revealed that the readiness of graduates of higher education institutions of the Aerospace Forces is insufficient for them to organize their kettlebell workouts in a methodologically proper way. The most common mistakes in organizing the training of cadets at higher education institutions of the Aerospace Forces are their lack of methodological knowledge about the allocation of training loads and self-organization of kettlebell workouts to maintain high levels of stamina while on combat alert duty. This has a negative impact on the level of cadets' stamina and endurance when they are on combat alert duty [3,7,8,9].

All the above demonstrates that there is a need for new, more effective approaches to managing physical training at higher education institutions of the Aerospace Forces to improve the methodological readiness of cadets required for self-organizing kettlebell workout routines to maintain high levels of stamina and endurance.

In the meantime, instructors engaged in researching different aspects of the physical training of cadets at higher education institutions of the Aerospace Forces remain divided on the concept of “physical readiness” for combat alert duty and the role of the kettlebell sport in relation to maintaining stamina and endurance. Furthermore, neither training goals nor methods to maintain the stamina and endurance of cadets at higher education institutions of the Aerospace Forces have been defined yet.

Experience shows that the objectives of physical training are not met in a uniform training system and there are no basic criteria by which to assess graduates’ level of physical readiness for combat alert duty.

Science has yet to elicit the psychological and pedagogical conditions that ensure high levels of the physical conditioning of cadets at higher education institutions of the Aerospace Forces, and to substantiate a pedagogical model of the physical training of cadets of higher education institutions of the Aerospace Forces involving kettlebell exercises to keep high levels of their stamina and endurance. Thus, the importance of the present research stems from:

- firstly, great significance of high levels of stamina and endurance of graduates of higher education institutions of the Aerospace Forces on combat alert duty;
- secondly, a need for a substantial increase in the quality of the physical training of cadets at higher education institutions of the Aerospace Forces;
- thirdly, a reasonable necessity for the development of the skills required to self-organize kettlebell workout routines to maintain high levels of stamina and endurance of cadets studying at higher education institutions of the Aerospace Forces.

### **Materials and methods**

Nowadays, the physical training of cadets at higher education institutions of the Aerospace Forces is considered to be an important tool to improve their stamina. Yet, the requirements concerning the physical training of graduates indicate that there is a need for new means and methods of training. Specific conditions affecting professional military activities do call for a model of the physical training process involving kettlebell exercises. The core objective of the physical training of cadets at the higher education institutions of the Aerospace Forces should be to improve their performance capacity by using kettlebell exercises.

Reviews and analyses of pedagogical literature on the organization of physical training of cadets at higher education institutions of the Aerospace Forces allow for determining the most common forms and methods of developing a pedagogical model engaging kettlebell exercises. It makes it possible to define them clearly in order to address the problem of the present research.

Taken together, they help to optimize the process of physical training of cadets at higher education institutions of the Aerospace Forces on the basis of the following practices:

- 1) comprehensive approach to planning tasks related to the physical enhancement of cadets;
- 2) elaborating on tasks related to the organization of all forms of kettlebell workouts;
- 3) choosing the optimal content of the physical training with due regard to the specifics of kettlebell workouts;
- 4) choosing the most effective kettlebell training techniques and organizational forms that would help to solve the problem of improving the learning capacity of cadets;
- 5) implementing the individual, functional and differentiated approaches to the process of physical training and the kettlebell workout;
- 6) establishing the pedagogical conditions necessary for the successful solution to the given tasks.

Consequently, the timeliness of the validation of the pedagogical model of physical training for the cadets of higher education institutions of the Aerospace Forces involving kettlebell exercises is determined by:

- firstly, the great importance of high levels of stamina and endurance of graduates of higher education institutions of the Aerospace Forces in the context of a combat mission;
- secondly, the necessity for a substantial quality improvement in the physical training of cadets at higher education institutions of the Aerospace Forces;
- thirdly, a reasonable need for the development of the skills required for self-organizing kettlebell workout routines to maintain high levels of performance efficiency of cadets at higher education institutions of the Aerospace Forces.

Results of a number of studies suggest that such objectives can be met by developing a special model of physical training reflecting the special features of the professional military activities of different military experts.

To achieve the above-listed objectives, a pedagogical model was created aimed at developing the skills required for the self-organization of kettlebell workout routines by cadets of higher education institutions of the Aerospace Forces (Fig. 1).

The given model provided for the practices of instructors and cadets directed at the implementation of the adopted resolutions and achievement of the objectives of kettlebell training.

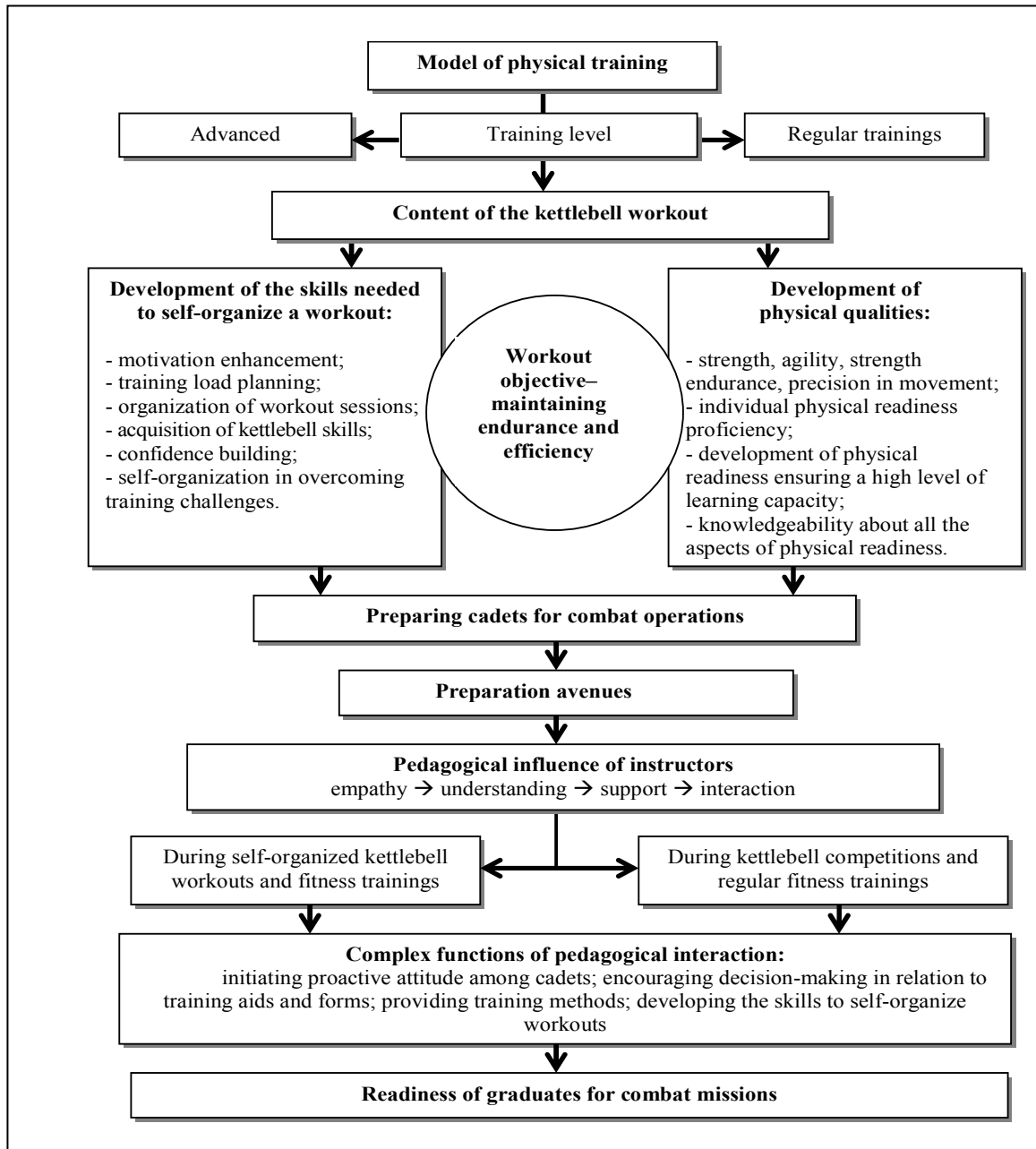


Fig. 1. Pedagogical model for developing the skills required by the cadets of the higher education institutions of the Aerospace Forces to self-organize kettlebell workout routines

The most efficient way to meet the current learning objectives is to utilize kettlebell training systems. Based on the above stated, a training information complex was developed to be employed as the dominant mode of learning and training for cadets. The complex was designed to teach cadets methods to arrange self-organized kettlebell workouts (Fig. 2).

The primary objective of this training information complex was to collect information on different aspects of arranging and conducting self-organized kettlebell workouts done by cadets of higher education institutions of the Aerospace Forces with the aim to enhance their performance efficiency and endurance.

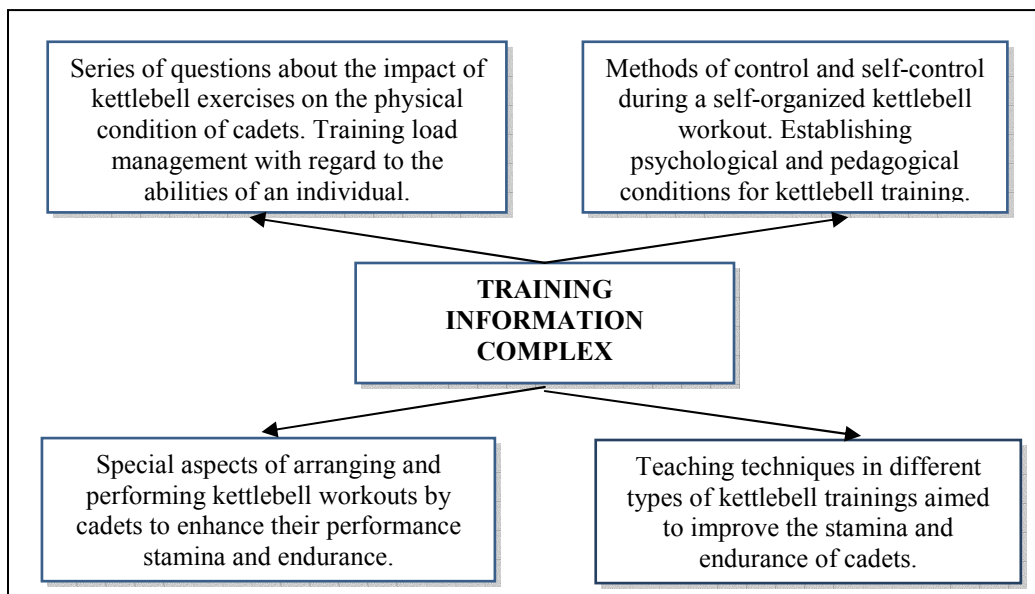


Fig. 2. Content of the training information complex designed to teach cadets of higher education institutions of the Aerospace Forces methods to arrange self-organized kettlebell workouts

The core idea behind the research and instructional methodology driving this complex was a systemic use of the principle objectives of kettlebell training to improve the performance efficiency and endurance of cadets.

The proposed complex was essentially an accumulation of modules interrelated in a certain cause-effect manner. The complex provided the information for meeting the current objectives concerned with the enhancement of stamina and endurance of cadets at higher education institutions of the Aerospace Forces with the aid of kettlebell exercises. The information content of the modules was oriented along the major avenues of teaching cadets of higher education institutions of the Aerospace Forces methods to arrange self-organized kettlebell workouts. Both software and infoware were developed with the help of experienced conditioning professionals. Their contribution allowed us to compile a sample list of subject matters to cover when teaching cadets of higher education institutions of the Aerospace Forces methods to arrange self-organized kettlebell workouts.

These subject matters exposed the content of information modules in regard to organizing and performing self-organized workouts and other training formats involving kettlebell exercises to improve the learning capacity of cadets.

The cadets of higher education institutions of the Aerospace Forces were offered some self-instructional lecture notes on different methods of self-organizing kettlebell workouts. Corresponding test questions, literature, training and video courses were prepared as well.

So, the introduced pedagogical kettlebell training model for cadets of higher education institutions of the Aerospace Forces aimed to develop the skills required for the self-organization of kettlebell workouts. It also ensured high levels of their learning capacity.

## Results and discussions

Preliminary research shows that an improvement of stamina and endurance of cadets studying at higher education institutions of the Aerospace Forces requires the unequivocal use of physical training aids. The performance efficiency of cadets of higher education institutions of the Aerospace Forces is determined by the indicators of academic achievement, which correspond to the objectives set in their curriculum. The primary indicators of performance efficiency are changes in the dynamics of the functional status and fitness shape of cadets, their academic progress, well-being, activity levels, mood, etc.

As the alert duty requirements to the physical fitness and endurance imposed on graduates of higher education institutions of the Aerospace Forces have been stepped up, easily available training aids have started to come to the fore. Kettlebells are a good example of such an aid. Our research results confirm high effectiveness of kettlebell exercises in enhancing the efficiency and endurance of military personnel.

Kettlebell training is especially important for graduates of higher education institutions of the Aerospace Forces since it helps to enhance their efficiency and endurance, which is of particular significance during actual combat missions. It is well known that the performance status of the officer changes depending on different variables – the time of day, the rate of the professional military activity and his or her fitness level. For this reason, the kettlebell training program aimed at maintaining the stamina and endurance of the officer of the Aerospace Forces should be designed with serious consideration given to the amount of training.

We are convinced that the choice of aids and methods of kettlebell training must accommodate the individual differences and readiness levels of graduates of higher education institutions of the Aerospace Forces. In fact, a lot of cadets studying at higher education institutions of the Aerospace Forces refuse to do physical exercises not because they are unaware of the importance of physical training, but due to a lack of interest in them. This may be caused by discrepancies between the physical actions of cadets and their individual physical and psychological abilities. The sport interests and skills of cadets of higher education institutions of the Aerospace Forces can be easily factored in their kettlebell training.

When determining the psychological and pedagogical conditions most favorable for enhancing efficiency and endurance of cadets at higher education institutions of the Aerospace Forces during their kettlebell training, particular regard must be paid to:

- expediency of the physical training provided to cadets at higher education institutions of the Aerospace Forces;
- determining appropriate training loads in accordance with cadet fitness levels;
- unequivocal use of different kettlebell training aids and methods to enhance the learning capacity of cadets;
- modeling various formats of kettlebell training to enhance the learning capacity of cadets;
- motivation and activity levels of cadets of higher education institutions of the Aerospace Forces engaged in kettlebell training.

We are of the opinion that kettlebell training should be pegged to the fitness dynamics among military personnel. This stipulation must find its way into the kettlebell training program. Kettlebell training requirements concerned with load planning were expressed in the form of the methodically validated technique of the load increase.

It is our view that the physical training to enhance efficiency, stamina and endurance of cadets during kettlebell workouts should be planned so that the training load could be increased gradually - the so-called principle of gradualness. In this way, the exercise load during kettlebell workouts grows steadily.

The physical training of cadets at higher education institutions of the Aerospace Forces complies with certain training programs. These programs impose restrictions of time and volume on physical training in general, and kettlebell training in particular. To overcome this contradiction, cadets were given the option to organize their kettlebell training by themselves.

In the matter of exercise and rest alternation, we held onto the conception according to which rest intervals between kettlebell training sessions should be determined by the precise interaction of fatigue and recovery processes in regard to a person's functional capacities. Then, the major stipulation on kettlebell training that uncovers the principle of gradualness was taken into consideration. In line with this principle, every subsequent training load should not precede a full recovery of the activated muscle functions. In other words, no training is to be planned before the strain of the last training session has disappeared completely.

Breaking the kettlebell training into short series of sessions is currently believed to be most beneficial as it allows for the summary effect, resulting in the cumulative enhancement of a person's functional capacities during a kettlebell workout. It is also noted that the alternation system of training should provide that major high-intensity workouts are performed only when cadets' performance capacity is completely restored.

This is a productive approach to follow in developing a kettlebell training program for cadets of higher education institutions of the Aerospace Forces.

Some studies point out that a high level of the general physical readiness of graduates of higher education institutions of the Aerospace Forces is an important indicator of their efficiency and endurance on combat alert duty. This is mostly due to the fact that kettlebell training contributes to improved efficiency and endurance and enhanced resilience to uncondusive impacts of the professional military activities on combat alert duty. It also balances out negative functional shifts in a person's body.

Although there is a great deal of studies on using different physical training aids, forms and methods to facilitate the development of the functional systems of military personnel, we failed to find any research into the best ways to improve the learning capacity of cadets studying at higher education institutions of the Aerospace Forces. Our literature review suggests that by utilizing certain kettlebell training aids to influence 'underperforming' functional systems, it is possible to successfully develop them and hereby enhance the overall endurance of the body.

To validate the pedagogical model of the kettlebell training of cadets of higher education institutions of the Aerospace Forces, it is of utmost importance to elicit the psychological and pedagogical conditions that determine the efficiency of this process. In order to achieve this research objective, it was decided to conduct a survey among conditioning experts, sports coaches, and the instructors of departments for physical training of higher education institutions of the Aerospace Forces.

Overall, 118 people took part in the survey. Its results are included in Table 1.

Survey respondents considered the systematic use of kettlebell exercises in all forms of the training available to cadets to be the key pedagogical condition. Cadets at higher education institutions of the Aerospace Forces tend to display different fitness levels. It is, therefore, critical to plan each cadet's training load in accordance with his level of physical fitness.

Table 1. Rank statistics of the psychological and pedagogical conditions required to improve the efficiency and endurance of cadets of higher education institutions of the Aerospace Forces with the use of kettlebell exercises (n=118)

Psychological and pedagogical conditions	Ranking index (%)	Ranking position (significance)
Systematic use of kettlebell exercises in all forms of the training available to cadets	20.3	1
Enhancement of cadets' motivation and interest towards the regular use of kettlebell exercises	18.8	2
Maintenance of competitiveness at training sessions, which requires cadets to manifest their volitional powers when doing kettlebell exercises	15.7	3
Development of the skills required by cadets to self-organize their own kettlebell workouts	13.1	4
Application of the individual approach to the organization of kettlebell training	11.9	5
Development of objective criteria used to assess the level of cadets' efficiency and endurance and determine the efficiency of professional military activities	9.3	6
Employment of various methodological techniques to enhance efficiency when organizing kettlebell workouts	6.2	7
Assessment of and provision for individual abilities of cadets during kettlebell workouts	4.7	8

Another very important condition is the enhancement of cadets' motivation and interest towards the regular use of kettlebell exercises. That is why these are kettlebell exercises that should be chosen from a broad variety of training aids. Furthermore, the training process should be organized so as to motivate every cadet to engage in kettlebell workouts.

Maintaining competitiveness at training sessions, which requires cadets to manifest their volitional powers when doing kettlebell exercises, is essential to improve their learning capacity. The fact is that only competitive activities can mold a person's volitional abilities.

Fostering the skills cadets need to organize their own kettlebell workouts is fundamental to the implementation of plans to promote physical development and learning capacity.

The application of the individual approach to the organization of kettlebell training and the development of objective criteria used to assess the level of cadets' efficiency and endurance and determine efficiency of professional military activities are also very important in ensuring the improved quality of the training offered to cadets at higher education institutions of the Aerospace Forces.

The implementation of the planned training activities made it possible to investigate performance index changes displayed by the cadets of the test groups during the pedagogical experiment. In addition, the cadets of the test groups were monitored to appraise their physical development, functional and mental status, and learning capacity. The analysis of the acquired data was mostly focused on the comparison of effectiveness of the developed pedagogical model of physical training and the ongoing academic program. On the completion of the pedagogical experiment, the indices for the functional and mental status, physical fitness and performance efficiency of the cadets were compared.

The research indicated that the greatest impact the pedagogical model of the physical training of cadets of higher education institutions of the Aerospace Forces involving kettlebell exercises had on the growth of speed-strength indices (pull-ups and 100-meter races).

Figure 3 below shows that there is a clear upward trend in numbers of pull-ups performed by the cadets of the experimental group (the red curve). Note: here and elsewhere in the study, the data collected from the experimental group is represented by the color red, while the data acquired from the control group is shown in blue.

The differences in test results are genuine – values of Student's t criterion are greater than 2.01 ( $p < 0.05$ ).

As for 100-meter races (Fig.4), it should be noted that the experimental group showed better results in comparison to the control group.

It is clear from the diagrams that kettlebell exercises performed on a regular basis lead to significant improvements in test results.

The differences in test results are genuine – values of Student's t criterion are greater than 2.01 ( $p < 0.05$ ).

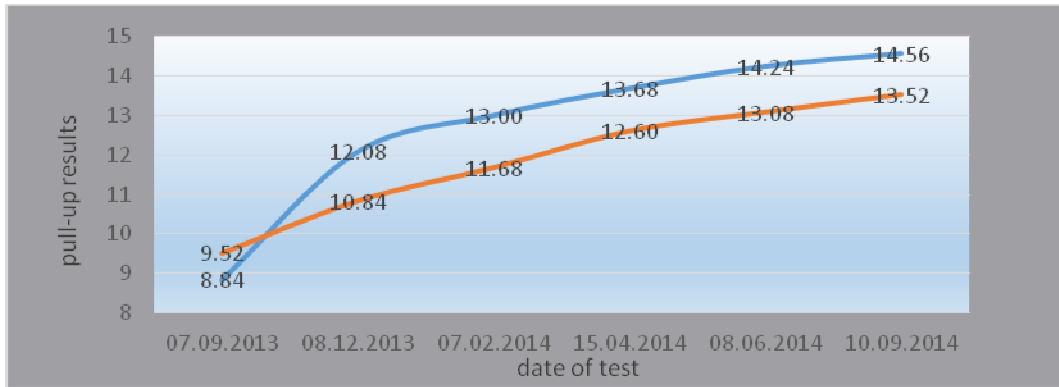


Fig. 3. Changing dynamics of pull-up results

Consequently, greater values of speed-strength developmental indices gained by the cadets of the experimental group allow for the conclusion that this phenomenon is primarily caused by the different content and methods of the physical training conducted in the test groups.

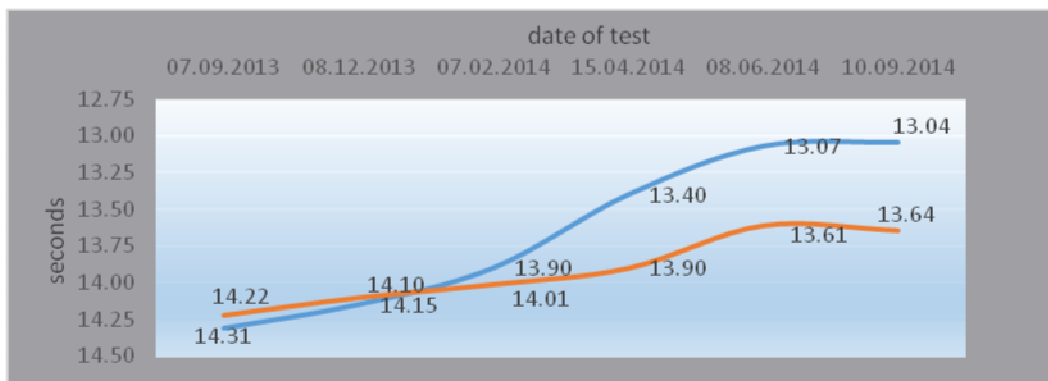


Fig. 4. Changing dynamics of 100-meter race results among cadets throughout the pedagogical experiment

The critical characteristic to consider when estimating the effectiveness of the developed pedagogical model of the physical training of cadets at higher education institutions of the Aerospace Forces involving kettlebell exercises turned out to be the endurance index (Fig. 5).

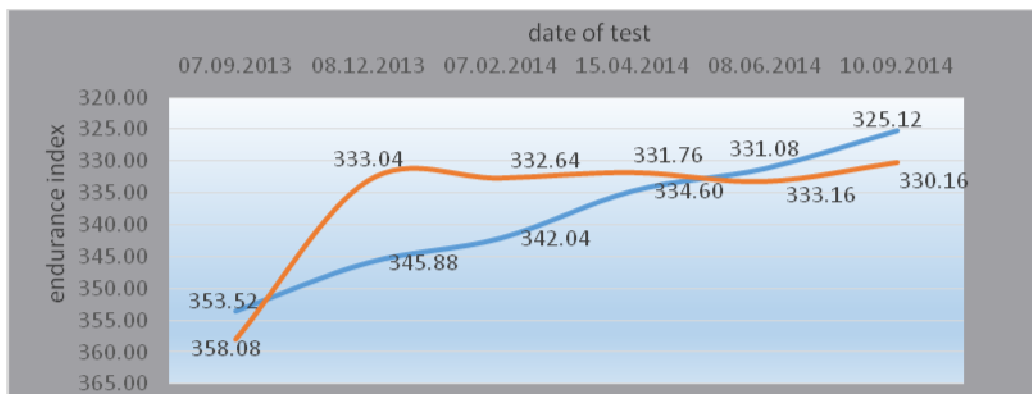


Fig. 5. Changing dynamics of the endurance index among cadets throughout the pedagogical experiment

The data acquired during the control exercise (3-kilometer race) was converted into seconds. Then, an endurance index was calculated, the difference between the time it took to complete the whole race distance and the time it would take if the runner maintained the speed at which he covered the short (reference) distance. The index was estimated by the formula:  $J = t - t_k \times n$ , where

$t$  – completion time, 3 km;

$t_k$  – completion time, short (reference) distance;

$n$  – number of short race distances constituting the whole race distance, in total.

Research has failed to identify any conclusive effect that weight or kettlebell training might have on the development of endurance among cadets. However, the desired result could be achieved if the cadets engaged in training sessions were fatigued. Our study has established that exhaustion exerts a significant impact on endurance development. The diagram illustrating changes in the endurance index indicates that there is an

upward trend in the development of endurance among the cadets of both the experimental and control groups (the endurance index declines). It is also worthy of note that at the start of the experiment, the endurance levels displayed by the control group were slightly higher than those displayed by the experimental group. They balanced out as the experiment proceeded. Alongside this, the results of the control exercise involving the 3-kilometer race were almost identical. At the final stage of the experiment, however, the endurance levels of the experimental group were found to be somewhat higher. The fact is that an endurance index has a strong correlation with the time needed to cover the short distance (100-meter race). In our case, this indicator showed better results in the experimental group than in the control group. It was ascertained that the results of the 3-kilometer race were nearly the same. All the above allows concluding that weight and kettlebell training has barely any impact on the development of cadets' endurance. This inference confirms the statistical significance of differences as determined by Student's t test. In our case, the tabulated value of t for p=0.05 is 2.01. The computed results were compared with the tabulated values to demonstrate that the differences among the means obtained in the course of the experiment are not significant.

There are no special control tests that military education institutions could use now to assess cadets' agility and flexibility. So, these characteristics have to be measured by the quality of cadet's performance in certain gymnastic exercises on the horizontal bar and parallel bars. The marks given to the cadet for the execution of these exercise are somewhat indicative of the developmental levels of these motor skills. It should, though, be noted that this kind of performance appraisal is of a fairly subjective nature and it utilizes a five-point grading scale to evaluate precision and correctness in the execution of a control exercise. As the marks were awarded by the instructors who did not have to adhere to any standard evaluation formats, the produced evaluation results may be perceived as lacking objectivity.

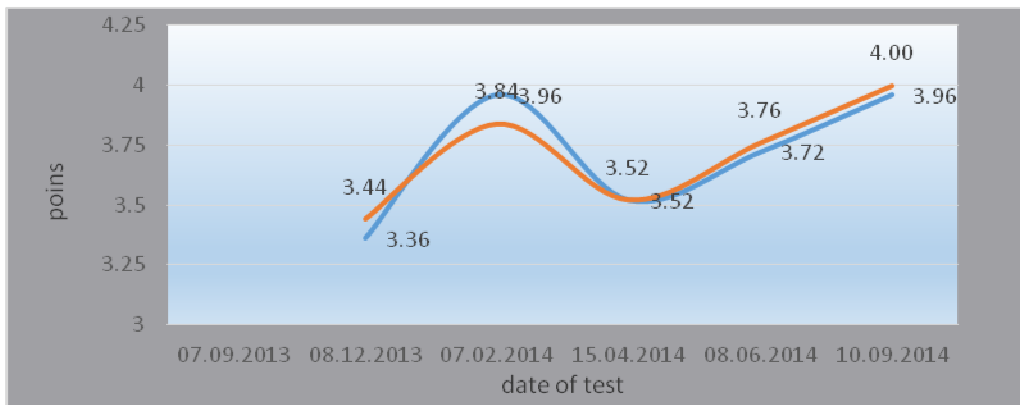


Fig.6. Changing dynamics in the assessment of endurance exercises on the horizontal bar and parallel bars throughout the pedagogical experiment

Our research has established that kettlebell training exerts no significant influence on the enhancement of agility performance among cadets (Fig.6). Nevertheless, it can be pointed out that kettlebell exercises using full ranges of motion promote ligamentous flexibility. Besides, kettlebell juggling undoubtedly results in improved athletic abilities related to agility development. Yet, the conditions and results of the pedagogical experiment are inconclusive about the impact kettlebell training might have on the effectiveness of agility and flexibility development among cadets.

This research was mostly focused on investigating the effect of kettlebell training on the learning capacity of cadets. The pedagogical experiment involved a comparative study of performance efficiency indices among the cadets of the test groups. Our analysis of the influence of kettlebell training on the performance capacity of cadets shows that both test groups experienced some positive changes (Table 2). These changes in the control group are attributable to the impact of the specific training provided by the higher education institution. Similar changes observed in the experimental group, in our opinion, may be explained by the impact of the pedagogical model of physical training involving the unequivocal use of kettlebell exercises. A greater, more significant, increase may be due to the impact of the experimental model of the physical training of cadets with the use of kettlebell exercises.

Table 2. Rating of learning capacity indices among cadets of the control and experimental groups (EG and CG) before and after the experiment (x±m) (points)

No.	Test parameter	Group	Initial index	Final index	Increase	P
1.	Mental alertness	EG	4.6±0.4	5.7±0.8	1.1	-
		CG	5.2±0.3	5.7±0.4	0.5	-
2.	Refocusing	EG	5.9±0.5	6.9±0.7	1.0	-
		CG	6.4±0.4	6.9±0.3	0.5	-



3.	Attention allocation	EG	6.0±0.6	7.6±0.3	1.6	-
		CG	6.5±0.4	7.2±0.3	0.7	-
4.	General memory	EG	5.2±0.2	7.0±0.3	1.8	p<0.05
		CG	4.8±0.2	5.5±0.3	0.7	-
5.	WAM (score)	EG	122.7±7.9	158.8±7.2	36.1	p<0.05
		CG	121.3±8.7	134.5±7.7	13.2	-
6.	Mental capacity	EG	6.6±0.2	8.1±0.3	1.5	p<0.05
		CG	6.7±0.4	6.9±0.3	0.2	-
7.	Cognitive consistency	EG	6.9±0.5	8.0±0.4	1.1	-
		CG	7.0±0.3	7.4±0.4	0.4	-
8.	Efficiency of mental operations	EG	7.0±0.2	8.0±0.3	1.0	p<0.05
		CG	7.0±0.4	7.3±0.4	0.3	-

The most pronounced effect was registered in relation to WAM, mental capacity, memory and the efficiency of mental operations, where changes were more significant ( $p<0.05$ ).

Since the main difference between the experimental and control groups was in the application of the pedagogical model of the physical training of cadets with the use of kettlebell exercises in the experimental group, the obtained results can be accounted for by the positive effects of the experimental program on the learning capacity of cadets studying at higher education institutions of the Aerospace Forces.

Better results achieved by the cadets of the experimental group in respect to leaning capacity enhancement allow for the conclusion that this phenomenon is primarily attributed to differences in training contents. Introduction of kettlebell exercises into the physical training program of the experimental group proved to be more effective. In view of this, kettlebell training, having the potential to improve the functional status and learning capacity of cadets of higher education institutions of the Aerospace Forces, is noticeably gaining significance at present. Our records indicate that kettlebell exercises are one of the most important means of enhancing performance efficiency and endurance. As a result, developing kettlebell training methods to optimize the motion patterns and efficiency of graduates of higher education institutions of the Aerospace Forces presents a major scientific challenge and opportunity for future investigative efforts. Our research has established the basics of kettlebell training. When exploring general ideas on the physical training of cadets at higher education institutions of the Aerospace Forces with the use of kettlebell exercise, it should be pointed out that the corresponding training goal has some specific features. It is understood that kettlebell workout routines are aimed at achieving high sports results. But the goal of using kettlebell exercise as part of the physical training of cadets was to adapt their functional abilities to intense learning activities. These exercise were directed at preventing adverse effects of professional military activities, maintaining the mental capacity, and optimizing the mental health of cadets studying at higher education institutions of the Aerospace Forces. Moreover, kettlebell workouts contributed to the development of the skills the cadets of the experimental group required to organize their own training.

Analyzing the causes and mechanisms of the impact kettlebell exercises exert on the enhancement of cadets' learning capacity, we came to the conclusion that by developing the neuromuscular apparatus in the course of training, we activate the entire nervous system, which results in improvements in the learning capacity of cadets. Research has revealed that the continuous and strenuous exertion of the same brain centers during intense learning activities evokes exhaustion. Kettlebell exercises make cadets switch to another activity, and therefore give tired cells an opportunity for rest. This tonifies the nervous system and, if considered in broader terms, eliminates the risk of mental disturbance during studies.

So, all the above demonstrates high efficiency of the created pedagogical model of the physical training of cadets of higher education institutions of the Aerospace Forces with the use of kettlebell exercises aimed to further develop their learning capacity and professional military readiness for combat operations.

Cadet references obtained within the first year of their military service as officers clearly show that those young officers from the experimental group who systematically engaged in kettlebell exercises demonstrated greater performance efficiency on combat alert duty. The data presented above is indicative of high efficiency manifested by the developed pedagogical model of the physical training of cadets with the use of kettlebell exercises.

## Conclusion

Our analysis of the impact exerted by kettlebell exercises on the learning capacity of cadets has shown that positive changes were exhibited by both test groups. They are due to the effects of the specific training provided by the higher education institution in regard to the control group, and to the influence of the developed pedagogical model of physical training in regard to the experimental group. The most pronounced effect was registered in relation to WAM, mental capacity, memory and the efficiency of mental operations, where changes were more significant ( $p<0.05$ ).

---

**References**

- Bakayev, V. (2015). Determining the significance of practical military skills applied by the special purpose regiments of the Internal Troops of the Russian Ministry of Internal Affairs to deliver combat objectives. *Journal of Physical Education and Sport*, 15(4), pp. 615-618.
- Bolotin, A.E., Bakayev V.V., Vazhenin S.A. (2015). Educational technology of using the system of Pilates for the prevention of spine disorders of female students. *Journal of Physical Education and Sport*, 15(4), pp. 724-729.
- Bolotin, A.E., Fernandez A.G.–A. (2011). Model of management of physical preparation in the army of Angola. *Proceedings of P.F. Lesgaft University*, №9 (79), pp. 164-169.
- Bolotin, A.E., Fernandez A.G.–A. (2011). Pedagogical conditions necessary for improvement of quality of process of physical preparation with Angolan military men Angola. *Proceedings of P.F. Lesgaft University*, №10 (80), pp. 185-187.
- Bolotin, A.E., Zaytsev O.S. (2012). Pedagogical model of ensuring readiness of graduates of higher education institutions of Air Defense (Air and Space Defense) to fighting activity. *Proceedings of P.F. Lesgaft University*, №9 (91), pp. 38-42.
- Bolotin, A.E., Zyukin A.V. (2014). Pedagogical model of formation of readiness of cadets of higher education institutions of BB of the Ministry of Internal Affairs of Russia to fighting activity, with use of means of fire and physical preparation. *Proceedings of P.F. Lesgaft University*, № 6 (112), pp. 75-79.
- Bolotin, A.E., Bukhanov A.V. (2013). Structurally functional model for the management of vocational training of staff of missile defense systems rescue formations. *Proceedings of P.F. Lesgaft University*, № 9 (103), pp. 30-34.
- Bolotin, A.E., Borisov S.A., Skripachev, A.V. (2014). Pedagogical model of the physical training of the cadets of higher education institutions of Air Defense with application of the training load rationing. *Proceedings of P.F. Lesgaft University*, № 9 (115), pp. 11-14.
- Bolotin, A.E., Skripachev S.A. (2014). Factors determining need of rationing of a training load during occupations by physical training of cadets of higher education institutions of Air Defense. *Proceedings of P.F. Lesgaft University*, № 5 (111), pp. 17-21.
- Bolotin, A. E., Bakayev V. V. (2015). Structure and content of the educational technology of managing students' healthy lifestyle. *Journal of Physical Education and Sport*, 15(3), pp.362-364.
- Bolotin, A. E. (2015). Pedagogical model for developing the professional readiness of cadets studying at higher education institutions affiliated with the GPS of the MChS with the use of physical training aids. *Journal of Physical Education and Sport*, 15(3), pp.417-425.
- Savchenko, O.A., Dubrovin D.A. (2015). Pedagogical model of physical training of cadets of higher education institutions of Military Space Forces with use of exercises with weights. *Proceedings of P.F. Lesgaft University*, № 8 (126), pp. 131-137.