

Original Article

Application of wrestling strength and speed exercises during the physical education of military students

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Abstract

Problem statement. Physical training in educational institutions with enhanced military and physical focus is a purposeful controlled process of physical improvement of future servicemen, which is carried out taking into account the peculiarities of their military and professional activities. To do this, it is necessary to analyze the state of development of students' physical skills and, on this basis, to develop recommendations for improving the process of physical education. Those points determined the relevance of our study. **Purpose.** This study aimed to determine the effectiveness of the use of wrestling strength and speed exercises during physical education of military students at the lyceum with enhanced military and physical training. **Methods.** There were used methods of theoretical analysis and generalization of scientific literature, pedagogical observation, pedagogical experiment, methods of mathematical statistics. **Results.** The results of pedagogical experiment indicated that experimental program of physical training was more effective than the traditional one. In experimental group the average increase of functional test results at the end of experiment was 10.7%, in control group – 6.1%. Most of the changes were significant in both groups ($p \leq 0.05$ – 0.001). The average increase in physical fitness in experimental group was 31.6%, while in control group it was 24.7%. The results of the most tests were also reliable in both groups ($p \leq 0.05$ – 0.001). The indexes of preparedness (speed, speed and strength, strength, endurance index) at the end of experiment also had a higher average growth in experimental group (3.5%) in comparison with control group (1.7%). The obtained results were confirmed statistically in both groups ($p \leq 0.05$ – 0.001). **Conclusions.** The results of experiment illustrated that the use of wrestling strength and speed exercises in the physical education of students at the Lyceum with enhanced military and physical training was more effective and provided positive changes in physical qualities.

Keywords: effectiveness, training, program, content, physical improvement.

Introduction

Physical training in educational institutions with military and physical orientation is a purposeful controlled process of physical improvement of future servicemen, which is carried out taking into account the peculiarities of their military and professional activities. The issues related to the improvement of student's physical skills have recently been considered in large number scientific papers. The main attention was paid to the content and structure of physical training of school-age children, its orientation and organization. The current social, economic and environmental conditions that have emerged recently in Ukraine demand the introduction of new pedagogical influences and methodological approaches that would increase the efficiency of children's physical fitness (Phillips, 1999; Destani, Hannon, Podlog & Brusseau, 2014; Ilnytsky, Okopny, Palatny, Pityn, Kyselystia & Zoriy, 2018).

Analysis of the recent researches and practical experience demonstrates that the problems of theory, methodic and organization of physical education in this area remain open and contradictory (Davison, Werder & Lawson, 2008; Kjonniksen, Anderssen & Wold, 2009; Maryan, Yuriy & Olha, 2013; Mechelen, Twisk, Post, Snel & Kemper, 2000). Mostly, physical training of military specialists is described fragmentally and needs to be developed (Ilnytsky et al., 2018; Johnson & Hyo Jung Kang, 2018).

Different authors have presented a lot of effective methods of physical fitness for people of different ages, including high school students (Perkins, Jacobs, Barber & Eccles, 2004; Trudeau, Laurencelle & Shephard, 2004). However, specialists do not pay enough attention to the improvement of physical skills of young people who study at specialized secondary schools, in particular in military lyceums. Therefore, in modern conditions, the importance of physical education is growing. It is necessary to create optimal conditions for improving the physical potential and health of children (Yuriy, Maryan, Sergiy & Oleksandr, 2014; Zadorozhna, Briskin,

Perederiy, Pityn & Stepanchenko, 2018; Lee, Orenstein & Richardson, 2008; Bohuslavska, Furman, Pityn, Galan Y & Nakonechnyi, 2017 et al.). To do this, it is necessary to analyze the level of development of students' physical skills and, on this basis, to develop recommendations for improving the process of physical education.

In modern Ukrainian institutions of secondary education with military direction, the problem of improving physical qualities important for the profession (strength, endurance, coordination skills, etc.) is quite acute. The level of these qualities, according to research, mostly does not exceed the below average (Pasichnyk, Pityn, Melnyk, Karatnyk, Hakman & Galan, 2018). Today, the inclusion of new sports disciplines in the program of physical culture of such institutions, which would purposefully contribute to the improvement of these qualities, is an appropriate and urgent task (Nakonechnyi I. & Galan, 2017). In particular, from the point of view of the profession requirements, means of wrestling can have a positive impact on the formation of future serviceman skills, as this sport requires a high level of physical fitness in general. Thus, the exercises offers by wrestling can contribute to a high-quality, purposeful increase in the level of students physical qualities and increase of their professional skills.

Purpose. This study aimed to determine the effectiveness of using wrestling strength and speed exercises during physical education of military students at the lyceum with enhanced military and physical training.

Methods.

There were used methods of theoretical analysis and generalization of scientific literature, pedagogical observation, pedagogical experiment, methods of mathematical statistics.

The level of students' physical development was determined according to the indicators of body length (height, cm), body mass (weight, kg), hand-held dynamometry (wrist dynamometry of the right and left hands (kg·f), Stange and Genchi's tests (characteristics of the functional state of the respiratory system).

Ruffier's test was used for examination of cardiovascular system and general physical preparedness). The heart rate was determined at rest (HR1). Then the student performed 30 squats. At the end of the exercise in the first (HR2) and last (HR3) 15 sec of the first minute of rest, the heart rate was measured again. The result was evaluated according to the Ruffier's index, according to the formula

$$\text{Ruffier's index} = \frac{4 \cdot (\text{HR1} + \text{HR2} + \text{HR3}) - 200}{10} \quad (2.1)$$

Rosenthal test allows to determine the endurance of respiratory muscles (intercostal, diaphragm). The spirometer is used to measure life capacity of the lungs (Vital Capacity, VC) five times in a row. The rest between approaches is not provided. If the endurance of the respiratory muscles is sufficient, then all the indicators will be approximately the same. Rapid muscle fatigue leads to a decrease in the level of VC in each subsequent indicator.

The level of physical fitness was performed using tests: standing long jump test (cm), long jump after run (cm), pull-up test on a bar (number of repetitions), raise after pull up with the turn on a horizontal bar (number of repetitions), raise by force on a horizontal bar (number of repetitions), push-ups on the bars (number of repetitions), the hold on the horizontal bars with bent legs (L-sit hold, seconds), running 100 m from a standing position start (seconds), running 1000 m (seconds), running 3000 m (seconds).

There was used the index method:

$$\text{Speed index} = \frac{V \cdot m \cdot s^{-1}}{\text{body length (m)}} \quad (2.2)$$

V, m·s⁻¹ – running speed for 100m distance.

$$\text{Speed and strength index} = \frac{\text{standing long jump (cm)}}{\text{body length (m)}} \quad (2.3)$$

$$\text{Strength index} = \frac{\text{hand-held dynamometry (kg·f)}}{\text{body mass (kg)}} \times 100 \quad (2.4)$$

$$\text{Endurance index} = \frac{V \cdot m \cdot s^{-1} \cdot \text{body length (cm)}}{\text{body mass (kg)}} \times 100 \quad (2.4)$$

V, m·s⁻¹ – running speed for 3000m distance.

To determine the reliability of the indexes we used the method of comparing the average values of two related and unrelated populations – Student's parametric t-test (IBM SPSS Statistics Base 2.0 package).

Organization of the study

The author's program did not go beyond the structural requirements of the current program of physical development in lyciums of such type and implemented in the first semester of 2013–2014 academic year. Today in the programs of physical education of secondary education institutions the learning of the material is based on variable modules, so the changes concerned only 30% of its content. There were recruited two groups of students – control (n=25) and experimental (n=24). During the first semester students of experimental group were offered to use wrestling exercises at physical education lessons. According to the legal documents, students should attend 5 physical education lessons per week. We suggested to dedicate every second lesson to the use of wrestling exercises. Most of exercises were aimed at development of strength, speed and power, coordination

skills (30% of physical education lessons, 28 classes). In the part of the program that did not actually differ in content from the traditional one (70% of physical education lessons, 56 lessons), students performed loads related mainly to the development of endurance (28 lessons), speed and flexibility (24 lessons). To development these physical skills students used exercises from track-and-field, gymnastics, ball games, hand-to-hand combat and others. At the same time, students of control group used the loads and exercises from various sports, which are offered in the traditional physical education program for students of the Lyceum with enhanced military and physical training (Wilmore & Costill, 1994; Prystupa, Okopnyy, Hutsul, Khimenes, Kotelnik, Hryb & Pityn, 2019). In experimental program 70% of the time allotted for wrestling was devoted to performing exercises of power, speed and strength nature within the methods of strictly regulated exercise (interval, continuous, combined). Only during 30% of the time students used game means and competitive exercises, sparring. The amounts of time devoted to the development of physical skills was the following: strength and speed – 30%, only strength – 30%, coordination – 20%, endurance – 10%, only speed – 5%, flexibility– 5%.

Due to the fact that students are mostly teenagers, the development of maximum strength involved exercises for increasing muscle mass. The time of their performing was within 25-30 seconds. Students were asked to perform from 6-8 to 10-12 repetitions (the number of repetitions depended on the difficulty of the exercise and the amount of additional load). Intervals between exercises were extreme active (recovery of heart rate to 101-120 bpm), between the sets – full and combined (recovery of heart rate to 91-100 bpm) (Wilmore & Costill, 1994; Yockey, 2005; Young, Deaner & Marks, 2006). Some strength exercises were performed using the weight (dumbbells), simulators and devices, in overcoming the resistance of own body weight. The magnitude of resistance when performing exercises was in the range of 30-80% of the maximum in a particular motor action. In one set there were performed from 3-4 to 5-6 repetitions in a row, the number of sets ranged from 2-6 for each exercise. An active extreme rest interval was used between repetitions in set, between the sets – a complete (full) combined rest. Coordination exercises were used at the beginning of the main part of the lesson, when the body was in a state of optimal preparedness. The number of repetitions of speed and strength exercises in one set ranged from 1-2 to 5-6 depending on the nature of the exercise, the amount of additional load and student's preparedness. The duration of such sets should be in the range from 4-5 to 10-15 seconds. Regarding the intensity of work, there was a similar trend: in the initial stages of experiment exercises were performed with relatively low intensity (60-70% of the individual maximum) with its gradual increase (up to 80-90%) at the end of the experiment. At the same time students had to learn basic wrestling elements and moves such as the stand-ups (right and left, front, low, middle, high standing positions), techniques in the racks (transfers, flooding, throws), floor wrestling technique (coups, pushing), etc. (Wilmore & Costill, 1994; Matveev, 2001; Platonov, 2004; Yuriy et al., 2014; Destani et al., 2014; Zadorozhna, Briskin, Pityn, Smyrnovskyy, Semeryak, Khomiak & Hlukhov, 2020).

Results.

Our research demonstrated that indexes of physical development (body length and body mass) didn't significantly change in experimental and control groups. They were mostly reliable. As for experimental group, during the first semester of academic year the average increase in body length (height) of students was 0.2% ($p \leq 0.01$). In control group it also increased significantly by 0.3% ($p \leq 0.01$). Regarding the group difference, the advantage of 0.3% was revealed in control group, but it was unreliable ($p > 0.05$).

The changes in average body mass (weight) in both groups were also insignificant. In experimental group, the average body mass decreased by 1.4% ($p \leq 0.01$), and in control group, this result was only 0.6% without reliable confirmation ($p > 0.05$). Regarding the differences between the groups, they were also unreliable – 4.1% ($p > 0.05$). The results of functional tests are represented in Table 1.

Table 1. Results of functional tests in control (n=25) and experimental (n=24) groups after experiment

Functional test	Results in CG			Results in EG			p***	
	Before experiment	After experiment	p*	Before experiment	After experiment	p**		
Stange test	\bar{X}	24.32	25.80	≤ 0.01	25.54	29.96	≤ 0.001	≤ 0.01
	SD	3.39	2.97		3.97	4.15		
Genchi test	\bar{X}	15.72	17.20	≤ 0.01	17.13	19.50	≤ 0.01	≤ 0.01
	SD	2.11	1.89		3.40	2.65		
Ruffier test	\bar{X}	10.33	10.12	≤ 0.01	10.30	9.96	≤ 0.05	> 0.05
	SD	1.15	0.99		1.87	1.59		
Rosenthal test	\bar{X}	3.48	3.72	> 0.05	3.46	3.75	≤ 0.05	> 0.05
	SD	0.65	0.54		0.72	0.61		

Legend: CG – control group; EG – experimental group; p* – the difference in control group before and after experiment; p** – the difference in experimental group before and after experiment; p*** – the difference between experimental and control groups before and after experiment.

Before experiment the difference between groups in the results of Stange and Gench's test were 4.8% and had no statistical significance ($p>0.05$). According to the results of the implemented programs in the first semester of the academic year, the students of experimental group increased the results of this test by 17.29% with the available statistical significance at the level of $p\leq 0.001$. In control group the increase was 6.09% ($p\leq 0.01$). As a result, after experiment students of experimental group had an average advantage of 4.78% ($p\leq 0.01$) over the students of control group.

According to Genchi's test, there were similar trends. Students of experimental group showed an average increase in time by 13.87%, and the participants of control group – 9.41%. For both groups, these increases were statistically significant ($p\leq 0.01$).

The initial data of cardiovascular system obtained by Ruffier's test at the beginning of experiment indicated the absence of statistical differences between groups ($p>0.05$). The implementation of experimental program provided the following changes. In experimental group indexes of cardiovascular system improved by 3.24% ($p\leq 0.05$), while in control group – by 2.05% ($p\leq 0.01$).

The changes in the level of physical fitness in control and experimental groups are represented in Table 2.

Table 2. Indicators of students' physical fitness in control (n=25) and experimental (n=24) groups after experiment

Physical fitness tests	Results in CG			Results in EG			p***	
	Before experiment	After experiment	p*	Before experiment	After experiment	p**		
Standing long jump, cm	\bar{X}	223.8	226.6	≤ 0.01	212.9	223.3	≤ 0.001	> 0.05
	SD	± 22.2	± 18.39		± 15.1	± 10.11		
Long jump after run, cm	\bar{X}	397.4	415.76	≤ 0.01	381.8	415.4	≤ 0.001	> 0.05
	SD	± 57.2	± 39.04		± 57.9	± 36.14		
Pull-up test (the chin-up test, number of repetitions)	\bar{X}	7.64	9.36	≤ 0.001	8.29	11.6	≤ 0.001	> 0.05
	SD	± 4.32	± 2.99		± 5.37	± 3.39		
Raise by force on a horizontal bar, number of repetitions	\bar{X}	2.92	4.96	≤ 0.001	2.58	4.67	≤ 0.001	> 0.05
	SD	± 2.19	± 1.67		± 2.35	± 1.17		
Raise after pull up with the turn on a horizontal bar, number of repetitions	\bar{X}	2.40	4.72	≤ 0.001	2.33	5.1	≤ 0.001	> 0.05
	SD	± 2.44	± 2.21		± 2.69	± 2.01		
Push-ups on the bar, number of repetitions	\bar{X}	9.20	12.04	≤ 0.001	10.9	14.0	≤ 0.001	> 0.05
	SD	± 5.18	± 3.34		± 6.12	± 3.41		
L-sit hold, seconds	\bar{X}	51.9	60.92	≤ 0.001	52.0	63.3	≤ 0.05	> 0.05
	SD	± 25.6	± 20.55		± 27.3	± 11.94		
Running 100m, seconds	\bar{X}	14.3	14.14	≤ 0.01	14.7	14.21	≤ 0.01	> 0.05
	SD	± 0.89	± 0.69		± 0.86	± 0.27		
Running 1000m, seconds	\bar{X}	205.41	200.88	≤ 0.001	224.12	202.42	≤ 0.001	≤ 0.001
	SD	± 5.28	± 5.71		± 14.08	± 12.15		
Running 3000m, seconds	\bar{X}	741.79	738.28	> 0.05	756.33	748.9	> 0.05	> 0.05
	SD	± 43.04	± 33.93		± 49.42	± 37.07		

Legend: CG – control group; EG – experimental group; p* – the difference in control group before and after experiment; p** – the difference in experimental group before and after experiment; p*** – the difference between experimental and control groups before and after experiment.

In "Standing long jump" test students of control group significantly improved their indicators by 1.3% ($p\leq 0.01$), while in experimental group the increase was 4.9% ($p\leq 0.001$). The results of "Long jump after run" test also underwent positive changes during experiment. At the same time, they were more considerable in experimental group (8.8%). In control group, the results of this test also increased by 4.6% ($p\leq 0.001$).

The pull-up test, which characterizes the level of strength endurance, the following changes occurred. The participants of experimental group significantly improved their results by 40.2% ($p\leq 0.001$). The results in control group were almost twice lower, but still quite significant – 22.5% ($p\leq 0.001$). The average advantage of students in experimental group in comparison with control was 19.5% ($p\leq 0.05$).

In exercise "Raise by force on a horizontal bar" changes in indicators showed a clear advantage of students in experimental group. Analysis of intergroup differences in this test indicated a certain advantage of control group over experimental, which was 6.3%, but it was unreliable ($p > 0.05$).

Within the next strength exercise "Raise after pull up with the turn on a horizontal bar" during the previous testing the results in both groups were insufficient. There were even students who didn't succeeded (no successful attempts were performed). However, after experiment students of experimental group improved their indicators by 117.9% ($p \leq 0.001$). The same situation was in control group – the results after experiment were higher by 96.7% ($p \leq 0.001$). In the exercise "Push-ups on the bar" the participants of control group increased their results by 30.9% ($p \leq 0.001$). In experimental group this indicator was approximately at the same level – 28.6% and with a high level of reliability ($p \leq 0.001$).

Positive changes were revealed in the test "L-sit hold" in both groups. In experimental group the average increase was 20.4% ($p \leq 0.05$). At the same time, students of control group managed to improve their indicators by 17.3% ($p \leq 0.001$). Intergroup difference in the test exercise "L-sit hold" indicated a slight advantage of the participants of the experimental group over the control group, which amounted to 3.6% ($p > 0.05$).

To examine the level of speed skills we used the test exercise "Running 100m". According to the initial data, there was no significant difference between the groups. At the end of the semester, the results in experimental group improved by 3.4% ($p \leq 0.01$), in control – by 1.2% ($p \leq 0.01$).

For assessment of endurance there were used two tests – "Running 1000m" and "Running 3000m". During the previous testing, students of control group demonstrated a significantly higher average results in both exercises ($p \leq 0.001$). Instead, at the end of experiment, the participants of experimental group managed to equal to the students of control group in the level of endurance. In test "Running 1000m" the average group result in experimental group increased by 9.6%, with a high level of statistical reliability ($p \leq 0.001$). In turn, in control group this increase was only 2.2%, but also with a high level of reliability ($p \leq 0.001$). Another test exercise – "Running 3000m" allowed us to establish that significant changes of aerobic endurance did not occur in any of the groups ($p > 0.05$). There was only a slight increase in experimental group – by 1%, and in control group – by 0.5%. Intergroup differences in the results of this test were not statistically confirmed ($p > 0.05$).

Assessing changes in students' physical qualities, we also focused on the indicators of their preparedness indexes. It should be mentioned that at the end of experiment speed index increased in both groups: in experimental group – by 3% ($p \leq 0.01$), in control group – only 0.03% ($p \leq 0.01$).

There were no statistically confirmed differences between the groups in speed index ($p > 0.05$). Some insignificant advantage of 0.4% remained on the side the control group participants, as the initial indicator was slightly higher (Table 3).

At the same time indicators of speed and strength index after pedagogical experiment also changed slightly in both groups. The average results in experimental group increased by 4.6% and were reliable ($p \leq 0.001$). In control group, this increase was 1% and was also statistically confirmed ($p \leq 0.05$).

Table 3. Indexes of students' physical preparedness in control (n=25) and experimental (n=24) groups after experiment

Indexes	Results in CG			Results in EG			p***	
	Before experiment	After experiment	p*	Before experiment	After experiment	p**		
Speed	\bar{X}	4.01	4.04	≤ 0.05	3.90	4.02	≤ 0.01	> 0.05
	SD	0.30	0.26		0.23	0.13		
Speed and strength	\bar{X}	1.28	1.29	≤ 0.05	1.22	1.28	≤ 0.001	> 0.05
	SD	0.13	0.11		0.10	0.07		
Strength	\bar{X}	45.40	47.36	≤ 0.001	46.65	48.66	≤ 0.001	> 0.05
	SD	8.51	7.69		9.25	7.97		
Endurance	\bar{X}	6.29	6.33	> 0.05	5.86	5.98	≤ 0.001	> 0.05
	SD	0.89	0.74		0.72	0.66		

Legend: CG – control group; EG – experimental group; p* - the difference in the control group before and after experiment; p** - the difference in the experimental group before and after experiment; p*** - the difference between experimental and control groups before and after experiment.

The comparison of speed and strength indexes between groups revealed a slight advantage of control group over experimental – 1.2% ($p > 0.05$). As for strength index, it increased in both groups. In experimental group the growth was 4.3% ($p \leq 0.001$), in control – 4.32% ($p \leq 0.001$). There were revealed no intergroup

differences in strength index with a sufficient level of reliability ($p > 0.05$). There was only a slight discrepancy between the groups, which amounted to 2.7% in favor of the experimental group.

At the same time, the lowest changes of endurance index were found in experimental group. The increase of this index was only 2% ($p \leq 0.001$). In contrast, control group showed even smaller changes in the endurance index. Their increase was only 0.7% and was not reliable ($p > 0.05$).

When comparing intergroup differences after experiment, we found an advantage of participants in control group (5.8%), but it had no statistical confirmation.

Discussion.

According to the results of pedagogical experiment, we obtained the data corresponding to the well-known general information. In particular, the increase in body length (height) and body mass (weight) were mostly the result of biological changes in students' bodies and quite natural for them (Wilmore & Costill, 1994; Platonov, 2004; Lee, Orenstein & Richardson, 2008; Yuriy et al., 2014; Pityn, Okopnyy, Tyravska, Hutsul & Ilnytsky, 2017).

According to general recommendations of most physical education specialists, we paid attention to the results of the most common and available tests such as Stange and Genchi, Ruffier and Rosenthal (Galan, Yarmak, Kyselytsia, Paliichuk, Moroz & Tsybanyuk, 2018; Galan, Andrieieva & Yarmak, 2019). The results at the beginning of the research had no significant differences between the groups. There were only some small fluctuations in favor of one or another group of students. However, the discussion of the data at the end of experiment allowed to conclude that the use of wrestling exercises may significantly increase the abilities of respiratory system – inhalation and exhalation breath-holds. In our opinion, it may be connected with special structure of wrestling exercises (the presence of a power component). When performing such exercise and overcoming weight resistance, student should make pause and hold breath.

The results of experiment illustrated that in both groups there were positive changes in students' physical fitness. That is why both programs of physical education (author's and traditional one) are effective for the student's physical development. In our opinion, a slight increase in the results of most functional tests may be caused by two reasons. The first one is that initial level of physical development was slightly higher in control group. The second reason may be connected with the structure and content of experimental program – the possible insufficient emphasis of the applied wrestling exercises on the level of speed and power qualities (; Davison, Werder & Lawson, 2008; Bohuslavskaya et al., 2017).

At the same time, the clear focus of the author's program with the use of wrestling exercises on these qualities allowed to have a more significant impact on their results in experimental group during the first semester of the academic year. As for the intergroup differences in the results of "Standing long jump" test at the end of experiment there was insignificant ($p > 0.05$) advantage of students in control group, which amounted to 1.5%. Obviously, it is connected to the relatively higher initial results of this test in control group in comparison with experimental.

Discussing the intragroup dynamics of the results in "Raise by force on a horizontal bar" test, it should be mentioned that in experimental group it was recorded at 80.6% and with a high level of reliability ($p \leq 0.001$). The intragroup increase in control group was slightly smaller – 69.9% with a high level of reliability ($p \leq 0.001$).

The increase of the results in most tests in experimental group is connected with the content of author's physical education program. The main accent was made on the use of wrestling power exercises which demanded overcoming resistance. At the same time the content of traditional program was aimed to develop power with the use of track-and-field exercises, gymnastics and ball games. This was also confirmed by the results of "Push-ups on the bar" test. The advantage of students in experimental group over their colleagues from control group was 14.3% and had a reliable character ($p \leq 0.05$).

The comparison of the results in both groups indicated that positive changes in experimental group were mostly significant and reliable. Instead, insignificant and mostly statistically insignificant differences in intergroup results after experiment could be explained by the fact that the initial level of their performance in the proposed test exercises was higher in the control group in comparison with experimental group. At the same time, after experiment the students of experimental group actually equaled or even slightly ahead in the level of strength indicators in comparison with their colleagues from control group. Moreover, after experiment the students of experimental group had better results in "Pull-up" and "Push-ups on a bar" tests. This advantage was significantly reliable (Kjonniksen, Anderssen & Wold, 2009; Ilnytsky et al., 2018).

It should be mentioned that the increase of strength indicators was more significant than speed skills. The positive changes in the growth of power indicators ranged from 17.3 to 117.9% in both groups. At the same time there were only minor changes in the level of speed qualities. We explain this by the fact that speed qualities develop much more slowly and require more significant influences, which is much easier to provide during specialized sports training than within physical education lessons. The last one is focused on harmonious development of all physical qualities.

When comparing the results of the "Running 1000m" test, we revealed a discrepancy of only 0.8% in favor of control group, but without confirmation of statistical significance ($p > 0.05$). This trend in endurance

indicators is obviously due to the slight emphasis on its development in both physical education programs. In particular, in the author's program its development took only 10% of the total time (due to the specifics of wrestling as a kind of sport), while in the traditional program there is lack of special endurance exercises (Pityn et al., 2017; Prystupa et al., 2019)

Comparison of indexes of students' physical preparedness demonstrated that the highest increase was observed in experimental group. This also confirmed the effectiveness of the author's physical education program. Thus, the results of experiment allowed to supplement information obtained in other scientific researches. In particular, there was confirmed the importance of implementing quality physical educational programs in lyceums with enhanced military and physical training for the formation of professional and applied skills of the future specialists (Young, Deane & Marks, 2006; Zadorozhna et al., 2018, 2020).

In addition, an effectiveness of the traditional structure and content of the physical education program for high school students with enhanced military and physical training was confirmed. At the same time, we verified an influence of author's program of physical education and made conclusion that wrestling exercises should be used for students' physical development (Trudeau, Laurencelle & Shephard, 2004).

One of the main conclusions is the fact that strength and speed exercises are the basis of physical education programs for high school students and, especially, for military students. These exercises provide not only proper physical development, but also improve the qualities and skills which are essential in future profession. The best way to improve these skills and qualities for military students is to use special program for physical development. Due to the program, 70% of physical education lessons should be devoted to general exercises for all physical qualities (speed, endurance, flexibility, coordination, strength) and 30 % of time – for special speed and power movements such as technical elements in wrestling.

Conclusions.

According to the results of pedagogical experiment the use of wrestling speed and strength exercises during physical education of lyceum with enhanced military and physical training has led to the positive changes in various aspects of students' physical development.

Analysis of the average increase of functional tests revealed a considerable effect of experimental physical education program of culture in comparison with the traditional one. In experimental group it was 10.7%, in the control – 6.1%. Most changes were significant in both groups ($p \leq 0.05-0.001$).

The average increase of physical preparedness in experimental group was 31.6%, in control – 24.7% ($p \leq 0.05-0.001$).

Indexes of students' physical preparedness (speed, speed and power, power, endurance index) after experiment were also higher in experimental group (3.5%) in comparison with control group (1.7%). The obtained results were confirmed statistically in both groups ($p \leq 0.05-0.001$).

In general, using of the wrestling means in physical education of lyceum students with enhanced military and physical training was effective from a practical point of view, as confirmed by the results of increasing the level of their physical and functional fitness, and therefore professional skills. It is advisable to include this sport activity as a variable module in the program of physical culture of secondary institution of such type.

Conflicts of interest. The authors declare that they have no competing interests.

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