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Original Article

Changes in the body mass index of cadets at the higher military educational institution as a result of kettlebell lifting

KOSTIANTYN PRONTENKO[1], OLGA KUVALDINA[2], VOLODYMYR MARTIN[3], GRYGORIY GRIBAN[4], VASYL PRONTENKO[5], VOLODYMYR ANDREYCHUK[6]
[1, 5]Zhytomyr Military Institute named after S. P. Koroliov, Zhytomyr, UKRAINE
[2]Admiral Makarov National University of Shipbuilding, Mykolaiv, UKRAINE
[3]Lviv StateUniversity of Physical Culture, Lviv, UKRAINE
[4]Zhytomyr Ivan Franko State University, Zhytomyr, UKRAINE
[6]National Academy of the Army, Lviv, UKRAINE

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Abstract:
This article investigated the influence of kettlebell lifting exercises on indicators of physical development of cadets at the higher military educational institution (HMEI) during the study period. Cadets in their 1st–5th year of study (n=474) who were engaged in the current system of physical education at a HMEI (group A, n = 416) and cadets who trained in the kettlebell lifting group during the study period (group B, n = 58) took part in the study. Physical development was investigated on the basis of height, body weight, body mass index and the ratio of the number of cadets in each group that were overweight. The body weights of cadets in their senior academic years who trained via kettlebell lifting were significantly lower (P<0.05) than those of cadets who were engaged in the current system of physical education by 4.2–6.7%. Additionally, an analysis of the body mass index showed that the percentage of cadets who were overweight in group A during their 3rd–5th year was 35.2–38.5%, whereas there was a decrease in the number of cadets with excess weight from 25% during the 1st year to 8.3% during the 4th year in group B. During the 5th year for group B, none of the cadets were found to be overweight, which confirms the positive effect of kettlebell lifting exercises.
Keywords: height, body weight, body mass index, cadet, kettlebell lifting

Introduction

As scientists [2, 3] pointed out, besides the necessary professional knowledge, skills and abilities, a high level of physical and psychological readiness, excellent physical development and functional state of the basic systems of the organism of the graduating cadets of the HMEI – a future commander – is a guarantee of high combat readiness and combat capability of the Ukrainian Armed Forces. It has been proven that regulars and systematic physical exercises and sports are an important and integral part in the process of forming a physically trained and professionally prepared specialist [3, 6]. Kettlebell lifting as one of the simplest and most accessible means of physical training in the military environment can have a positive influence on the physical development and functional state of the basic systems of future officers both during their study in the HMEI and in the process of future service.

The analysis of the effect of kettlebell lifting exercises on physical development, the scientists [4, 5] found out that these exercises with kettlebells contribute to raising the level of health, esthetic self-improvement due to the proportionality and symmetry of muscles and the overall harmonic development of all muscle groups, body correction, including elimination shortcomings, recovery after injuries, increase of work capacity; the formation of harmonious physique. Scientists [1, 7, 9] indicated that a large number of exercises with kettlebells is performed with the inclination and straightening of the body which greatly contributes to the strengthening of the muscles of the back, shoulders, legs, abdominal press – the formation of a muscular corset accordingly preventing injuries in everyday life, military service, etc. According to the scientists [2, 4, 10] the use of means of kettlebell lifting in the educational process helps to eliminate various defects in the structure of the body, forms the correct posture, helps to reduce body weight, improves the functional status of the musculoskeletal and cardiopulmonary systems, gives confidence, optimism, promotes good mood.

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 were engaged in the current system of physical education at the HMEI (group A, n = 416)

Corresponding Author: KOSTIANTYN PRONTENKO, E-mail: prontenko-kostya@ukr.net

and cadets who trained in the kettlebell lifting group during the study period (group B, n = 58) took part in the study.

Physical development was investigated on the basis of height, body weight, body mass index and the ratio of the number of cadets in each group that were overweight. The norm of a body mass index for men under the age of 25 is 18.50-24.99 kg/m^2. If the index value is 25 kg/m^2 or more, the cadet is overweight.

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 kettlebell lifting exercises on indicators of physical development of cadets at the HMEI 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 investigation of body weight dynamics during the study at the HMEI showed that in the 1st year in both investigated groups the indicators did not differ significantly (P> 0.05). In the 2nd year the average body weight of kettlebell sportsmen (72.2 kg) was found to be lower than that of the cadets who were engaged in the current system (73.7 kg) by 1.5 kg, but a reliable difference between them was not revealed (P> 0.05) (Table 1). In the 3rd, 4th and 5th academic years, the weight of the cadets of group B is significantly lower than that of the cadets of group A by 3.7 kg; 3.7 kg and 4.4 kg respectively (P> 0.05) (Table 1).

Table 1. Changes in the height and the body weight of cadets who were engaged in the current system of physical education at the HMEI (group A, n = 416) and cadets who trained in the kettlebell lifting group (group B, n = 58)

Year of study	Group A (n=416)		Group B (n=58)		Authenticity of difference
	n	X±m	n	X±m	
Height, cm					
1st year	62	174.8±0.81	16	175.2±1.40	P>0.05
2nd year	112	175.3±0.56	9	175.6±1.52	P>0.05
3rd year	91	175.4±0.59	14	175.4±1.43	P>0.05
4th year	76	176.1±0.52	12	175.8±1.49	P>0.05
5th year	65	176.3±0.49	7	176.1±1.55	P>0.05
Authenticity of difference ($P_1 - P_5$)	P>0.05		P>0.05		
Body weight, kg					
1st year	62	72.1±1.02	16	71.9±1.15	P>0.05
2nd year	112	73.7±0.69	9	72.2±1.62	P>0.05
3rd year	91	75.2±0.77	14	71.5±1.27	P<0.05
4th year	76	75.8±0.82	12	72.1±1.30	P<0.05
5th year	65	76.9±0.93	7	72.5±1.89	P<0.05
Authenticity of difference ($P_1 - P_5$)	P<0.001		P>0.05		

The comparative analysis of body weight of cadets of the 1st and 5th year showed that in group A the indicators of the cadets of the 5th year (76.9 kg) are significantly worse than that of the cadets of the 1st year (72.1 kg) for 4,8 kg (P<0.001), and in group B the average body weight of the graduating cadets – kettlebell sportsmen – (72.5 kg) is not significantly different from the cadets of the 1st year (71.9 kg) (P> 0.05) (Fig. 1), which convincingly testifies to the positive influence of kettlebell lifting exercises on the physical development of the cadets in HMEI.

The analysis of the body mass index of cadets at the HMEI showed that in the 1st year there was no reliable difference between the cadets of groups A and B (P> 0.05). In the 2nd and senior academic years, the body mass index of cadets in group B was better than that of cadets who were engaged in the current system of

physical education at the HMEI (group A) by 0.57 kg/m^2; 1.20 kg/m^2; 1.13 kg/m^2 and 1.35 kg/m^2 respectively, however, the indicators do not differ significantly (P> 0.05) (Table 2).

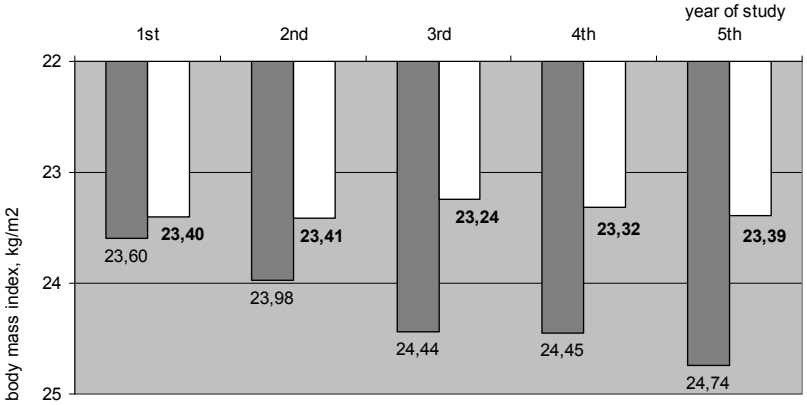

Fig. 1. Changes in the body weight of cadets who were engaged in the current system of physical education at the HMEI (group A, n = 416) and cadets who trained in the kettlebell lifting group (group B, n = 58), (n = 474), kg:

– cadets of group A;
– cadets of group B

The investigation of changes in the body mass index in each of the groups indicates that there was a significant deterioration of the index in group A – the difference between the indicators of 1st year cadets (23.60 kg/m^2) and the 5th year cadets (24.74 kg/m^2) is 1,14 kg/m^2 (P <0.05). In group B the body weight index of the 5th year cadets (23.39 kg/m^2) is not significantly different from those of the 1st year cadets (23.40 kg/m^2) (P> 0.05), which confirms the positive effect of kettlebell lifting exercises on indicators of physical development and the health of future officers compared to the current system of physical education (Table 2).

Table 2. Changes in the body mass index of cadets who were engaged in the current system of physical education (group A, n = 416) and cadets who trained in the kettlebell lifting group (group B, n = 58), kg/m^2

Year of study	Group A (n=416)		Group B (n=58)		Authenticity of difference
	n	X±m	n	X±m	
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
Authenticity of difference ($P_1 – P_5$)	P<0.05		P>0.05		

The assessment of the body mass index showed that according to the table of ranking of the body mass index the value of the index of both groups in all academic years is within the norm (18,50–24,99 kg/m^2). However, the analysis of the trend of index changes in group A by means of the extrapolation method gives the right to assert that in the future the average value will go beyond the norm and will correspond to «excess weight». The analysis of the ratio of the number of cadets in each group whose body mass index is estimated as «overweight» showed that in the 1st year in both groups the number of such cadets was approximately the same: in group A – 27.4%, in group B – 25% (Fig. 2). In the subsequent years in group A the number of overweight cadets increased while in group B it decreased. Thus, in group A in the 5th year 38.5% of the cadets are found to have overweight, and no one was found in group B, which confirms our preliminary conclusion about the positive influence of kettlebell lifting exercises on the reduction and maintenance of normal body weight (Fig. 2).

Discussion

The revealed trend of changes in the body weight and accordingly in the body mass index of the cadets of group A indicates that the current conditions of the study of cadets at the HMEI, which are characterized by large volumes of educational material, prolonged stay in the classroom and self-training in a forced sedentary position, low motor activity, neuro-emotional tension especially during the sessions, lack of physical training classes in the 5th year (in the 10th semester), a considerable separation of senior cadets from training during the periods of internship and practice in the troops, lead to an increase in the weight of the cadets especially in senior academic years. At the same time, training under the current system of physical education at the HMEI do not effectively affect the stabilization of body weight of cadets in the process of studying. The indicators of body weight of the cadets, who regularly and systematically attend training in kettlebell lifting, remain stable over the

entire period of the study. The body mass index is within the normal limits and remains unchanged in the study period. At the same time, the very essence of the kettlebell sport consists in the multiple exercises with kettlebells for a long period of time and requires a high level of endurance of cadets, promotes weight loss in the process of kettlebell lifting exercises. Moreover, the problems highlighted above (lack of physical training in the 10th semester, internships, practice, etc.) are quite effectively solved in the process of kettlebell lifting exercises through the simplicity, availability of exercises with kettlebells, a moderate size of sports equipment and other advantages of kettlebell lifting.

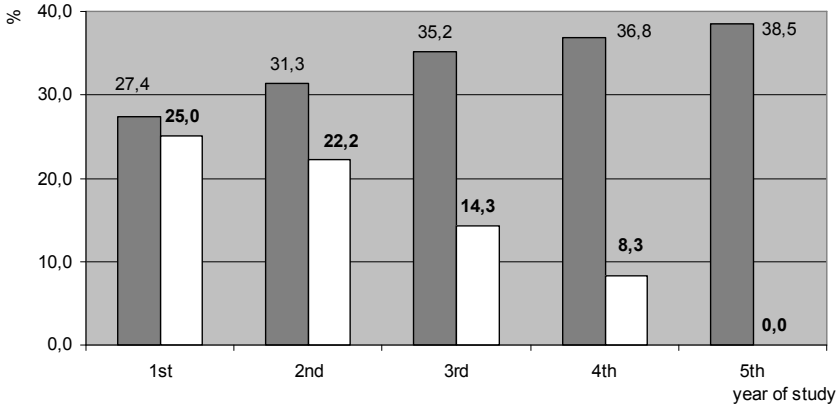

Fig. 2. The ratio of cadets of groups A and B who are overweight while studying at the HMEI (n = 474), %:
– the ratio of cadets of group A;
– the ratio of cadets of group B

Thus, according to the results of the conducted research, it has been established that kettlebell lifting exercises have a positive influence on the indicators of physical development of the cadets at the HMEI in the process of studying.

Conclusions

1. It has been established that the body weight of cadets in their senior academic years who trained in kettlebell lifting were significantly lower ($P<0.05$) than those of cadets who were engaged in the current system of physical education by 3.7–4.4 kg, which corresponds to 4.2–6.7%.

2. An analysis of the body mass index showed that the percentage of cadets who were overweight in group A during their 3rd–5th year was 35.2–38.5%, whereas there was a decrease in the number of cadets with excess weight from 25% during the 1st year to 8.3% during the 4th year in group B. During the 5th year for group B, none of the cadets were found to be overweight, which confirms the positive effect of kettlebell lifting exercises.

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