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Original Article

Health improvement of cadets from higher military educational institutions during kettlebell lifting activities

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Abstract:
The influence of kettlebell lifting activities on the physical health level of cadets from higher military educational institutions (HMEI) during the study period was examined. Cadets in the 1st–5th year of study (n=474) who studied according to the current system of physical training at the HMEI (group A, n=416) and cadets who attended a kettlebell lifting class during the study period (group B, n=58) took part in the investigation. Physical health was investigated according to the H. L. Apanasenko method, which allows to determine the body mass index, the life index, the power index, Robinson`s index and the heart rate recovery time after dosed physical loading. The health level of cadets who attended a kettlebell lifting class during their 2nd–5th year was determined to be significantly better ($P<0.05$) than that of the cadets who studied according to the current system of physical training for 2.69–4.46 points (38.7–62.5%). This confirms the positive effect of kettlebell lifting activities on cadets` health improvement during the study period.
Keywords: physical health level, cadet, kettlebell lifting

Introduction

Health is one of the most vital human values. Strong constitution and high resistance to unfavourable factors of the environment are one of the most important requirements for the active longevity, successful studying, productive professional activities, personal and domestic happiness. Only physically, mentally and psychically healthy person can convert his or her opportunities the most effectively and feels a contributing member of society [1, 8].

According to the number of scientists, health is the most essential factor of implementation of individual's life program which considerably defines the social tasks` materialization [4, 6]. According to World Organization of Health Care, health is defined as human condition, which is characterized not only by the absence of diseases or physical defects but also by total physical, mental and social well-being [2, 3]. According to M. M. Amosov's definition, a person can be considered healthy if he or she has harmonious physical and mental development and is well adapted to physical and social environment [1]. The other scientists tell that health is the amount of reserves in the organism, the maximum effectiveness of the organs during maintaining boundaries of functions [2, 8, 9]. Based on the above we can state that just a health person is able to implement his or her physical and mental abilities and achieve their social destiny.

In the current context there is critical situation about the people's health condition because of sharp increase of disease incidence, increased mortality, genetic defections, crime rate degradation, pupils' and students' physical fitness reduction, negative occurrences intensification in the political, international areas and many other factors in Ukraine. Modern development level of society considerably actualizes scientific problems connected with looking for the ways of youth's health preservation and improvement.

In H. L. Apanasenko's studies safe level of physical health is determined to exist (at the boundary between the third and the fourth levels – according to the express-method it is 12 points), above which there is practically no endogenous risk factors of chronic somatic diseases' developing, diseases by themselves and the mortality from them. The scientist notice that the share of population that is at the safe health zone has reduced from 8 to 1% for the last 20 years in Ukraine [2]. Physical activities have a great importance for the health improving and disease prevention. Physical training and sport must provide an excellent health level, high effectiveness of military men's labour and full continuum of recreative and rehabilitation actions. One of the simple and affordable ways of physical training in military area is the kettlebell lifting activities that can have a positive influence on physical health of future army officers during the studying at the HMEI and the future work.

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Materials and methods

Four hundred seventy four cadets of Zhytomyr Military Institute named after S. P. Koroliov in their 1st–5th year of study who studied according to the current system of physical training at the HMEI (group A, n=416) and cadets who attended a kettlebell lifting class during the study period (group B, n=58) took part in the investigation.

The examination of physical health was held according to the H. L. Apanasnko method which is based on the anthropometry characteristics (body height, body weight, vital capacity, handgrip test) and also state of the cardiovascular system. The health level was evaluated in points and provided estimation of the body mass index, the life index, the power index, Robinson's index and the heart rate recovery time to output level after dosed physical loading (20 squats per 30 seconds). According to the Apanasenko method the low health level corresponded to 3 and lesser points, below the average – 4-6 points, the average – 7-11 point, above the average – 12-15 points, the high health level – 16-18 points.

During the researches the authenticity of difference between the indicators of cadets of groups A and B by means of Stydent's criterion has been determined. The dynamics of indexes in each of groups has been also estimated.

The aim of the article is to investigate the influence of the kettlebell lifting activities on the level of physical health of cadets of higher military educational institutions during the study period.

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

Results

The analysis of the height of the cadets at the HMEI showed that in all academic years there was no significant difference between the cadets of the respective groups ($P>0.05$) – the difference between the groups A and B does not exceed 0.4 cm. During the study period, the height of the cadets of both groups increased: in group A – for 1.5 cm, and in group B – for 0.9 cm, but there was not a reliable difference between the indicators of the cadets of the 1st and 5th years of both groups ($P> 0.05$) (Table 1). The conducted analysis shows that the trainings both according to the current system of physical education and in the kettlebell lifting group do not significantly affect the height rates of cadets in the process of studying at the HMEI.

The analyses of body mass index of cadets of HMEI revealed that there is no difference between the characteristics of cadets from the groups A and B in the 1st year of study ($P>0.05$). In the 2nd and senior years the cadets-kettlebell lifters have better body mass index than the cadets who were studying according to the current system properly for 0.57; 1.20; 1.13 and 1.35 kg/m^2, however the indicators do not differ from each other credibly ($P>0.05$) (Table 1).

The examination of body mass index changes in each group reveals that the group A had a credible performance degradation – the difference between indices of the 1st (23.60 kg/m^2) and the 5th (24.74 kg/m^2) years is 1.14 kg/m^2 and it is authentic ($P<0.05$). The body mass index of the cadets-kettlebell lifters of the 5th grade (23.39 kg/m^2) does not credibly differ from the cadets' of the 1st grade (23,40 kg/m^2) indices in the group B ($P>0.05$) that confirms the positive effect of the kettlebell lifting activities, in contrast to studying according to the current system of physical training, on the indices of physical development and health of future officers. The evaluation of body mass index reveals that according to the table of body mass index's grading its meaning is within normal range for the cadets of both groups and every year (18.50–24.99 kg/m^2). However, the analysis of index changes tendency of cadets from the group A due to the extrapolation method enables to state that the average meaning is going to fall outside the limits and equal overweight.

The analysis of the life index revealed that there is no credible difference between cadets from the group A and B in the 1st and the 2nd grade ($P>0.05$). In the 3rd grade the life index of the cadets-kettlebell lifters is credibly better than the cadets who were studying according to the current system of physical training for 6.22 ml/kg ($P<0.01$), in the 4th grade – for 7.83 ml/kg ($P<0.01$), in the 5th – for 7.85 ml/kg ($P<0.01$) (Table 1). The examination of life index changes during the study allows to notice the negative dynamics of index in the group A – the cadets of the 5th grade had worse results than cadets of the 1st grade for 0.99 ml/kg ($P>0.05$). In the group B we can see a tendency of the improving the life index during the study. So, the meaning of the life index is the best in the 5th grade (63.61 ml/kg) and credibly better in comparison to the 1st grade 7.80 ml/kg ($P>0.05$). According to the table of grading the life index is estimated as average in the group A of all years and the level of functional capability of respiratory system is evaluated as average for the cadets of the 1st and the 2nd grades and as above the average for the cadets of senior grades, that confirms our previous conclusions about positive effect of the kettlebell lifting activities on the characteristics of the cadets' respiratory system.

The investigation of the power index of cadets, which characterizes muscle system's abilities and is determined by ratio of the dynamometry indicator of stronger arm to the body weight, reveals that the meaning of power index of examining groups does not credibly differ in the 1st and the 2nd grade ($P>0.05$). The average meaning of the power index of the cadets from the group B is credibly better than from the group A in the 3rd grade for 8.31% ($P<0.01$), for 11.50% – in the 4th grade ($P<0.001$), for 15.75% – in the 5th grade ($P<0.001$) (Table 1). The analysis of the dynamics of the power index during the cadets' studying at the HMEI revealed

that the index is credibly improving in the process of studying in both of groups, but if the difference between the indicators of the cadets of the 5th and the 1st grades is 4.36% in the group A (P<0.001), then in the group B there is 19.26% (P<0.001), that means the positive influence of the kettlebell lifting activities on the future officers' health improving. The evaluation of the power index according to the system of grading demonstrates that the meaning of the power index corresponds to the low level for the cadets of all grades who were studying according to the current system of physical training at the HMEI, and the level of power abilities for the cadets-kettlebell lifters is estimated as below the average in the 2nd grade, the average – in the 3rd grade and above the average in the 4th and the 5th grades that emphasizes the advantage of the kettlebell lifting activities.

Table 1. Changes of indicators of physical health of cadets who studied according to the current system of physical training at the HMEI (group A, n = 416) and cadets attended a kettlebell lifting class during the study period (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	
Body mass index, kg/m^2					
1st year	62	23.60±0.36	16	23.40±0.51	P>0.05
2nd year	112	23.98±0.21	9	23.41±0.71	P>0.05
3rd year	91	24.44±0.25	14	23.24±0.56	P>0.05
4th year	76	24.45±0.30	12	23.32±0.62	P>0.05
5th year	65	24.74±0.31	7	23.39±0.73	P>0.05
Life index, ml/kg					
1st year	62	56.75±0.85	16	55.81±1.90	P>0.05
2nd year	112	56.20±0.69	9	58.94±2.31	P>0.05
3rd year	91	55.72±0.72	14	61.94±1.94	P<0.01
4th year	76	55.77±0.77	12	63.60±1.96	P<0.01
5th year	65	55.76±0.82	7	63.61±2.18	P<0.01
Power index, %					
1st year	62	55.06±1.14	16	55.91±2.49	P>0.05
2nd year	112	57.25±0.86	9	61.08±2.87	P>0.05
3rd year	91	57.84±0.92	14	66.15±2.62	P<0.01
4th year	76	59.23±0.97	12	70.73±2.53	P<0.001
5th year	65	59.42±0.99	7	75.17±2.11	P<0.001
Robinson's index, c. u.					
1st year	62	87.19±0.81	16	86.41±1.82	P>0.05
2nd year	112	86.23±0.65	9	83.36±2.38	P>0.05
3rd year	91	85.65±0.69	14	80.61±1.94	P<0.05
4th year	76	83.66±0.73	12	77.04±2.51	P<0.05
5th year	65	85.69±0.79	7	73.81±2.67	P<0.001
Heart rate recovery time after 20 squats per 30 seconds, s					
1st year	62	132.1±2.58	16	134.6±4.45	P>0.05
2nd year	112	125.6±1.96	9	117.5±4.37	P>0.05
3rd year	91	121.3±2.05	14	103.8±3.12	P<0.001
4th year	76	118.5±2.27	12	95.2±3.28	P<0.001
5th year	65	116.9±2.45	7	88.1±3.21	P<0.001

The analysis of the Robinson's index, which is defined by the product of the heart rate at rest and the systolic blood pressure, demonstrated that the authentic difference between indicators of the groups A and B in the 1st and 2nd years is not revealed (P>0.05). The cadets who were attending a kettlebell lifting class has the Robinson's index better than cadets who were studying according to the current system of physical training for 5.04 c. u. in the 3rd grade (P<0.05), for 6.62 c. u. – in the 4th grade (P<0.05), for 11.88 c. u. – in the 5th grade (P<0.001) (Table 1), that means the positive effect of the kettlebell lifting activities on the development and improvement of the functional abilities of the cadets' cardiovascular system during the study. Examining the changes of the Robinson's index in each group, we determined that the indicators were improving in the group A till the 4th grade (P<0.01), and they deteriorated in the 5th grade in comparison to the 4th one, and the meaning of the Robinson's index of the cadets of the 5th grade does not credibly differ from the cadets of the 1st grade (P>0.05), the difference is 1.5 c. u. In the group B we can see pronounced tendency to the improving of the functional abilities of the cadets-kettlebell lifters' cardiovascular system during the study – the indicators in the 5th grade is credibly better than in the 1st grade for 12.6 c. u. (P<0.001). The evaluation of the Robinson's index allows to state that the reserves of the functional abilities of the cadets' of both groups cardiovascular system