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## Non-traditional means of physical training in middle school physical education classes

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### Abstract

The article investigates the influence of non-traditional means of physical education on indicators of physical development and physical preparedness of pupils of middle school age in rural schools. The timeliness of the research: preserving and improving moral, physical and mental health of pupils is one of the priorities according to the Concept of a new Ukrainian school. The participants of the research: fifty pupils aged 12–13 years old participated in the study. They were divided into two groups: experimental (n=25), where pupils practiced stretching, Crossfit and elements of hatha yoga during physical education classes and control (n=25), where pupils followed the traditional curriculum. The experimental group included 11 boys and 14 girls, 12 boys and 13 girls were in the control group. All of the pupils in both groups were in the main medical group and did not practice sports. The methods of the research: theoretical analysis and generalization of scientific and methodical literature, questionnaires, pedagogical observation, pedagogical experiment, testing, methods of mathematical statistics. At the end of the experiment, there was a significant increase in the studied parameters of the pupils of the EG ( $p < 0.05$ ), which indicates the high efficiency of the usage of non-traditional means of physical training in the physical education classes in the rural school. Conclusions. Comparing the obtained end-results of the experimental group with the state norms proposed by the resolution «On state tests and norms of assessment of physical preparedness of the population of Ukraine», which we used during the experiment, it should be noted that the level of physical preparedness of pupils increased in comparison to the initial data and meets the standards of normative requirements. The conducted experiment allowed to develop pupils' interest to the lessons of physical

education and showed their desire to engage in non-traditional means of physical education in the next academic year.

**Keywords:** physical education, physical development, physical preparedness, pupils of middle school age

### Introduction

According to the Concept of a new Ukrainian school, preserving and improving moral, physical and mental health of pupils is one of the school priorities. This value is of strategic importance for the sustainable development of society, and, therefore, it is one of the prior development goals of modern Ukraine. At various stages of society's development, attention has always been attributed to the study of health problems. It is no wonder that in the normative legal documents such as the Law of Ukraine «On Higher Education», the National Doctrine of the Development of Education in Ukraine, it is emphasized that the need for health is fundamental to the system of vital values of every person, without which it is not possible for the personality to self-actualize. Consequently, the successful development of each child, in general, depends on the state of his health [1, 2, 3, 4, 5]. Physical education plays a special role in the solution of this issue, which corresponds not only to the ability to manage vital motor activity in different conditions and to educate the need for systematic physical exercises throughout life, but also for the formation of a harmoniously developed personality [6, 7, 8]. It is the teachers of physical education who promote the development of a physically healthy personality of a pupil.

### 2. Literature Review

Analysis of literature sources [7, 8, 9] showed that today teachers of physical education are facing the task of not only preserving the health but increasing its level. The most effective ways of improving the health of children are motor activity, rational organization of day routine and rest regime, nutrition and psychological comfort, etc [1, 5, 10]. Motor activity is a necessary condition for the normal development of a young person, his health. Physical education is one of the components of a healthy lifestyle, health promotion and its improvement. Physical education class plays an important role in the development of the child [2, 6, 11, 12]. However, schools do not pay due attention to the health of children, the subject of physical education; as a result, pupils have reduced interest for physical education, in addition, there is no proper sports base for conducting physical education classes [2, 3, 7, 9, 13]. Therefore, the purpose of introducing non-traditional means of physical training in the physical education classes was to create a modern, interesting and developing class in a rural general-education school that would meet the desires, needs and interests of pupils.

The aim of study is to determine the influence of non-traditional means of physical education on indicators of physical development and physical preparedness of pupils of middle school age in rural schools.

### 3. Method

#### 3.1. Participants

The study was attended by fifty pupils of the 7<sup>th</sup> grade aged 12–13 years, which were divided into two groups: experimental (n=25) and control (n=25). The experimental group included 11 boys and 14 girls, 12 boys and 13 girls were in the control group. All of the pupils in both groups were in the main medical group and did not practice sports. The study was conducted during 2017–2018 school year on the basis of the Yemilchin liberal arts school. The research related to human use has been complied with all the relevant national regulations and institutional policies and has followed the tenets of the World Medical Association (WMA) Declaration of Helsinki – ethical principles for medical research involving human subjects.

#### 3.2. Materials

The study of indicators of general physical preparedness was carried out on the basis of test exercises: «running for 60 m» (speed), «flexing and extending arms while lying on the floor» (strength), «running for 1500 m» (endurance), «shuttle running 4x9 m» (agility), «tilting body forward while sitting» (flexibility), «jumping for length» (speed-power quality). Assessment of physical development of pupils was carried out using the method of anthropometry (height, body weight). Height was measured by a height gauge with an accuracy of 0.1 cm. Body weight was determined on special medical scales with an accuracy of 0.1 kg 3–4 hours after eating. To determine the functional parameters of the cardiovascular system, heart rate was measured at rest for 1 minute and after exercise (30 squats for 45 seconds) with heart rate monitor. For an objective assessment of the health of a child and assessment of cardio performance, the Ruffier test was carried out. Quantitative data was processed by statistical methods. To determine the probability of difference in the results of the study the Student's test was done. The significance for all statistical tests was set at  $p < 0.05$ . All statistical analyses were performed with the SPSS software, version 21, adapted to medical and biological researches.

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

#### 3.3. Procedure

Physical education classes were conducted three times a week for 45 minutes. Classes were conducted in accordance to the general structure of the lesson, which consisted of three parts: preparatory, main and final. Pupils of the experimental group followed the methodology we proposed, according to which 60–70 % of the exercises was designed for the implementation and in-depth study of non-traditional means of physical education. In the preparatory part of the lesson, warm-up activities were carried out. Towards the end the sets of exercises designed for stretching of muscles were included; they were aimed at increasing mobility in the joints and elasticity of the muscles and training of the locomotors apparatus for the main load (exercises in pairs, with balls, ropes, gymnastic sticks, which were executed with maximum strength from 10 to 20 seconds, including the relaxation). The main part – the Crossfit – exercises which were aimed at general physical training of pupils and increasing the functional capabilities of different systems of the body. In the main part of the lesson, the sequence of physical exercises was as follows: firstly, exercises for speed were performed, then for strength, and in the end – for endurance. Exercises were carried out with high intensity. In the final part of the lesson, stretching and methods of hatha yoga (asanas – poses for relaxation and development of physical qualities, pranayama – breathing exercises on the ground and in motion) were performed. The elements of hatha yoga in the final part of each lesson were designed for the body recovery after exercising. Every 2 weeks the type and the level of workload in the classes changed according to the individual characteristics of boys and girls. The variety of exercises depended on the creative potential of a certified teacher who previously underwent a special training in these kinds of sports. Girls from the experimental group performed exercises with less intensity, number of repetitions and approaches, compared to the boys of the EG. In addition, classes in the experimental group were conducted to the music. Pupils of the control group followed the general curriculum on physical education for grades 5–9 for general education institutions approved by the regulation of the Ministry of Education and Science from 07.06.2017 number 804.



In the beginning of the main pedagogical experiment, we conducted a questionnaire for the pupils of the experimental group to determine their attitude towards the introduction of non-traditional means of physical training in the classes of physical education. The initial level of indicators of physical development and overall physical preparedness in both groups were determined. The main tasks of our study were: to analyze literary sources on the topic of the research; to determine the attitude of pupils to non-traditional means of physical education and to introduce them in the classes of physical education in rural school; to study the dynamics of indicators of physical development and physical preparedness of pupils of secondary school age during the school year and compare them to the state norms.

#### 4. Results

In the beginning of the main pedagogical experiment, we conducted a questionnaire for the pupils of the experimental group to determine their attitude to the introduction of non-traditional means of physical training in physical education classes and the choice of non-traditional physical education methods, which they preferred to implement in physical education lessons during the experiment. During the study, it was found that 92 % of the pupils surveyed expressed the desire to experiment and implement non-traditional physical training in physical education lessons (Table 1). Based on the results of the questionnaire on the choice of non-traditional means of physical education, it was determined that pupils mostly would like to practice respiratory exercises and recreational exercises of hatha yoga (25%), classic stretching (23%), and Crossfit (21%). The smallest percentages pupils attributed to such non-traditional types of exercises as aerobics (11%), classic yoga (8%), Pilates (7%). Taking into account preferences of the pupils, we decided to introduce such non-traditional means of physical education as classic stretching, hatha yoga, and Crossfit in the physical education classes for the experimental group.

*Table 1. Experimental group questionnaire results of the liberal arts school pupils.*

No	Questions and answers	Answers results (%)
1.	Do you want non-traditional means of physical training to be introduced in physical education classes? a). «Yes» b). «No»	92 8
2.	What types of non-traditional means of physical training would you like to practice in physical education lessons? a). Aerobics b). Classic stretching c). Pilates d). Hatha yoga (respiratory exercises and recreational exercises) e). Body flex f). Classic yoga g). Crossfit	11 23 7 25 5 8 21

Physical development of a child is also associated with the mode of motor activity, which is a biological need of the organism and can be satisfied in the process of physical education. Level assessment of the physical development of a child is an integral part of the control over the state of child's health. Therefore, the assessment of physical development was carried out on the principle of centimetographic tables and such anthropometric indicators as height and body weight. Indicators of the physical development of the pupils of both groups are presented in Table 2. It can be noted that the indicators of physical development of the students of both groups are average, corresponding to their age, and accordingly the students have normal level of physical development.

According to the data presented in Table 2, before the beginning of the experiment, the pupils of both groups were almost identical, with the absence of reliable differences ( $p > 0.05$ ). In general, it can be noted that the data obtained from the study indicate that the morphofunctional characteristics of the pupils in both groups have improved. However, pupils from the control group showed minor changes, and pupils who

participated in non-traditional physical education classes during the school year had significant improvements in all indicators. Thus, according to physical development indicators, height in the experimental group was significantly changed by 6.1 cm for boys and by 5.41 cm for girls, compared to those who were in the control group, where the height for boys increased by 3.14 cm and by 3.42 cm for girls. Body weight for boys in the EG increased by 4.46 kg, for girls in the EG - by 3.21 kg, while the body weight for boys in the CG increased by 3.7 kg, and for girls in the CG - by 2.65 kg.

Thus, the indexes of functional parameters of the cardiovascular system in the state of rest did not differ significantly in the experimental and control groups of pupils at the beginning of the experiment, while the indexes of heart rate in the state of rest had a significant difference in the experimental group of pupils compared with the pupils of the control group at the end of the experiment. So, heart rate in the state of rest for the EG of pupils decreased by 7.12 beats per min. for boys and at 6.81 beats per min. for girls, respectively, heart rate in the state of rest for the CG of pupils decreased by 2.72 beats per min. for boys and by 0.54 beats per min. for girls. The heart rate after completing 30 squats in 45 seconds significantly decreased for the experimental group of pupils in the end of the experiment, compared to the heart rate indexes of the control group, indicating the adaptation of the cardiovascular system to regular physical activity. In addition, the positive effect of non-traditional means of physical education on the child's functional state of the cardiovascular system according to the Ruffier test should be noted. Thus, after the experiment, the Ruffier index for boys grew by 3.2 standard points, for girls in the EG by 2.0 points, whereas for boys in the CG this indicator also improved, but slightly - by 0.7 and 0.68 points respectively.

**Table 2.** Morphofunctional changes of the experimental and control groups of pupils in the beginning and in the end of the experiment ( $\bar{X} \pm m$ ).

Morphofunctional indicators	Experimental group (n=25)		Control group (n=25)	
	Bs. (n=11)	Grls. (n=14)	Bs. (n=12)	Grls. (n=13)
<i>Before the experiment</i>				
Height, cm	149.74±3.5	149.2±0.62	150.56±2.3	148.48±0.53
Body weight, kg	41.58±2.6	42.3±0.27	42.1±1.4	43.7±0.7
Heart rate in state of rest, bts./min.	77.75±5.2	78.9±6.12	78.9±3.8	76.4±3.9
Heart rate after exercise (30 squats in 45 seconds) bts./min.	110.36±4.1	112.4±2.3	112.29±3.7	110.52±2.9
The Ruffier test, points	6.5±0.05	6.7±0.1	6.4±0.23	6.78±0.02
<i>After the experiment</i>				
Height, cm	155.84±2.2*	154.61±1.34*	153.7±3.2*	151.9±0.7*
Body weight, kg	46.04±3.4*	45.51±0.63*	45.8±2.28*	46.35±1.82*
Heart rate in state of rest, bts./min.	70.63±3.7*	72.09±4.9*	76.18±6.3	75.86±2.81
Heart rate after exercise (30 squats in 45 seconds) bts./min.	104.12±3.5*	102.9±2.6*	112.09±3.1	109.58±4.1
The Ruffier test, points	3.3±1.02*	4.7±0.54*	5.7±1.04	6.1±0.25

Note \* - the validity of the differences in Student's test at  $p < 0.05$  before and after the experiment

In order to determine the influence of non-traditional means of physical education on the dynamics of indicators of physical preparedness, complex testing was carried out. Quantitative analysis of the test results showed that during non-traditional means of physical education practices there were positive changes in all indicators of the development of physical qualities of the pupils under study (Table 3).

Non-traditional means of physical education had a positive influence on the development of high-speed abilities of pupils of the EG. According to the results of the test exercise «Running for 60 m», speed indicators for boys and girls of the CG are probably lower than that of the representatives of the EG, both in the beginning and in the end of the practice experiment. Indicators for running for 60 m for boys in the EG increased by 13.8 %, for girls in the EG - by 10.2 %. While, for the boys in the CG it increased by 4.2 %, and for girls in the CG - by 5.2 %, respectively. Significant changes were observed for the pupils of the

experimental group when performing the test on «Flexing and extending arms while lying on the floor» as well. Consequently, for boys in the EG, the increase in results was 42.1 %, for girls in the EG - 20.2 %, which indicates that there have been positive changes in the development of strength endurance of hands. Minor changes occurred for the control group of pupils as well. Growth for boys in the CG was 26.5 %, for girls in the CG - 6.1 %. At the same time, quantitative changes are more significant in experimental groups and make up for 42.1 % against 26.5 % for boys and for 20.2 % against 6.1 % for girls. Consequently, there is an increase in the indicators for boys in the EG by 15.6 %, for girls in the EG - by 14.1 %, in comparison with an increase in the results of pupils in the CG. Quantitative characteristics of the increase in results between pupils of experimental and control groups have a probable difference ( $p < 0.05$ ).

**Table 3.** Physical training indicators of experimental and control groups of pupils in the beginning and in the end of the experiment ( $X \pm m$ ).

Physical training indicators	Experimental group (n=25)		Control group (n=25)	
	Bs. (n=11)	Grls. (n=14)	Bs. (n=12)	Grls. (n=13)
<i>Before the experiment</i>				
Running for 60 m, sec.	10.8±0.8	11.7±0.6	10.6±0.55	11.5±0.4
Flexing and extending arms while lying on the floor, times	17.1±0.8	10.9±0.6	17.3±0.8	11.4±0.79
Shuttle running 4x9 m, sec.	11.6±1.2	12.0±1.24	11.5±1.06	12.3±1.5
Tilting body forward while sitting, cm	0 6.2±.7	± 12.1 0.8	5.8±0.6	± 11.8 0.7
Jumping for length, cm	173.7±4.1	152.3±4.3	171.8±3.7	152.1±3.3
Running for 1500 m, min, sec.	7.91±1.02	9.81±1.52	7.75±1.76	9.92±1.48
<i>After the experiment</i>				
Running for 60 m, sec.	9.3±0.7*	10.5±0.69*	10.15±0.5*	10.9±0.4*
Flexing and extending arms while lying on the floor, times	24.3±0.91*	13.1±0.74*	21.9±0.54*	12.1±0.79
Shuttle running 4x9 m, sec.	10.7±2.01*	11.5±1.51*	11.0±1.3	12.1±1.03
Tilting body forward while sitting, cm	9.3±0.91*	15.9±0.68*	7.5±0.61*	12.2±0.75
Jumping for length, cm	180.3±4.5*	155.5±4.6*	175.4±3.8*	154.9±3.3
Running for 1500 m, min, sec.	6.80±0.84*	8.27±0.95*	7.52±1.06	9.15±0.92

Analysis of the results of the test «Shuttle running 4x9 m» showed that there were positive changes in the development of agility in the control and experimental groups for boys. Given that our experiment did not include exercises for the purposeful development of this quality, we did not expect a significant increase here. However, the experiment showed the opposite: despite a slight increase in absolute and relative indicators - the increase was 4.34 % for boys in the control group, in the experimental - 7.75 %. More significant quantitative increase in the results of the test «Shuttle running 4x9 m» was observed for girls: 1.62 % for the control group and 4.2 % for the experimental group. Significant differences are observed when doing the test exercise «Running for 1500 m». Consequently, for boys in the EG time for performing the test exercise decreased by 14 % at the end of the experiment, by 15.69 % for girls, whereas for pupils CG it reduced by 2.96 % for boys and by 7.76 % for girls. Statistically significant changes also occurred during the performance of the «Jumping for length» test, which characterizes the level of development of speed-strength abilities. Thus, for boys in the EG the increase was 3.8 %, while for girls in the EG - 2.1 %, respectively. At the same time, for boys in the CG growth was 2.1 %, and for girls 1.8 %, respectively. Consequently, the increase of the demonstrative force for boys in the EG exceeds the increase of the CG by 1.7 %, and for girls - by 0.3 %, respectively. During the practice experiment the magnitude of the increase is significant for boys and girls ( $p < 0.05$ ). This is reinforced by the fact that the age of 11-14 years is a period of rapid development of speed-power abilities. It is worth noting that the significant level of growth in the results was recorded for the test exercise on flexibility «Tilting body forward while sitting» for the girls of the experimental group, which is by 31.4 %, compared to the girls of CG, for whom this figure increased by



3.4 %. Significant differences were observed for boys in experimental and control groups. In this way, the results for boys in the EG increased by 50 %, while for boys in the CG - by 29.3 %. Consequently, for girls in the EG an increase exceeds 28 %, compared to the CG, for boys - 20.7 %.

Thus, such a significant increase in the results of these tests in experimental groups is related to the proposed and implemented non-traditional exercises in physical education classes, which in turn influenced the development of the physical qualities of the pupils. In addition, in the end of the experimental study, we conducted the questionnaire on whether pupils liked the classes of physical education with non-traditional means of physical training and whether they would like to continue with such classes, to which the children unanimously answered «yes» (100 %). It confirms pupils' positive attitude to the introduction of non-traditional means of physical education in the lessons of physical education.

## 5. Discussion and Conclusion

The results of many scientists' researches [1, 4, 8, 10, 14-17] testifies to the urgency of our work and the need to improve the traditional system of physical education in school. The analysis of the results of physical preparedness indicators of the pupils of both groups showed that the implementation of non-traditional means such as «hatha yoga», classic stretching, Crossfit in the lessons of physical education proved to be effective first of all for the development of flexibility. When performing the test exercise «Tilting body forward while sitting» the indicators increased by 28 % for girls in the experimental group and by 20.7 % - for boys, compared with the results of pupils in control groups. The analysis of the correlation between the indicators of the effect of non-traditional means of physical education and the development of physical qualities in the end of the experiment indicates that the second-best performance indicator was the indicator of strength qualities. Thus, when performing the test exercise «Flexing and extending arms while lying on the floor» the indicator of the increased result exceeded 15.6 % for the boys in the experimental group, and for girls - 14.1 %, as compared to the increase in the results of power qualities pupils of control groups. The test run time «Running for 1500 m» decreased by 11.04 % for boys in the experimental group and by 7.93 % for girls. At the same time, we can assure that the implementation of the experimental group of exercises with the Crossfit in the educational process significantly improved the physical form of pupils, developed power qualities, improved the work of the heart and trained the body to adapt quickly to the change of intense loads in a minimal time and, therefore, created much faster muscle stress state.

Analysis of the results of the study showed that among the indicators of general physical preparedness, after exercises on flexing and extending arms while lying on the floor, there is a slightly smaller increase in the results of the development of speed and agility after the performance of the test exercises «Running for 60 m» and «Shuttle running 4×9 m» respectively. The obtained data indicate a slight decrease in the time of realization of the corresponding distances. Thus, in experimental groups, the increase in the speed results was 9.6 % for boys and 5 % for girls. But, unfortunately, the main ability in this case - agility - does not show significant dynamics. Difference in the increase of the agility results for pupils in the EG and CG is - 3.41 % for boys and 2.58 % for girls. The smallest percentage in the growth of the results can be traced when performing jumps for length, 1.7% is the best result of the increased force for the boys and 0.3 % - for the girls. The analysis of morphofunctional indicators and indicators of physical preparedness of pupils showed that for improving the health of pupils of secondary school age and increasing their level of physical training, the main focus should be put on the physical development of children and the development of their physical qualities; improvement of the educational process by introducing non-traditional means of physical education in the lessons of physical education.

## Conclusions

1. As a result of the analysis of literary sources, low child health indicators, low level of physical education of schoolchildren, lack of pupils' interest to physical education lessons were revealed. It was determined that an integrated approach to the assessment of children's health and the introduction of non-traditional physical training in physical education lessons lead to improved pupils performance.

2. The conducted experiment allowed to develop pupils' interest to the lessons of physical education and showed their desire to engage in non-traditional means of physical education in the next academic year.

3. Significant differences in calculations of indicators of pupils' physical preparedness are revealed after all control test exercises for experimental group. Thus, the greatest increase in the results is observed during the test «Tilting body forward while sitting» (for boys by 50 %, for girls – 31.4 %) and «Flexing and extending arms while lying on the floor» (for boys for 42.1 %, for girls – 20.2 %), somewhat lower is observed in performing the test exercises «Running for 1500 m» (for boys by 14 %, for girls – 15.69 %), «Running for 60 m» (for boys by 13.8 %, for girls – 10.2 %) and «Shuttle running 4×9 m» (for boys by 7.75 %, for girls – 4.2 %). The smallest increment can be observed when performing the «Jumping for length» test (for boys by 3.8 %, for girls – 2.1 %). Indicators of the increase in the results after the test exercises for the control group of pupils were at a much lower level.

Comparing the obtained end-results of the experimental group with the state norms proposed by the resolution «On state tests and norms of assessment of physical preparedness of the population of Ukraine», which we used during the experiment, it should be noted that the level of physical mobility of pupils increased in comparison to the initial data and meets the standards of normative requirements.

Prospects for further research in this direction. It is planned to investigate the influence of non-traditional means of physical education on the indicators of physical health of middle school pupils.

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