UNIWERSYTET HUMANISTYCZNO-PRZYRODNICZY IM. JANA DŁUGOSZA W CZĘSTOCHOWIE
Sport i Turystyka. Środkowoeuropejskie Czasopismo Naukowe 2023, t. 6, nr 1

http://dx.doi.org/10.16926/sit.2023.01.07

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Effectiveness of various physical activity programs in increasing functional capabilities of young females

How to cite [jak cytować]: Sliusarchuk V., Iedynak G., Galamanzhuk L., Mykhalskyi A., Yurchyshyn Y., Prozar M. (2023): *Effectiveness of various physical activity programs in increasing functional capabilities of young females*. Sport i Turystyka. Środkowoeuropejskie Czasopismo Naukowe, vol. 6, no. 1, pp. 119–135.

Skuteczność różnych programów aktywności fizycznej w zwiększaniu funkcjonalności młodych kobiet

Streszczenie

Możliwości funkcjonalne są istotne dla funkcjonowania zawodowego oficerów, zwłaszcza młodych oficerek. Konieczne jest poszukiwanie najskuteczniejszych programów aktywności fizycznej

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wpłynął do redakcji: 25.02.2022 r.; przyjęty do druku: 11.11.2022 r.

poprawiających możliwości funkcjonalne. Dlatego niniejsze badanie miało na celu porównanie skuteczności dwóch programów aktywności fizycznej młodych kobiet podczas pierwszego roku szkolenia w akademii wojskowej. W badaniu wzięło udział łącznie 129 młodych kobiet w wieku 17–18 lat. Do grupy eksperymentalnej włączono 21 uczestniczek, do kontrolnej zaś 108. Każda grupa różniła się interwencją związaną z aktywnością fizyczną stosowaną w ciągu roku nauki. Do pomiaru efektywności interwencji zastosowano pomiar tętna (HR), ciśnienia krwi (BP), wskaźnik pojemności życiowej (VCI), siłę izometryczną (IMIS), wskaźnik testu Ruffiera (RTI) i wskaźnik Robinsona (RI). Wszystkie badane parametry fizjologiczne uległy poprawie w obu grupach, jednakże grupa eksperymentalna osiągnęła znacznie większą poprawę niż grupa kontrolna w pięciu z ośmiu parametrów (HR, 4,5%; VCI, 15,4%; IMIS, 12,6%; RTI, 16,9%; RI, 5,0%). Podsumowując, w grupie eksperymentalnej zastosowana interwencja zapewniła bardziej znaczącą poprawę możliwości funkcjonalnych. Wskazane jest wykorzystanie opracowanego modelu w praktyce aktywności fizycznej podchorążych podczas szkolenia w akademii wojskowej w celu poprawy ich możliwości funkcjonalnych.

Słowa kluczowe: aktywność fizyczna, parametry doświadczenia, kadetki, cechy funkcjonalne.

Abstract

Functional capabilities are important for professional activities of officers, especially young female officers. It is necessary to identify the most effective physical activity programs to improve functional capabilities. Therefore, this study aimed to compare the effectiveness of two physical activity programs for young females during their first year of training at a military academy. A total of 129 young females aged 17–18 participated in this study. Twenty-one and 108 charges were included in the experimental and control groups, respectively. Each group differed in terms of the physical activity interventions used during the year of learning. The outcome measures included heart rate (HR), blood pressure (BP), vital capacity index (VCI), isometric strength (IMIS), Ruffier test index (RTI) and Robinson index (RI). All studied physiological parameters improved in both groups; however, the experimental group achieved a significantly higher improvement than the control one in five of the eight parameters (HR, 4.5%; VCI, 15.4%; IMIS, 12.6%; RTI, 16.9%; RI, 5.0%). In conclusion, the intervention used in the experimental group provided a more significant improvement in functional capabilities. It is advisable to use the developed model in the practice of cadets' physical activity during training at a military academy to improve their functional capabilities.

Keywords: physical activity, experiment parameters, cadets, functional features.

Introduction

Preparing young females for professional activities that take place in military academies involves large amounts of physical activity [20]. This feature is typical not only for military academies of Ukraine but also for the educational institutions of countries whose armies are members of the North Atlantic Alliance [4, 11, 18, 28]. This applies to both male and female cadets [14, 16]. They use physical activity to perform different tasks. In particular, this applies to maintaining health, preventing overload and harmful effects of physical activity during various professional tasks [1, 11, 18]. Low levels of physical activity also lead to prob-

lems with cadets' annual physical tests and their level of physical fitness [24, 25]. In connection with this, the paper focuses on finding new approaches to the organization, formation of the physical activity content of young females, and its implementation in various forms during their studies at the Military Academy [13, 26].

It is also important to positively influence the indicators of physical fitness, the functionality of cadets, and servicemen for the successful performance of professional tasks [8, 21]. In particular, these authors recommended paying more attention to the development of functional capabilities of the muscular system, namely concentrating on the development of muscle groups of the upper extremities and strength endurance in a dynamic mode. One of the leading reasons for increased attention to the study of functional capabilities is that they are an important component of an individual's willingness to perform professional tasks, which determine the military [19, 23, 29, 30]. Therefore, it is particularly important to consider the physiological features that characterize male and female bodies [9, 15, 31, 33]. Such knowledge helps to increase efficiency in solving various professional tasks and establishes the risk degree of harm to the body during training and physical activity [8, 11]. In connection with the latter, it is important to know the influence of different parameters of physical activity on the physiological characteristics of young females during their studies at the military academy. Therefore, the purpose of this study was to compare the effectiveness of two physical activity programs used to increase the functional capabilities of young females during the first year of training at a military academy.

Materials and Methods

Participants

The subjects of the study were the physiological parameters of young females who used various physical activity programs during their first year of training at the military academy. A total of 129 young females participated in this study. Of these, 21 young females were included in the experimental group (E), and the remaining 108 were included in the control group (C). Group E included young females who started studying at the academy in Lviv (Ukraine) at the beginning of this study. Group C consisted of young females who started studying at the academy in Lviv (40 participants), Khmelnytskyi, Ukraine (37 participants), and Zhytomyr, Ukraine (31 participants) one year earlier. Groups E and C were formed based on the results of random sampling. For all young females who fulfilled the criteria of "age", namely, it had to be in the range from 17 years and

3 months to 18 years and 5 months, the indicated number of young females was chosen.

Study Protocol and Interventions

The study included a comparison of the young females' results after using different physical activity programs during their spare time. In group E, such a program included: in September, 12 lessons of 60 minutes each, in October – 13 lessons of 75 minutes, and from November to June – 3 lessons of 90 minutes each week. Such an approach is necessary to ensure a gradual increase in physical load against the background of adaptation of the body to the previous load [31, 32, 34]. The preparatory part of the 60-minute class lasted 5–11 minutes, namely: in the first and second classes it was 11 minutes, in the next two – 10 minutes, then in the following two – 9 minutes, etc.; in the eleventh lesson, the duration was 6 minutes, in the twelfth – 5 minutes. Simultaneously, with each new decrease in the duration of the preparatory part, the length of the main part increased by the same amount within 45–50 minutes. The final part of such classes was practically the same and lasted for 4–5 minutes. An increase in time was required for the coach to provide the necessary recommendations. The physical load parameters during the 5- and 4-minute final parts did not differ.

The preparatory part of the classes held in October (75-minute class) was 7–12 minutes long. A gradual decrease in the time of the preparatory part and an increase in the time of the main part by a similar amount occurred in the same way as during the 60-minute classes; this part lasted from 57 to 61 minutes. The final part of such classes was practically the same and lasted for 6–7 minutes.

Regarding classes in November, which lasted 90 minutes, the preparatory part took from 15 to 20 minutes, the main one took from 62 to 65 minutes, and the final part took from 8 to 10 minutes. The duration of the preparatory and main parts was changed on the same basis as during the 60- and 75-minute classes. For the "December-May" period, each 90-minute class included 15 minutes for the preparatory part, 67 for the main part, and 8 for the final.

The preparatory part of the training in group E consisted of walking, running at a slow pace, and a set of exercises (two exercises each for the muscles of the upper limbs, trunk, and lower limbs). Exercises and dosages corresponded to those recommended by special documents [20] and researchers [7, 8, 12, 32]. Thus, in September, 60-minute classes were held, and walking and running were performed for 5 minutes during the first six training sessions. An execution of set exercises was reduced from 6 to 4 minutes. There were six exercises like that, the performance of each – 8 repeated maximums and the rest of them took place during the transition of the young females from one exercise to another. The duration of the complex performance was reduced owing to the increase in

the pace of each exercise as a result of adaptation to the load. During the seventh and eighth classes, 8 minutes of the preparatory part were performed as follows: 3 – running at a slow pace, but with an increase in speed by 15% compared to that used in the previous classes; 5 minutes to perform the same exercises for eight repeated maximums, but with a 10% decrease compared to that used in previous classes. During the ninth-tenth 60-minute classes, walking and running were performed for 3 minutes, throughout the eleventh class – 2, during the last twelfth class – one; the set of exercises in all these classes was performed for 4 minutes.

In October, when the girls had 75-minute classes, walking and running were used for 5 minutes during the first six. The time for performing a complex of exercises was reduced: the first and second class – 6 minutes, the third-fourth – 5 minutes, the fifth-sixth – 4. The number of exercises was the same as in September training, but the dosage of each was increased to 10 repeated maximums as a result of adaptation. Starting from the seventh class, the set of exercise workouts was performed for five minutes, and the duration of walking and running was reduced, but at the same time, the speed of their performance increased. Thus, during the seventh and eighth classes of the 9-minute preparatory part, the young females walked and ran for 4 minutes, throughout the ninth and tenth – 3 minutes, and the eleventh to thirteenth 75-minute classes – 2.

In November, when the young females started using 90-minute sessions, the first six walks and runs lasted 6 minutes. The time for performing an exercise complex decreased: the first and second classes – 14 minutes, the third and fourth – 13 minutes, the fifth and sixth ones – 12. The number of exercises was increased to nine (two for the muscles of the upper limbs, four for the trunk, and three for the muscles of the lower limbs), and the dosage was increased to 12 repeated maximums. Starting from the seventh workout, the set of exercises was performed for 12 minutes, the duration of walking and running was reduced, but the speed of their performance – increased. Therefore, in the seventh and eighth 17-minute lessons, during the preparatory part, the young females walked and ran for 5 minutes, during the ninth and tenth 16-minute lessons – 4, and during the eleventh and twelfth 15-minute lessons – 3.

The content of the main part of the training in Group E was aimed at increasing the functional capabilities of young females during the first year of training at the military academy. This result was evidenced by the improvement in the physiological parameters to the highest possible level. In this regard, the basic amount of load in the physical activity program of group E ensured a heart rate (HR) of 150-170 bpm-1. To achieve these various variants of Body Workout fitness training, adaptation was taken into account. So, during the 60-minute classes that took place during the first (September) month of training at the academy, it was the “26 Mins Full Body Aerobic Workout” option. During the 75-

minute classes (October), the girls used the "45 Mins Full Body Aerobic Workout", and during the 90-minute classes in November – the "60 Mins Full Body Aerobic Workout". Specifying the load parameters, we note that during the first six 60-minute classes, the main part involved the performance by all young females of a series combining 40 hand movements, both hands, and feet (mostly). In the first two and the third exercise set, each one of the movements was performed with the following number of repeated maximums: the first two exercises – 8 and 12, respectively, the third and fourth exercise – 10 and 15, the fifth and sixth exercise – 12 and 18. There was a rest between the execution of these exercise sets, which lasted, depending on the rate of HR recovery, from 45 to 60 seconds.

During the seventh lesson, the girls performed 50 movements with the upper limbs, 40 with the legs, and 40 with both legs and hands; during the eighth lesson, 50, 50, and 40 movements, respectively; and during the ninth lesson, 50 movements were performed in each specified complex. At the same time, in all these classes, the number of repeated maximums of each movement was as follows: in the complex of hand movements, with the simultaneous involvement of arms and legs – 8 each, whereas in the complex of leg movements – 12. In the next classes, each specified complex involved the performance of 50 movements, the number of repeated maximums as follows: the tenth lesson – in a complex of hand movements, with simultaneous involvement of arms and legs – 8 each, in a complex of leg movements – 12; the eleventh lesson – 10 and 15, respectively, the twelfth lesson – 12 and 18. There was no rest between the sets of movements.

During all 75-minute classes, the young females in group E performed two series, each of which combined a complex of movements with hands, simultaneously with hands and legs (mainly). Other dosing parameters were the same as those in the previous sessions, except for the length of the rest between the two sets. Such a rest was aimed at almost complete recovery of HR, which lasted up to 120 seconds.

During November 90-minute classes, the young females of group E performed three series, and during the other 90-minute classes (December-May) – four series; each combined a set of movements with hands, simultaneously with hands and feet, mostly with feet. Other dosage parameters were the same as those in the previous sessions, except for the duration of the rest between these sets. Thus, with three series, the duration of the rest was as follows: after the first series, 90 s; after the second, 120 s. With four series, the length of the rest was as follows: after the first – 90 seconds, after the second – 110 seconds, after the third – 120 s; in the last week of each month, the rest after each series was reduced by 10 seconds. Exercises specified by the physical education curriculum at the military academy were widely used here [20]. These were gymnastics,

track and field exercises, elements of swimming, exercises for movement on skis, hand-to-hand combat, overcoming an obstacle course, and sports games, most of them were also performed with additional weights (dumbbells 1–1.5 kg, rubber band).

In the final part of each 60-minute session, the girls in group E performed one or two exercises to relax the muscle groups that were most involved in training, one or two exercises to stretch these muscles in a static mode for 15–20 seconds, and one breathing exercise. The number of these types of exercises during the 75-minute classes was one-two, three and one, respectively, whereas during the 90-minute classes – two-three, four and one. All exercises were performed at a slow pace with almost no rest.

It should be noted that in group C, some aspects of the physical activity program were used by young females during free time from school, in particular, in some organizations. Exercises in the main part of the classes differed from those used in group E. Thus, each young female in group C chose how she wanted to organize this type of physical activity in her free time, specifically, she could train in a team or individually. In the latter case, the young female formed a set of exercises to solve the task of increasing her functional capabilities. While performing physical activity in a team, the main part of the lesson included a sports game chosen by the majority of the young females in the team as a means of physical activity. As can be seen, in both cases, such an activity was not mandatory, and the main emphasis was placed on young females' desire to do it in their free time from studying. As for the number of classes during the academic year, their duration, and the load of parameters used, it can be noted that they were consistent with those used in group E.

Outcome measures

To obtain data on the physiological parameters of the young females, necessary tests were conducted. They took place at the beginning (September) and end of the experiment (June, the end of the academic year at the military academy). Intermediate testing was not carried out because the task of this work was to obtain an overall picture of the effectiveness of experimental and current programs of physical activity of the young females in their free time from studying in increasing functional capabilities during the first year of training at the military academy. The studied parameters were related to the activity of the cardiovascular, respiratory, and neuromuscular systems of the young females. Well-known functional tests recommended by the American College of Sports Medicine [2] and researchers, including O. Bar-Or and T. Rowland [6], J. Wilmore, D. Costill, L. Kenney [33], and others. The outcome measures used included blood pressure (SBP and diastolic DBP), heart rate (HR), vital capacity

(VC), Ruffier index (RTI), Robinson index (RI = SBP x HR /100); vital capacity index (VCI = VC/body mass), and index maximum isometric strength (IMIS = maximum isometric strength/body mass). All the requirements were met during the tests. In this case, HR reflected the state of the heart, and together with blood pressure and RI, the state of the cardiovascular system at rest; the value of VC indicated the ability of the lungs to receive oxygen, and the value of VCI indicated the state of the respiratory system in terms of a full supply of oxygen to the body. The value of IMIS allowed for the assessment of the state of skeletal muscle development in the young females, which indirectly indicates the state of excessive accumulation in the muscles of structural and energy potentials that increase their working capacity. We used certified equipment: to determine the blood pressure – Santamedical Adult Deluxe Aneroid Sphygmomanometer, to determine the IMIS – handgrip Camry dynamometer, to determine the VCI – NDD EasyOne Plus System 2000-2 spirometer. Before the commencement of the research, we obtained permission to participate in the study from each young female and her parents. The data for the study were the quantitative values of the functional samples. Each year, each of the studied characteristics was set to its default values and then compared to those obtained at the beginning and end of the first year of study. Thus, we determined the increase or decrease in the value of a particular functional characteristic or its manifestation at the achieved level. The organization of the study considered the provisions of the World Medical Association on the ethical principles of medical research with human participants.

Data analysis

All statistical analyses were performed using SPSS Version 20. For each parameter the following calculations were performed: mean (M), standard deviation (SD), Kolmogorov-Smirnov Test (KS), and when necessary – the value of *Z*. The latter allowed us to determine the Mann-Whitney *U* test, which was used in case when applying Student's *t*-test for dependent and independent samples was not possible. The reason for using the latter was that the distribution of values of the indicator in the sample was different from normal. The 0.05, 0.01, and 0.001 probability levels were used to indicate statistical significance.

Results

Before the analysis of the researched groups' data obtained at the beginning and end of the pedagogical experiment, the correspondence of the distribution of the values of each parameter to the normal distribution was determined. The result of the K-S Test proved the lack of normal distribution for some character-

istics at the beginning of the study. In Group E, this was SBP, in group C, SBP, DBP, and VC. A similar result was obtained at the end of the experiment, where in group E, SBP and DBP values differed from the normal distribution. In Group C, a feature similar to that of DBP and VC was noted. These results were considered when determining the discrepancy between the means of two independent or dependent samples. Comparing the values of the indicators at the beginning and end of the experiment, it was established that all physiological parameters improved in group C during the academic year (Table 1).

Table 1. Changes in the physiological parameters of the young females in group C during the experiment (n = 108)

Parameter	At the beginning		At the end		The size of the change		t	p
	M_1	SD_1	M_2	SD_2	M_1- M_2	M_1- M_2 (%)		
HR at rest, bpm^{-1}	80.69	5.28	74.52	4.99	-6.17	7.7	8.85	0.001
SBP, mmHg	114.61	5.02	117.38	4.68	2.77	2.4	7.03	0.001*
DBP, mmHg	74.69	4.78	78.19	4.73	3.50	4.7	7.96	0.001*
VC, ml	1.94	0.24	2.69	0.25	0.75	38.7	9.02	0.001*
VCI, $ml \cdot kg^{-1}$	34.86	5.68	41.18	5.64	6.32	18.1	8.2	0.001
IMIS, %	30.51	5.55	41.66	6.14	11.15	36.5	14.06	0.001
RTI, conditional units	10.84	0.70	9.76	0.81	-1.08	10.1	10.16	0.001
RI, conditional units	92.64	5.80	84.42	5.61	-8.22	8.9	10.57	0.001

Note: t-critical values for related samples at the level of $p<0.001$ – 3.392; the p value obtained using using nonparametric tests are highlighted with asterisks (*); HR – heart rate, SBP – systolic blood pressure, DBP – diastolic blood pressure, VC – vital capacity, VCI – vital capacity index, IMIS – index maximum isometric strength, RTI – Ruffier test index, RI – Robinson index

At the same time, the positive change in the values of these parameters was in the range of 2.4–38.7%. The smallest change was noted in SBP, which was the largest in VC. A similar result was found in the E group, except for the values at which the physiological parameters of the young females improved. Thus, the positive change in values was in the range of 2.8–53.1%, the smallest was found in SBP, and the largest was in IMIS (Table 2).

The latter testified to a significant improvement in the development of skeletal muscles in the girls, which indirectly indicates a state of excessive accumulation of structural and energy potentials in the muscles, which increase their working capacity. Although there were significant positive changes in physiological parameters in both groups, comparing them revealed some features. First, it was noted that out of all eight indicators, five differed by a statistically significant value. This was applied to the HR at rest, VCI, IMIS, RTI, and RI. However, in all these indicators, the values of the girls in group E showed higher positive re-

sults than those of the girls in group C (Table 3). In particular, the most pronounced differences were in the RTI values; in group C, it was 9.76 ± 0.81 conditional units, in group E – 8.11 ± 0.51 conditional units (t = 12.13; p < 0.001); in this indicator, a lower value indicates a higher positive result. The values of the other physiological parameters in both experimental groups were almost the same (p = 0.114–1.0).

Table 2. Changes in the physiological parameters of young females in group E during the experiment (n = 21)

The name of the parameter	At the beginning		At the end		The size of the change		t	p
	M_1	SD_1	M_2	SD_2	M_1- M_2	M_1- M_2 (%)		
HR at rest,bpm^{-1}	80.14	2.2	71.14	1.93	-9.00	11.2	14.11	0.001
SBP, mmHg	115.48	2.7	118.71	2.33	3.23	2.8	3.4	0.001*
DBP, mmHg	76.33	2.67	78.76	2.30	2.43	3.2	3.07	0.002*
VC, ml	1.97	0.18	2.84	0.21	0.87	44.2	13.59	0.001
VCI, ml·kg^{-1}	34.50	2.89	47.54	2.78	13.04	37.8	14.87	0.001
IMIS, %	30.64	2.38	46.91	2.90	16.27	53.1	19.97	0.001
RTI, conditional units	10.77	0.74	8.11	0.51	-2.66	24.7	13.70	0.001
RI, conditional units	91.93	3.79	80.22	1.94	-11.71	12.7	12.56	0.001

Note: t-critical values for related samples at the level of p < 0.001 – 3.392; Note: the p value obtained using nonparametric tests are highlighted with asterisks (*); HR – heart rate, SBP – systolic blood pressure, DBP – diastolic blood pressure, VC – vital capacity, VCI – vital capacity index, IMIS – index maximum isometric strength, RTI – Ruffier test index, RI – Robinson index

Table 3. Differences in physiological parameters in group E and group C at the end of the experiment

Group/ characteristic	HR at rest, bpm^{-1}	SBP, mmHg	DBP, mmHg	VC, ml	VCI, ml·kg^{-1}	IMIS, %	RTI, conditional units	RI, conditional units
M_2(C) – M_2(E)	3.38	1.33	0.57	0.15	6.36	5.25	1.65	4.2
M_2(C) – M_2(E) %	4.5	1.1	0.7	5.6	15.4	12.6	16.9	5.0
t	5.331	-1.189	0.001	0.10	7,81	6.08	12.13	6.14
p	0.001	0.291*	1.0*	0.114*	0.001	0.001	0.001	0.001

Note: the p value obtained using nonparametric tests is highlighted with asterisks (*)

Discussion

During their studies at the military academy, young females are engaged in large amounts of physical activity. This contributes to the successful solution of

various content training tasks [1, 11, 18, 21, 29]. Therefore, the search for a model of physical activity that leads to achieving the best results in as many characteristics of young females as possible is an important scientific task. This study found out that the current model of physical activity in the military academy, which is implemented in free time, improves all physiological parameters of young females. This was evidenced by the changes in the values of the indicators of the young females in group C obtained during the first year of their studies at the military academy. However, the changes in group E also showed an improvement in all physiological parameters.

This result is attributed to a set of reasons. One reason, as noted earlier [28], is the implementation of the generalized stage of the adaptation syndrome (cross-adaptation) established by H. Selye. That is, the specific workload used by the young females in each group during the school year led to such a cross effect. In other words, when influencing any one physiological characteristics, an improvement was also noticed in other characteristics that were not affected by this load at all. According to the researchers [6], the basis of cross-adaptation is not a single reaction but a wide range of non-specific reactions of the body to the proposed exercise. One possible cause of the cross-effect is the low level of development of the physiological parameters studied in both groups of the young females. The conclusions available in the professional literature [7, 12] and the data obtained by us earlier [27] confirm the presence of young females with below-average and low levels of development of functional and physical capabilities.

Another reason for this result was that physical activity programs involved the engagement of such systems and mechanisms of the body that are associated with different physiological parameters [3, 5, 34]. The study also found out that after using the proposed programs, the results in Group E were much better than those in Group C. One of the reasons for this achievement was the content of physical activity provided for each program used. In particular, the influence of the environment (including physical activity) on the body triggers, first of all, a stress response, which consists in increasing the functioning of the circulatory system, respiration, and simultaneous activation of regulatory systems, mobilizing functional reserves [33, 34]. The values of indicators that reflect the state of the circulatory system (HR and RI), respiratory system (VCI), and body response to exercise (RTI) were higher in group E than in group C.

In addition, the systematic use of physical activity in different areas has a similar effect: there is a shortage of energy resources (macroergs), which intensifies the process of phosphorylation and mobilizes glycogen stores. This is a signal for the cells' genetic apparatus that initiates accelerated synthesis of nucleic acids and proteins, greater formation of mitochondria and enzymes, at the level of the musculoskeletal system – an increase in the number of active

motor units, additional involvement of muscle fibers, increased strength and rate of muscle contraction fiber, an increase in muscle glycogen, ATP, creatine phosphate [25]. The closer to the current state of the organism are the parameters of the proposed physical activity program, the more strongly the genetic apparatus of cells is activated due to energy deficiency, providing greater growth of energy potential. The latter is the basis for a better result in increasing nonspecific resistance or cross-adaptation [8, 33]. The data from our study on the values of IMIS, to some extent, further confirm greater effectiveness of the physical activity program in group E than in group C. This is because IMIS reflects the state of skeletal muscle development in the young females, which indirectly indicates the state of excessive accumulation of structural and energy potentials in the muscles, which increases their working capacity. At the end of the experiment, IMIS reached the value of 46.91 ± 2.9 conditional units in group E, while in group C – only 41.66 ± 6.14 conditional units (t = 6.08; p < 0.001). At the beginning of the experiment, the values were 30.64 ± 2.38 and 30.51 ± 5.55 conditional units respectively, which is almost the same, as evidenced by t, which was 0.12 (p > 0.05).

We also noted the importance of motivating young females to engage in physical activity, which was reflected in the study's results. In particular, the functionality in both groups differed from the high functionality, so they needed to be adjusted [10]. It is an additional physical activity that is the main solution for such problems [26]. Higher results in group E than in group C were associated with the positive impact of the program on the psychological needs of young females, namely independence, competence, and integration into the activities of the team. The program of group E allowed us to meet all of these needs, while in group C, to some extent, only competence and independence were catered for. These needs are crucial in the formation of internal motivation to engage in physical activity [22]. The formation of this type of motivation should be included in physical activity programs used to improve the physical performance, and functional characteristics of servicemen [17, 18]. However, these assumptions require experimental verification. In future research, we plan to focus on solving this task.

It is important to note that the research had limitations, the biggest one being partially classified information about the military during the war. Another important limitation is the small number of young females studying at the Lviv academy every year, where the experimental program was implemented. Group E, as well as group C, was formed by random sampling; the maximum possible number in group E was 21 young females. The criterion for selection into each group was compliance with the age limit, namely, from 17 years and 3 months to 18 years and 5 months. The number of young females in group C was 108,

and their data on physiological parameters were obtained one year earlier when they started studying at Zhytomyr, Lviv, and Khmelnytskyi academies.

Conclusion

The use of experimental and current physical activity programs during one academic year is effective in increasing the functional capabilities of young females. All the studied physiological parameters improved in both groups; however, the experimental group achieved a higher result than the control group in five of the eight parameters. Thus, at the end of the last academic year, the HR of the young females reached the value of 74.52 bpm^{-1}, while in the experimental group it was 71.14 bpm^{-1}, and the difference was 4.5%; the value of VCI was 41.18 $ml \cdot kg^{-1}$ and 47.54 $ml \cdot kg^{-1}$ (difference 15.4%), IMIS – 41.66 and 46.91% (difference 12.6%), RTI – 9.76 and 8.11 conditional units (difference 16.9%), RI – 84.42 and 80.22 conditional units (difference 5%) ($p < 0.001$). Among the last two indicators, smaller values indicate a higher functional capacity of the cardiovascular system at rest (RI) and after dosed physical exertion (RTI).

STATEMENT OF ETHICS

This study was conducted in accordance with the World Medical Association Declaration of Helsinki. The study protocol was reviewed and approved by the Research Ethics Committee of the Kamianets-Podilskyi National Ivan Ohiienko University (17 February, 2022, Kamianets-Podilskyi, Ukraine). All participants provided written informed consent to participate in this study.

DECLARATION OF CONFLICTING INTERESTS

The authors declared no potential conflicts of interests with respect to the research, authorship, and/or publication of the article *Effectiveness of various physical activity programs in increasing functional capabilities of young females.*

FUNDING

The authors received no financial support for the research, authorship, and/or publication of the article *Effectiveness of various physical activity programs in increasing functional capabilities of young females.*

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