

## Kettlebell lifting as a means of physical training of cadets at the higher military educational institution

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### Abstract:

The influence of the kettlebell lifting activities on the level of physical fitness level of cadets in higher military educational institution (HMEI) during the learning process was examined. Cadets in the 1<sup>st</sup>–5<sup>th</sup> year of study (n=474) who were studying according to the current system of physical training at a HMEI (group A, n=416) and cadets who were attending a kettlebell lifting class while the studying (group B, n=58) took part in the investigation. The level of physical fitness was examined via the following tests: 100 m of running, pulling up on a cross-beam, 3 km of running, overcoming an obstacle course (400 m), complex power exercise, forward inclination of the body in a seating position, holding the body in a horizontal position. The kettlebell lifting activities had the most prominent positive effect on the development of power qualities, static muscle endurance, endurance and flexibility. The cadets in the senior courses exhibited better test results compared with cadets who were studying according to the current system of physical training ( $P<0.05-0.001$ ).

**Keywords:** physical fitness, physical training, cadet, kettlebell lifting

### Introduction

Modern military professional activity of the graduate cadets of HMEI takes place under extreme conditions in environments with such unfavourable factors as constant being in a nervous and physical strain, exhausted and stressed; low physical activity during continuance of confined spaces (checkpoints, blindages); the carrying of heavy weight (weapon, munitions, ammunition); the necessity to act in night in any weather and in any place; the unstructured motion state and others. The influence of unfavourable factors causes significant negative changes in military men's organisms. Besides, the absence of systemic physical fitness training in combat operational zone and appropriate material resources leads to such consequences as metabolic disorder and body weight gain (getting overweight), decrease in the level of physical fitness and health deterioration, increasing injury rate (especially locomotor system), emergence of different diseases, deterioration in mental condition [1, 5, 7]. It leads to the necessity of improvement of physical training at HMEI.

In studies of a number of scientists [1, 2, 3] it is determined that the higher level of military man's physical fitness is, the more effectively his professional activities are, while the indicators of health and professionally important psychological characteristics preserve stability in the process of work, in comparison to military men with low level of physical fitness. The analysis of literary sources [4, 5, 10] revealed that the efficient means of cadets' physical training in HMEI, and also military men's ones during war fighting can be the kettlebell lifting, which has many advantages such as the absence of high material expenses; compactness of appliances; possibility of training in confined spaces and in the open; possibility of individual and group training; a wide range of easy and available exercises makes impossible adaptation to the exercises of the same type; possibility of training with military men with different physical fitness levels, high efficiency of physical, moral and volitional qualities' development, strengthening of back and all body muscles; prophylaxis of spine bone and joint injuries.

So, a number of studies [3, 4, 5, 9] determine that the kettlebell lifting training promotes development of strength, general and strength endurance, flexibility, physical coordination, increasing of physical capability, development of students' moral, volitional and psychological qualities. The optimal combination of the kettlebell lifting means and exercises focused on endurance development during the training process increases the level of students' physical capability. During physical and mental activity the kettlebell lifters get tired much later than their peer. The exercises with weights which are held with body bending in terms of multiply repetition are treated as running at a modest pace that promotes strengthening of cardiovascular and respiratory system. Bending pump effectively blood along the spine bone, that get it and all internals, which functioning depends on

the state of the spine bone, better. The exercises with weights have wholesome influence on the military men's muscles and osteoarticular system; conduce to improvement of body proportionality, form natural and right posture. The systematic exercises with weights increase the self-confidence develop such moral and volitional qualities as courage, self-determination, firmness, sense of purpose, moderation and will to win. The kettlebell lifting activity (systematic training and participation in contests) makes extra demands to organism, create the stressful situations and causes mobilization of cadets' organism reserves. Tense stressful situations of competitive activities stimulate development of personal moral and volitional processes, form his temper, teach to overcome difficulties firmly. The mental qualities are developing during the exercises with weights that considers the unity of influences on the motivational, intellectual, volitional, emotional and effective practical sphere of cadet that provides formation not only knowledge, abilities and skills, but also motives, needs, convictions of personality in advisability of his activity which is often connected with conscious coping with physical exercise. The volitional personal qualities which are brought up in the process of the kettlebell lifting training appear effectively in professional activities.

### Materials and methods

Four hundred seventy four cadets of Zhytomyr Military Institute named after S. P. Koroliiov in their 1<sup>st</sup>–5<sup>th</sup> years of study who were studying according to the current system of physical education at a HMEI (group A, n = 416) and cadets who trained in the kettlebell lifting class during the hours of sports activities (group B, n = 58) took part in the investigation. The level of physical fitness both of groups was examined.

The level of physical fitness was examined via the following tests: 100 m of running (speed qualities), pulling up on a cross-beam (strength qualities), 3 km of running (general endurance), overcoming an obstacle course (400 m) (coordination abilities, dexterity, special qualities), complex power exercise (dip ups during a minute and sit-ups during a minute) (strength qualities), forward inclination of the body in a seating position (flexibility), holding the body in a horizontal position (static endurance of body muscles). The examination of the exercises was held by the instructors of department of physical education, special physical training and sport during control matching (tests, examinations). During the researches the authenticity of difference between the indicators of cadets of groups A and B by means of Student's criterion has been determined. The dynamics of indexes in each of groups has been also estimated.

The aim of the article is to examine the influence of the kettlebell lifting activities on the indicators of physical fitness of cadets in higher military educational institutions in the learning process.

Research methods: theoretical analysis and generalization of scientific and methodical literature, pedagogical supervision, testing, methods of mathematical statistics.

### Results

The analysis of results in 100 m of running showed up that the cadets of the 1<sup>st</sup> year of study at the HMEI both of groups did not credibly differ from each other ( $P>0.05$ ) (table 1). The results of cadets of the 4<sup>th</sup> and 5<sup>th</sup> years of study who were studying according to the current system of physical education were properly better for 0.4 and 0.5 sec than results of cadets who were attending a kettlebell lifting class ( $P<0.05$ ). Analyzing the changes of speed indicators of cadets from each group separately, it is important to note that results in 100 m of running of group A in the 5<sup>th</sup> year for 0.9 sec credibly better than in the 1<sup>st</sup> year ( $P<0.001$ ). In the group B the results of the graduate cadets are also better than the results of cadets of the 1<sup>st</sup> year of study for 0.3 s, but the authentic difference is not revealed ( $P>0.05$ ) (table 1). The level of speed qualities of cadets of the 1<sup>st</sup> and 2<sup>nd</sup> years of study from group A is rated as a «good» grade, and in their senior academic years – as an «excellent» grade. The level of speed qualities in the group B is rated as a «good» grade in the all years of study.

The examination of results in pulling up on a cross-beam shows up that only in the 1<sup>st</sup> year of study the level of cadets' strength qualities both of groups did not credibly differ ( $P>0.05$ ) (table 1). In the 2<sup>nd</sup> year of study cadets from group B had better results than cadets from group A for 1.5 times, but the difference was not authentic ( $P>0.05$ ). In all other years of study the cadets who were attending a kettlebell lifting class had credibly better results than everyone who were studying according to the current system of physical education ( $P<0.05$ –0.001). So, in the 3<sup>rd</sup> year of study the difference between the results of cadets from group A and B was 3.1 times, in the 4<sup>th</sup> year – 4.6 times, in the 5<sup>th</sup> year – 5.8 times.

The analysis of results in 3 km of running demonstrated that the indicators of endurance development did not have authentic difference between cadets both of groups in the 1<sup>st</sup> and 2<sup>nd</sup> years of study ( $P>0.05$ ). Starting from the 3<sup>rd</sup> year the cadets who went in for the kettlebell lifting have credibly better results in 3 km of running in comparison to the results of the cadets who were studying according to the current system of physical education at a HMEI ( $P<0.05$ –0.01). So, in the 3<sup>rd</sup> year the group's B results dominate over the group's A for 29.5 sec ( $P<0.05$ ), in the 4<sup>th</sup> year – for 30.8 sec ( $P<0.05$ ), and in the 5<sup>th</sup> year – for 36.2 sec ( $P<0.01$ ) (table 1).

The examination of results in the exercise on the obstacle course (400 m) showed up that the indicators of group A and B were not credibly different in the 1<sup>st</sup> and 2<sup>nd</sup> years ( $P>0.05$ ). In the 3<sup>rd</sup> and 4<sup>th</sup> years the results of cadets from group B were properly better than the results of cadets from group A for 3 and 4.1 sec, but the

authentic difference was not found out ( $P>0.05$ ). In the 5<sup>th</sup> year the results of group B turned out to be better credibly for 5.1 sec ( $P<0.05$ ) (table 1).

The checking of the results in complex power exercise demonstrated that the cadets from group B, especially in their senior academic years, had properly better results than the cadets from group A for 10.5 times; 13.8 times and 18.1 times ( $P<0.05-0.001$ ) (table 1). The best results of cadets from both groups were set in the 5<sup>th</sup> year of study that means the improvement of the cadets' level of physical fitness in the process of studying at a HMEI ( $P<0.001$ ). However, the cadets' results from the group A in the 5<sup>th</sup> year were better than results of the 1<sup>st</sup> year for 12.3 times and in the group B – for 25.1 times.

Table 1. Changes of indicators of physical fitness of cadets who were studying according to the current system of physical training at a HMEI (group A, n = 416) and cadets who attending a kettlebell lifting class while the studying (group B, n = 58)

Year of study	Group A (n=416)		Group B (n=58)		The authenticity of difference
	n	X±m	n	X±m	
100 m of running, sec					
1 <sup>st</sup> year	62	14.6±0.12	16	14.5±0.13	P>0.05
2 <sup>nd</sup> year	112	14.3±0.08	9	14.4±0.16	P>0.05
3 <sup>rd</sup> year	91	14.0±0.10	14	14.3±0.13	P>0.05
4 <sup>th</sup> year	76	13.8±0.11	12	14.2±0.14	P<0.05
5 <sup>th</sup> year	65	13.7±0.12	7	14.2±0.16	P<0.05
Pulling up on a cross-beam, times					
1 <sup>st</sup> year	62	12.1±0.75	16	13.7±0.93	P>0.05
2 <sup>nd</sup> year	112	14.3±0.48	9	15.8±1.04	P>0.05
3 <sup>rd</sup> year	91	16.1±0.61	14	19.2±0.96	P<0.05
4 <sup>th</sup> year	76	17.3±0.72	12	21.9±1.02	P<0.001
5 <sup>th</sup> year	65	18.2±0.78	7	24.0±1.06	P<0.001
3 km of running, sec					
1 <sup>st</sup> year	62	789.3±8.19	16	795.2±13.42	P>0.05
2 <sup>nd</sup> year	112	757.4±7.66	9	729.4±13.17	P>0.05
3 <sup>rd</sup> year	91	735.2±7.93	14	705.7±12.10	P<0.05
4 <sup>th</sup> year	76	722.1±7.86	12	691.3±10.93	P<0.05
5 <sup>th</sup> year	65	717.8±7.34	7	681.6±11.21	P<0.01
Overcoming an obstacle course (400 m), sec					
1 <sup>st</sup> year	62	143.1±1.69	16	146.0±1.82	P>0.05
2 <sup>nd</sup> year	112	137.8±1.27	9	137.4±2.73	P>0.05
3 <sup>rd</sup> year	91	132.2±1.34	14	129.2±2.08	P>0.05
4 <sup>th</sup> year	76	126.9±1.30	12	122.8±2.65	P>0.05
5 <sup>th</sup> year	65	123.3±1.52	7	118.2±2.21	P<0.05
Complex power exercise, times					
1 <sup>st</sup> year	62	52.2±2.17	16	57.5±3.52	P>0.05
2 <sup>nd</sup> year	112	57.1±1.29	9	63.8±3.76	P>0.05
3 <sup>rd</sup> year	91	59.8±1.78	14	70.3±3.63	P<0.05
4 <sup>th</sup> year	76	62.4±1.93	12	76.2±3.27	P<0.01
5 <sup>th</sup> year	65	64.5±1.84	7	82.6±3.41	P<0.001
Forward inclination of the body in a seating position, cm					
1 <sup>st</sup> year	62	6.8±0.58	16	7.2±1.49	P>0.05
2 <sup>nd</sup> year	112	7.4±0.32	9	13.8±1.17	P<0.001
3 <sup>rd</sup> year	91	8.8±0.35	14	17.3±1.02	P<0.001
4 <sup>th</sup> year	76	10.2±0.43	12	18.2±0.91	P<0.001
5 <sup>th</sup> year	65	10.4±0.37	7	19.0±0.85	P<0.001
Holding the body in a horizontal position, sec					
1 <sup>st</sup> year	62	94.3±4.25	16	112.1±6.71	P<0.05
2 <sup>nd</sup> year	112	110.6±3.10	9	199.8±8.27	P<0.001
3 <sup>rd</sup> year	91	127.1±3.57	14	215.3±5.65	P<0.001
4 <sup>th</sup> year	76	136.4±3.13	12	221.9±5.42	P<0.001
5 <sup>th</sup> year	65	142.9±4.06	7	228.2±6.18	P<0.001

The achievement of high results in the kettlebell lifting besides strength and endurance demands the high level of development of flexibility, that is why a great deal of attention is given to developing of this quality in the cadets-kettlebell lifters' training process. The analysis of the cadets' results in forward inclination of the body showed up that the indicators are credibly better in the group B ( $P<0.05-0.001$ ) than in the group A in all years, except the 1<sup>st</sup> one. In the 2<sup>nd</sup> year the difference between indicators was 6.4 cm, in the 3<sup>rd</sup> year – 8.5 cm, in the 4<sup>th</sup> year – 8 cm, in the 5<sup>th</sup> year – 8.6 cm (table 1).

The analysis of the cadets' results in holding the body in a horizontal position strongly demonstrated influence of the kettlebell lifting activities on the strengthening of back and stomach muscles of the kettlebell lifters. So, starting with the 1<sup>st</sup> year the results in static exercise of the cadets from group B were credibly better than ones from group A. The difference between indicators of cadets from groups A and B was 17.8 sec in the 1<sup>st</sup> year; 89.2 sec – in the 2<sup>nd</sup> year; 88.2 sec – in the 3<sup>rd</sup> year; 85.5 sec – in the 4<sup>th</sup> year; 85.3 sec – in the 5<sup>th</sup> year (table 1).

### Discussion

The examination of results in 100 m of running showed up that the current system of physical training has more effective influence on the development of cadets' speed qualities in comparison to the kettlebell lifting training. It confirms our previous conclusions and the scientists' results, which mention the absence of correlation between the results in the kettlebell lifting and the indicators of speed qualities.

The analysis of the cadets' results in pulling up on a cross-beam demonstrated, that the level of strength indicators in both groups in all years is rated as an «excellent» mark and it is increasing in the process of study. But if the results of cadets of the 5<sup>th</sup> year of study are better than the results of cadets of the 1<sup>st</sup> year in group A for 6.1 times, then this difference in group B is 10.3 times. It means more pronounced positive effect of the kettlebell lifting activities on the level of strength qualities of cadets during study at a HMEI. The examination of results' changes in 3 km of running shows that the changes are positive in both of groups, but if the cadets of the 5<sup>th</sup> year in group A have credibly better level of endurance developing (11 min 58 sec) than the cadets in the 1<sup>st</sup> year (13 min 09 sec) for 1 min 11 sec ( $P < 0.001$ ), then this changes have more pronounced character in group B – the difference between the indicators of cadets of the 5<sup>th</sup> year (11 min 22 sec) and the 1<sup>st</sup> year (13 min 15 sec) is 1 min 54 sec ( $P < 0.001$ ). And the level of endurance developing of cadets from both groups in the 1<sup>st</sup> year is rated as «satisfactory» mark, in the group A in the 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> years – as «good» mark and only in the 5<sup>th</sup> year – as «excellent» one. In the group B in the 2<sup>nd</sup> – 5<sup>th</sup> years – an «excellent» mark, that means a positive effect of the kettlebell lifting activities on the level of endurance developing of cadets – future officers. The comparison of results in overcoming the obstacle course according to normative requirements demonstrates that in the 1<sup>st</sup> year the cadets from group A have results which are rated as a «good» mark, from group B – as «satisfactory» mark, in the 2<sup>nd</sup> year the results of both groups are rated as «good» mark, the results of cadets from group A in their senior academic years are rated as a «good» mark, and from group B – as an «excellent» one. It confirms the conclusions of many scientists' studies about a positive influence of the kettlebell lifting activities on the developing of all physical qualities and the improving of a special fitness of cadets [2, 3, 7, 10]. The analysis of the indicators of flexibility demonstrates that the difference between the results of cadets of the 1<sup>st</sup> and the 5<sup>th</sup> years is 3.4 cm in the group A and 11.8 cm in the group B that confirms our previous conclusions about positive influence of the kettlebell lifting activities on the level of cadets' flexibility developing. Examining the changes of the results in holding the body in a horizontal position discovered that the results of the cadets in the 5<sup>th</sup> year (2 min 23 sec) are better than the results of the cadets in the 1<sup>st</sup> year (1 min 34 sec) in the group A for 48.6 sec, and the difference between the indicators of static endurance of cadets of the 1<sup>st</sup> year of study (1 min 52 sec) and of the 5<sup>th</sup> year of study (3 min 48 sec) for 1 min 56 sec in the group B.

Therefore the analysis of the level of development of physical qualities of the cadets of HMEI in the process of study confirmed the many scientists' conclusions about various positive influences of the kettlebell lifting activities on the organism of cadets – future officers. The most expressed effect of the kettlebell lifting activities is on the developing of strength qualities, static endurance of body muscles, endurance and flexibility. The least influence of the kettlebell lifting activities is on the level of speed qualities – the results of the cadets in the senior academic years who were studying according to the current system of physical training are credibly better than the results of cadets who were attending a kettlebell lifting class.

### Conclusions

1. It is set that the kettlebell lifting activities had the most prominent positive effect on the development of power qualities, static muscle endurance, endurance and flexibility. The cadets-kettlebell lifters in the senior courses exhibited better test results compared with cadets who were studying according to the current system of physical training ( $P < 0.05-0.001$ ).

2. It is determined that the kettlebell lifting activities have more effective influence on the level of physical fitness of the cadets than the training according to the current system of physical training during the learning process in HMEI.

### References

- Griban, G. P., Romanchuk, S. V., Romanchuk, V. M. (2014). Physical education in military subunits, *ASV*, 540 p.
- Kyslenko, D., Prontenko, K., Bondarenko, V., Iukhno, Iu., Radzievskii, R., Prontenko, V., Kizyun, O. (2017). Development of the physical qualities of future specialists in protective activities due to the use of the kettlebell sport during studies. *Journal of Physical Education and Sport*, 17 (2), pp. 789–794.

- Kuzmin, A. A. (2003). Kettlebell sport: Iron sport for iron men. Methods of training by Andrey Kuzmin, *Ohio*, 60 p.
- Prontenko, V. V. (2006). The dynamics of growth of result in kettlebell sport depending on the power indexes of sportsmen, *Young sporting science of Ukraine*, 10 (2), pp. 350–353.
- Prontenko, K., Bezpaliy, S., Mihalchuk, R., Popov, S. (2014). Morfofunctional state of graduating cadets of higher military educational establishments, which went in for weight sport during studying. *Slobozhanskyi herald of science and sport*, 3 (41), pp. 92–98.
- Prontenko, K., Andreychuk, V., Martin, V., Prontenko, V., Romaniv, I., Bondarenko, V., Bezpaliy S. (2016). Improvement of physical preparedness of sportsmen in kettlebell sport on the stage of the specialized base preparation. *Journal of Physical Education and Sport*, 16 (2), pp. 540–545.
- Prontenko, K., Prontenko, V., Bondarenko, V., Bezpaliy, S., Bykova, G., Zeleniuk, O., Dvoretzky, V. (2017). Improvement of the physical state of cadets from higher educational establishments in the Ukrainian Armed Forces due to the use of the kettlebell sport. *Journal of Physical Education and Sport*, 17 (1), pp. 447–451.
- Prontenko, K., Griban, G., Prontenko, V., Bezpaliy, S., Bykova, G., Zeleniuk, O., Dvoretzky, V. (2017). Level and dynamics of functional preparedness indexes of kettlebell sportsmen. *Journal of Physical Education and Sport*, 17 (2). Pp. 712–716.
- Prontenko, K., Griban, G., Prontenko, V., Bezpaliy, S., Bondarenko, V., Andreychuk, V., Tkachenko, P. (2017). Correlation analysis of indicators of athletes' readiness and their competitive results in kettlebell sport. *Journal of Physical Education and Sport*, 17 (Supplement issue 4). pp. 2123–2128.
- Vatel, S., Gray, V. D. (2005). Kettlebells: strength training for power and grace, *New York Sterling Publishing*, 127 p.