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Rope Skipping As A Means Of Increasing Students' Physical Activity

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ABSTRACT

The article shows the use of a rope as a type of physical activity that is suitable for both boys and girls. She also develops all physical qualities. The aim of the research is to determine the influence of the means of jumping rope on the physical fitness of senior pupils. Research methods: analysis of special and scientific literature on the research topic; pedagogical observation of the learning process; pedagogical experiment; pedagogical testing of the physical qualities of high school students; methods of statistical data processing - for mathematical processing of the research results. The study involved 70 boys and 75 girls in grades 10-11. The results of testing physical readiness indices indicate a significant improvement in the development of physical qualities of students in experimental groups under the influence of jumping rope. This means that the rope can be recommended for use in the process of physical education of high school students. The study proposed to use skipping in various forms of physical education for senior pupils: at physical education lessons according to the variable module "Skipping", in different parts of physical education lessons according to other variable modules ("Athletics", "Football", Volleyball "), in independent lessons , on rolling breaks, sports entertainment, competitions. And the use of three groups of exercises with a rope according to the degree of difficulty in various forms of training contributes to the increase in the physical fitness of students.

Keywords: rope skipping, students, physical preparedness, physical abilities.

1. INTRODUCTION

One of the tasks of physical education is to increase the physical activity of children, adolescents and youth. Today, in the era of global informatization, this is difficult to do. Young people lead a sedentary lifestyle, spend most of the day at computers and various gadgets. Therefore, it is necessary to create such conditions so that she moves more and thereby improves her health and motor ability.

Motor activity is one of the main factors of proper physical development of children. This is an integral part of their way of life and behavior. At the same time, one can observe a steady decrease of students` motor activity and, as a result, their level of health and physical fitness (Kravchuk & Trostianskyi, 2014; Lopatiev et al., 2017; Krutsevych, Sainchuk, & Pidleteichuk, 2018; Otravenko, O. et al., 2021).

According to contemporary requirements of educational process, it is extremely important to find ways of increasing students` motor activity with the use of physical culture means that students like (Kravchuk, & Trostianskyi, 2017; Yermolova, Derevianko, Zakharchuk, Silkova, & Tymchyk, 2017; Nadiahan & Cabauatan, 2021). A lot of studies proved that students prefer modern fitness programs (Rotaienko, 2012; Sevil, Sánchez-Miguel, Pulido, Práxedes, & Sánchez-Oliva, 2018; Kuśnierz, Rogowska, & Pavlova, 2020). A perspective step in solving this problem is the use of fitness technologies in physical education of high school students, involving students in extracurricular activities that can be conducted in various organizational forms, and also the use of new, modern motor activities that encourage students to exercise (du Toit, Pienaar, & Truter, 2011; Bakiko,

Savchuk, Dmitruk, Radchenko, & Nikolaev, 2020; Mischenko, et al., 2020; Zhamardiy, Shkola, Tolchieva, & Saienko., 2020).

Modern young girls and boys distinguish fitness classes among other types of physical activity (Mischenko et al., 2021). One of such type that is gaining popularity is rope skipping, which refers to aerobic fitness programs. Rope skipping is a combination of jumping rope, including long, in combination with acrobatic elements, dance exercises, with one or two skipping ropes performed individually, in pairs or groups (Pravdov, & Korneva, 2010; Skipping Lesson Plan for Physical Education, 2017). The availability of exercises, their relative simplicity and emotionality allows using rope skipping in various forms of physical education, with students of different ages and levels of physical condition (Laurson, Brown, Dennis, & Cullen, 2008; Boyko, & Karnyukhina, 2018; Shkola, Zhamardiy, Saienko, Tolchieva, & Poluliashchenko, 2020).

However, despite the great popularity of rope skipping, there are only episodic studies in the scientific literature (Ha, Lonsdale, & Ng, 2014). Some studies proved the positive influence of rope skipping to the physical fitness of university students (Pravdov, & Korneva, 2010; Kasatskaya, & Geychenko, 2013). There are practically no scientific approaches to introduction of rope skipping in physical education of Ukrainian schools.

The article will consider the problem of the influence of jumping rope on the physical fitness of students both in domestic scientific works and in foreign ones. An analysis of the levels of physical fitness by means of a rope in boys and girls will also be carried out, it will be determined which physical qualities are more developed due to jumping rope, and the results of the experiment will be compared with the initial ones and the effectiveness of the introduced teaching methodology will be revealed.

2. MATERIALS AND METHODS

The aim of the study is to determine the impact of rope skipping means on the physical preparedness of high school students.

The pedagogical experiment lasted during 2018-2021 in H. S. Skovoroda Kharkiv National Pedagogical University, Municipal Establishment «Kharkiv Humanitarian Pedagogical Academy» of Kharkiv Regional Council, Poltava National Pedagogical University named after V. G. Korolenko took part.

The study involved 70 boys and 75 girls of 10th – 11th grades. Students were divided into four experimental (EG) and four control groups (CG) depending on age and gender. EG1 included 20 boys of 10th grades, EG2 – 16 boys of 11th grades, EG3 – 18 girls of 10th grades, EG4 – 19 girls of 11th grades. CG1 included 19 boys of 10th grades, CG2 – 15 boys of 11th grades, CG3 – 19 girls of 10th grades, CG4 – 19 girls of 11th grades. All participants agreed to participate in the experiment.

The research methods were as follows:

- analysis of special and scientific literature - to identify the relevance of the problem under study and various methods and technologies for teaching jumping rope in Ukraine and in the world;
- pedagogical observation - to identify the strengths and weaknesses of the level of physical fitness of students;
- pedagogical experiment - to compare the results of the experimental groups and the proposal of a methodology to increase the level of physical fitness of students;
- pedagogical testing - to obtain reliable information about the levels of physical fitness in different periods of the experiment;
- methods of statistical data processing - for mathematical processing of the obtained research results. Study results were processed using the «Data Analysis» package of Microsoft Excel 2013 spreadsheets and Statistica 8.0. Descriptive statistics (mean and standard deviation) were determined. The reliability of the differences in average values was estimated by the Student's t-test; the withdrawal was considered to be reliable at $p<0.5 – 0.001$.

3. RESULTS AND DISCUSSION

The experiment lasted for one school year. For students of experimental groups we offered a variable module «Skiping» that was implemented during the third quarter of school year. Additionally there were offered the use of rope skipping exercises in the preparatory, main or final parts of physical education lessons on variable modules «Track and Field», «Football» (1st and 4th quarters of school year), «Volleyball» (2nd quarter of school year) depending on the tasks of lessons. Moreover, skipping exercises were used in extracurricular activities (independent classes, moving breaks, sport entertainments, competitions). Students of control groups were engaged in variable modules «Track and Field», «Football» (1st and 4th quarters of school year), «Volleyball» (2nd quarter of school year), «Weightlifting», «Gymnastics» (3rd quarter of school year).

The structure of the lesson on the variable module «Skipping» has three parts, as any fitness class. Each part includes a number of components or subparts. The preparatory part lasts for 10 minutes and involves the organization of students and workout. Workout includes a variety of walking, running, jumping, general exercises with a skipping rope.

The main part continues for 30 minutes and includes three components: aerobic (15 minutes), strength part (10

minutes) and stretching (5 minutes). Aerobic component provided for the mastery of the basic movements of skipping, combining them in combination, relay races and moving games with a skipping rope. Strength part includes exercises for developing the strength of different muscle groups. Stretching component is aimed at developing flexibility. The final part lasts for 5 minutes. There were used exercises to relax muscles, breathing exercises, summarizing the lesson.

To consistently master the elements of skipping, we have selected three groups of exercises – for beginners, for those who jump at an average level and for those who perform jumping exercises at a high level. The level of students' mastery of jumping exercises was determined by the test «rope jumping in 1 min.»

The first group of exercises included exercises related to the acquisition of motor action and bringing it to the skill, the development of coordination of hands and legs movements (for example, jumping without a skipping rope, learning the correct rotation of a skipping rope, jumping on two legs and their varieties, on one leg, alternately, squat, with frequent lifting of the thigh, cancan, figure eight, with movement in space, with a rotation for 90°, paired with one skipping rope, combinations of jumps, relay races, long jump rope, jumping over a long rotating rope, running through a long rotating skipping rope and others).

The second group of exercises was aimed at developing endurance and speed in the process of jumping rope and mastering more complex coordination structures of motor actions (in addition to the exercises of the first group added more types of jumping on two legs, one leg, double rotation, throwing and catching one end of skipping rope, with a rotation for 180°, more types of jumps through a long skipping rope, in pairs, threes).

The third group included exercises that combine different coordination difficulties of jumping (in addition to the exercises of the first two subgroups, more complex techniques are offered by jumping on two legs, on one leg, holding objects between the legs, lying down, from different starting positions, with double and triple rotation of the skipping rope, single and group jumps in the double long skipping rope, etc.).

In order to assess the physical preparedness of high school students, we selected motor tests, which are part of a system of tests and standards for annual assessment of physical fitness of ukrainian schoolchildren. These tests characterize the level of endurance, strength, speed, agility and flexibility. There are exercises: 2000 m run for boys of 16 years old and girls of 17 years old, 3000 m run for boys of 17 years, 1500 m run for girls of 16 years; pull-ups for boys, push-ups for girls; standing long jump; 100 m run; 4 × 9 m shuttle run; tilt forward from a sitting position.

Conditions for conducting motor tests corresponded to generally accepted methods (Adam 1993; Krutsevych et al., 2019).

The results of testing the physical fitness indicators testify a significant improvement in the development of physical qualities of students in experimental groups under the influence of rope skipping (Table 1).

Table 1. Physical preparedness indicators of 10th grade (EG1 = 20, CG1 = 19) and 11th grade (EG2 = 16, CG2 = 15) boys before and after the experiment ($\overline{X}$ ± S)

Test	Group	Experiment stage		Group	Experiment stage		t	p
		Initial data	Final data		Initial data	Final data		
2000 m run, min.	EG1	9.00 ± 0.25	8.40 ± 0.27	CG1	9.06 ± 0.33	8.87 ± 0.36	5.22	.000
		t=8.57; p=.000			t=1.90; p=.065			
3000 m run, min.	EG2	14.00 ± 0.29	13.28 ± 0.33	CG2	14.05 ± 0.28	13.69 ± 0.36	3.72	.000
		t=7.20; p=.000			t=3.27; p=.002			
Pull-ups, times	EG1	9.94 ± 1.10	11.75 ± 1.54	CG1	9.97 ± 1.16	11.03 ± 1.67	1.44	.158
		t=4.41; p=.000			t=2.35; p=.002			
	EG2	9.40 ± 2.01	11.51 ± 1.90	CG2	9.46 ± 2.05	11.00 ± 2.02	0.72	.477
		t=3.10; p=.004			t=2.08; p=.004			
Standing long jump, cm	EG1	206.20 ± 7.55	222.01 ± 8.74	CG1	204.65 ± 7.48	211.16 ± 8.49	3.94	.000
		t=6.12; p=.000			t=2.51; p=.001			
	EG2	211.10 ± 8.08	226.21 ± 7.69	CG2	210.78 ± 8.65	216.13 ± 8.48	3.46	.001

		t=5.43; p=.000			t=1.71; p=.098		
100 m run, sec.	EG1	14.75 ± 0.17	14.35 ± 0.16	CG1	14.76 ± 0.18	14.65 ± 0.19	7.50	.000
		t=10.0; p=.000			t=2.57; p=.009			
	EG2	14.77 ± 0.20	14.28 ± 0.19	CG2	14.78 ± 0.24	14.62 ± 0.22	4.85	.000
		t=8.16; p=.000			t=2.28; p=.030			
4x9 m shuttle run, sec.	EG1	10.10 ± 0.20	9.49 ± 0.26	CG1	10.13 ± 0.28	9.94 ± 0.34	5.00	.000
		t=8.71; p=.000			t=1.90; p=.065			
	EG2	9.98 ± 0.17	9.47 ± 0.20	CG2	9.99 ± 0.23	9.83 ± 0.28	4.50	.000
		t=10.2; p=.000			t=2.00; p=.055			
Tilt forward, cm	EG1	6.75 ± 1.15	8.55 ± 1.22	CG1	6.76 ± 1.18	7.52 ± 1.34	2.57	.014
		t=5.00; p=.000			t=1.90; p=.065			
	EG2	6.74 ± 1.55	8.56 ± 1.36	CG2	6.75 ± 1.50	7.58 ± 1.47	1.96	.059
		t=3.64; p=.001			t=1,56; p=.129			
Rope jumping in 1 min., times	EG1	75.05 ± 3.22	90.14 ± 2.95	CG1	76.01 ± 3.10	78.03 ± 3.22	12.35	.000
		t=15.7; p=.000			t=2.00; p=.053			
	EG2	76.15 ± 2.19	88.24 ± 2.01	CG2	76.12 ± 2.34	77.85 ± 2.57	12.51	.000
		t=16.5; p=.000			t=1.94; p=.062			

There is a significant improvement of endurance, strength of the arms, speed and strength abilities, speed, agility, flexibility in EG1 and EG2. In addition, the experimental groups significantly improved the results of the test «rope jumping in 1 min.». In the beginning of the experiment the level of student achievement on this test corresponded to the average level. After the experiment boys of EG1 performed a high level, and boys of EG2 – a sufficient level.

The improvement of the result of testing strength, speed and strength abilities, speed was determined in boys of CG1. An increase in the results of endurance, strength, speed was discovered in CG2.

Comparing the results of the physical preparendness of experimental and control groups among themselves, we found significantly higher results in tests of endurance, speed and strength abilities, speed, agility, flexibility (in EG1) and in «rope jumping in 1 min.» in experimental groups at the end of the experiment. At the same time, the initial results of boys had no statistically significant differences in tests ($p > 0.05$).

In general, the control groups showed a tendency to improve the results of physical fitness testing, but not all tests revealed statistically significant changes. Moreover, it should be noted that in the experimental groups the increase of results is more statistically significant than that in the control groups. This indicates an adequate selection of means for the development of students` physical abilities.

Significant changes in test results under the influence of classes were also found in the physical preparedness of girls (Table 2). There is a significant increase in the results of tests for endurance, strength, speed and strength abilities, speed, agility, flexibility in EG3 and EG4.

Table 2: Physical preparedness indicators of 10th grade (EG3 = 18, KG3 = 19) and 11th grade (EG4 = 19, KG4 = 19) girls before and after the experiment ($\overline{X}$ ± S)

Test	Group	Experiment stage		Group	Experiment stage		t	p
		Initial data	Final data		Initial data	Final data		
1500 m run, min.	EG3	8.55 ± 0.22	8.00 ± 0.34	CG3	8.50 ± 0.26	8.23 ± 0.36	2.30	.027
		t=6.87; p=.000			t=3.00; p=.004			
2000 m run, min.	EG4	9.90 ± 0.38	9.48 ± 0.41	CG4	9.92 ± 0.34	9.74 ± 0.42	2.00	.053
		t=3.50; p=.001			t=1.50; p=.142			
Push-ups, times	EG3	14.00 ± 1.50	17.26 ± 1.64	CG3	14.22 ± 1.65	16.10 ± 1.78	2.14	.039
		t=6.52; p=.000			t=3.48; p=.001			
	EG4	14.50 ± 1.90	17.41 ± 2.12	CG4	14.55 ± 2.01	16.22 ± 2.32	1.67	.103
		t=4.54; p=.000			t=2.38; p=.022			
Standing long jump, cm	EG3	156.85 ± 3.10	167.22 ± 3.24	CG3	159.95 ±3.25	162.10 ± 3.41	4.69	.000
		t=9.87; p=.000			t=2.00; p=.053			
	EG4	165.25 ± 4.24	176.45 ± 5.05	CG4	166.45 ± 4.51	170.21 ± 5.20	3.75	.000
		t=7.46; p=.000			t=2.39; p=.022			
100 m run, sec.	EG3	17.41 ± 0.30	16.39 ± 0.38	CG3	17.45 ± 0.32	17.05 ± 0.41	5.50	.000
		t=9.27; p=.000			t=3.63; p=.000			
	EG4	17.10 ± 0.22	16.12 ± 0.29	CG4	17.11 ± 0.24	16.88 ± 0.38	7.60	.000
		t=14.0; p=.000			t=2.30; p=.027			
4x9 m shuttle run, sec.	EG3	11.60 ± 0.21	11.03 ± 0.27	CG3	11.62 ± 0.23	11.48 ± 0.36	4.50	.000
		t=8.14; p=.000			t=1.75; p=.088			
	EG4	11.40 ± 0.33	10.95 ± 0.36	CG4	11.38 ± 0.31	11.20 ± 0.37	2.27	.029
		t=4.50; p=.000			t=1.80; p=.080			
Tilt forward, cm	EG3	11.55 ± 2.58	16.65 ± 3.10	CG3	11.50 ± 2.64	14.45 ± 3.15	2.15	.038
		t=5.42; p=.000			t=2.64; p=.003			
	EG4	12.51 ± 2.40	17.20 ± 3.15	CG4	12.53 ± 2.38	15.15 ± 3.12	2.02	.050
		t=5.21; p=.000			t=2.94; p=.005			
Rope jumping in 1 min., times	EG3	80.10 ± 4.42	92.12 ± 4.50	CG3	81.25 ± 4,38	84.20 ± 4,58	5.35	.000
		t=8.12; p=.000			t=2.04; p=.048			
	EG4	83.22 ± 4.36	96.12 ± 4.76	CG4	83.45 ± 4.52	85.05 ± 4.86	7.14	.000
		t=8.77; p=.000			t=1.05; p=.300			

The girls-students of the experimental groups also significantly improved the results of the test «rope jumping in 1 min.» and, accordingly, the technique of jumping exercises. In the beginning of the experiment the results corresponded to the average level of academic achievement in EG3 and EG4. After the experiment the results improved to a sufficient level.

Girls of the control groups also have an increase in physical fitness. CG3 improved the results in the tests for endurance, strength, speed and flexibility. An increase in strength, speed and strength, speed and flexibility was determined in CG4.

It should be noted that comparing the results of physical fitness in girls of experimental groups, as well as in boys, there were more statistically significant changes in indicators than in control groups. This indicates a more effective training with the use of skipping.

The experimental groups of girls had statistically significant differences in tests for endurance (in EG3), arm strength (in EG3), speed and strength abilities, speed, agility, flexibility and «rope jumping in 1 min.» at the end of the experiment. At the beginning of the study, the indicators of girls, as well as boys, had no statistically significant differences between groups.

4. CONCLUSIONS

Despite numerous scientific studies, the problem of developing the physical abilities of high school students is topical (Marchenko, & Boiechko, 2018; Ivashchenko, 2020; Osipov, Ratmanskaya, Nagovitsyn, Zhuikova, & Iermakov, 2020). It also demands to find the latest and most effective means of fitness and methods of their use that could diversify the content of physical education programs (Pashkevych, & Matviyenko, 2016; Sribnyy, 2016). Besides, students` sports interests must be taken into account. Foreign systems of physical education have a positive experience of organizing classes using rope skipping. This is reflected in the research of scientists (Ha, & Ng, 2014; Ha, Burnett, Sum, Medic, & Ng, 2015; Boyko, & Karnyukhina, 2018).

Offered to include exercises with jumping rope to sport classes for developing speed and strength abilities (Valeev, 2014). Suggested using rope skipping to increase students' physical activity during PE lessons and recess (Ha, Burnett, Sum, Medic, & Ng, 2015). At the same time, those researches had no effectiveness for increasing the volume of schoolchildren` physical activity.

Some studies proved the positive impact of rope skipping to physical preparedness of university students. The general working capacity, speed and strength and coordination abilities have been improved (Kasatskaya, & Geychenko, 2013). According to other data, the results of tests in strength, flexibility, speed and speed and strength abilities have been increased (Pravdov, & Korneva, 2010).

Unlike other researchers, we offer the use of skipping in various forms of physical education of high school students: in physical education classes on the variable module «Skiping», in different parts of physical education lessons on other variable modules («Track and Field», «Football», «Volleyball»), in independent classes, on moving breaks, sports entertainment, competitions. Our data in increasing the level of endurance, speed, strength, agility, flexibility, speed and strength abilities of high school students under the influence of rope skipping confirmed the data of (Pravdov, & Korneva, 2010; Kasatskaya, & Geychenko, 2013; Yang, Lee, Gu, Zhang, & Zhang, 2020).

According to data obtained in this study, rope skipping can be recommended for using in physical education process of high school students. Application of three groups of rope skipping exercises according to their difficulty in various forms of classes helps to increase the physical preparedness of students.

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