

Implementation practices of the Rugby-5 into the physical education of schoolchildren 12-13 years old using information technology

VOLODYMYR ASHANIN¹, LUDMILA FILENKO², VLADLENA PASKO³, OLENA TSERKOVNA⁴, IHOR FILENKO⁵, ANNA POLTORATSKAYA⁶, KATERYNA MULYK⁷

^{1,2,3,5,6,7}Kharkiv state academy of physical culture, UKRAINE

⁴Kharkiv National University of Radio Electronics, UKRAINE

⁵Kharkiv gymnasium 172, UKRAINE

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Abstract. Purpose: to study the influence of rugby-5 sessions on the functional and physical capabilities of the body of pupils of 12-13 years taking into account the information technologies of instruction. **Research materials:** study involved schoolchildren 12-13 years old (n=62). **Results:** Rugby-5 was introduced in lessons of physical training; computer training program was used for theoretical training in Rugby-5, the development is designed to improve the level of the functional state of the body of school children. **Conclusions:** proved the effectiveness of introducing Rugby-5; the level of physical development and physical readiness in pupils of 12-13 years did not have significant differences ($p>0,05$), the functional state of the organism had positive changes ($p<0,01$); factor analysis identified two groups of factors that contributed to improving the performance of the cardiovascular system of the organism.

Keywords: Rugby-5, schoolchildren, physical culture, computer program, physical development, functional state, health.

Introduction.

Playing sports (basketball, volleyball, handball, etc.) Introduced in the classes on physical culture in Ukrainian schools. Bykova O., Druz V., Pomeshchikova I., Strelnikova E., Strelnikov G., Melnyk A. & Shyriaieva I. (2017) and Melnyk V., Pasichnyk V., Semeryak Z., Karatnyk I. & Galan Y. (2017) established the need to use sports games for children 13-14 years for the development of various physical qualities.

The motor qualities of students are formed by means of an integrated approach, which is described in detail in the works Kozina Z., Repko O., Ionova O., Boychuk Y., Korobeinik V. (2016); Nakonechnyi I., Galan Y. (2017). In recent years, in Ukraine, among youth, this type of sport such as rugby is gaining popularity. Pasko V., Podolyaka O., Martyrosyan A., Filenko I. (2012); Sabirov O. (2015) and Pasko V., Martyrosyan A., Mukha V. (2017) substantiated the scientific aspects of the development of rugby in Ukraine. Authors (Ashanin, Pasko, Podolyaka, Rovnyy, & Yermolaiev, 2015; Kvasnitsa, 2016; Martyrosyan, Pasko, Rovnyi, Ashanin, & Mukha Volodymyr, 2017) noted that a rationally organized training process contributes to the harmonious development of the motor qualities of young people and encourages them to engage in sports, in particular, rugby.

Ukrainian schoolchildren want to learn new sports and actively develop. Every year more and more educational institutions introduce in the school program on physical culture rugby-5. The scientific data of the leading specialists (Filenko, Filenko, & Martirosyan, 2012; Filenko et al., 2018) indicate an increase in the popularity of rugby-5 over the last 5 years.

The development of a modern child is impossible without the use of information and innovation technologies. The training process in physical culture is also based on advanced technologies, which are studied in works by Azhyppo O., Pavlenko V., Mulyk V., Mulyk K., Karpets L., Grynova T., Sannikova M. (2018).

Innovative technologies of physical education training are presented in works by Ashanin V. et al. (2017) who developed the computer program "Physical education". Computer training technologies are used in the preparation of future teachers of physical culture, coaches in various sports (Filenko, Filenko, Martirosyan, 2013). Scientists (Filenko et al., 2017) proved the effectiveness of information technology training to improve schoolchildren' knowledge. Information technologies in physical education and sports also contribute to the mental activity of schoolchildren.

Intellect of students changes under the influence of physical exertion. Important research Podrigalo L. et al. (2016), who established the relationship between the mental and physical activity of students under the influence of physical education.

Considering the foregoing, it is urgent to introduce the Rugby-5 into the system of physical education of schoolchildren using modern information technologies.

Material and methods.

Study was conducted on the basis of the Kharkov gymnasium No. 172 (Ukraine). Study involved 62 pupils (18 girls and 44 boys) aged 12-13 years. The following methods and methods were used in the study: analysis of scientific and experimental literature and information on Internet sites on physical culture and sports; methods of information modeling; questioning anthropometric measurements (length and body weight); testing (running on 30 m, shuttle run 4x10 m, lifting the trunk in a sitting position, jumping rope, standing long jump, angle body from sitting position); functional test of Rufie; methods of mathematical statistics.

The methodology of the study was to study the scientific literature on the problem of using new means of physical education for schoolchildren. On the basis of the analysis, an innovative method for introducing the Rugby-5 into the educational process on physical culture was developed. Information technologies are applied as a multimedia computer program on Rugby-5. First stage of the research was of a determining nature, in which anthropometric indicators, indicators of physical development and physical readiness, and the functional state of the organism of pupils of 12-13 years were studied. Second stage of the research lasted from September to December 2017. At this time, there was information technology in Rugby-5 training in physical education lessons. After the end of the research, a re-testing of the individual grades of the schoolchildren was conducted. Comparative analysis of the results of the study was carried out using the methods of mathematical statistics.

Statistical analysis.

Generalization of the studied characteristics was assessed by mean arithmetic value, standard deviation and error of mean arithmetic. Confidence of differences between mean values was stated by Student's t-criterion. Assessment of statistical hypotheses based on 5% significance level. For statistical processing of data we used licensed program Microsoft Excel (2016), Statistics7, SPSS. Statistical analysis of the received results was conducted, considering recommendations on Microsoft Excel tables' usage for computer data analysis.

The study was conducted in accordance with the Helsinki Declaration. The study was approved by the ethics committee of the Kharkov State Academy of Physical Culture (Ukraine). All participants gave informed consent and were acquainted with the procedure of the study.

Results of the research.

Rugby-5 is one of the varieties of contactless games. This makes rugby-5 lessons safe. The physical game Rugby-5 was introduced on 15 lessons of physical culture. Theoretical information about the Rugby-5 game was provided in the first lesson. This allowed schoolchildren to familiarize themselves with the basic rules of the game and technical techniques, safety techniques during Rugby-5. In the second lesson, the schoolchildren studied the performance of taking a short pass and moving with the ball, which contributed to the development of their dexterity. During 3-5 sessions, the subjects studied the method of cross-pass, which contributed to the development of their dexterity and speed. Speed-power work was activated from 6-7 lessons, when schoolchildren began to learn tactical combinations and interactions. The task of the schoolchildren was to catch up with the player with the ball and tear off the ribbon from him. From 8 lessons began the introduction of 15 minutes of games. Tactical combinations were learned with the simultaneous mastery of a long pass and the development of power qualities. To do this, schoolchildren were given exercise sets with weights, resistance in pairs, throw-ball throws, and basketball ball throws at the target. Speed-force work was developed by means of playing tactical combinations, in which schoolchildren must quickly and accurately transfer rugby ball to each other. The speed of transmission and the accuracy of the shots were estimated.

When performing gaming exercises, there is a problem of compliance with the requirements of a contactless game. Players pushed each other, struck their hands, trying to take away the ball. It was also a common mistake to break the tape into a player without a ball. These errors were corrected in each lesson. Mastering the basic methods of playing rugby-5 schoolchildren was carried out during 15 lessons, after which they had high rates of technical and tactical action and did not allow fouls. The process of training Rugby-5 became stable and systematic, which allowed carrying out working out and fixing the skills of the game.

For self-consolidation of the acquired skills of the game in Rugby-5 pupils were provided sets of exercises for home and independent performance. The purpose of these tasks was to increase the level of possession of technical elements in Rugby-5 and the development of physical qualities, the instruction of schoolchildren to independent physical training. Control over the implementation of these exercises was carried out in each lesson before the start of the main part.

Before the beginning of each Rugby-5 lesson, the schoolchildren of the experimental group were provided with a computer training program, which consisted of a training video film and a set of lessons for studying technical elements and tactical combinations. Each computer lesson has a main page, a soundtrack, sound effects, animation settings. The educational material of the program is provided in the form of a video. Each video is provided with a soundtrack with a text explanation of the execution of each element of the game. Computer program was used as a means of theoretical preparation. The pupils of the control group were engaged in physical education lessons according to the generally accepted basketball program.

The testing of indicators of the level of physical development and physical preparedness of schoolchildren aged 12-13 years was carried out before and after the experiment. To test the static hypothesis, the Student's parametric test (t-test) was used. On the indicators of the level of physical development and physical preparedness of schoolchildren aged 12-13 years, there were no significant differences ($p > 0,05$) between the control group 1, who were engaged in basketball (Group 1) and the experimental group, who played in rugby-5 (Group 2) group (table 1).

Table 1. The level of physical development and physical readiness of schoolchildren 12-13 years

Tests	Group 1 (n=30)	Group 2 (n=32)	t	p
	M±m			
Body length, (cm)	158,0±0,42	160,0±0,31	0,89	>0,05
Body weight (kg)	45,0±0,82	44,8±0,77	0,09	>0,05
Running on 30 m, (s)	4,3±0,07	4,5±0,09	1,23	>0,05
Lifting the trunk from the prone position (once per minute)	10,3±0,11	10,2±0,10	1,25	>0,05
Jumping rope (once a minute)	53,5±1,15	52,1±1,23	1,56	>0,05
Shuttle run 4x10 m, (s)	140,1±2,35	142,5±1,56	1,78	>0,05
Standing long jump, (cm)	185,0±0,01	183,0±0,02	1,77	>0,05
Angle body from sitting position, (cm)	10,9±0,87	10,2±0,69	1,62	>0,05

Remark: t-limit value for the degrees of freedom ($k=62$) is equal to 2.00 when $p < 0,05$.

The results indicate that the level of physical activity in basketball and in rugby is approximately the same and adequate to the physical level of development and physical fitness of children.

The correlation analysis revealed reliable dependences (table 2) between the standing long jump and angle body from sitting position ($p < 0,01$), running on 30 m and shuttle running 4x10 m ($p < 0,01$) and the effect of length and body weight on the physical readiness of schoolchildren.

Table 2. Dependence of indicators of physical readiness of schoolchildren of 12-13 years under the influence of classes on Rugby-5

Tests	Body length	Body length	Running on 30 m	Lifting the trunk from the prone position (once per minute)	Lifting the trunk from the prone position (once per minute)	Standing long jump	Angle body from sitting position	Shuttle run 4x10 m
Body length, (cm)	1	<0,01	<0,05	<0,05	-	<0,05	<0,01	<0,05
Body weight (kg)	0,38	1	<0,05	<0,05	-	-	-	-
Running on 30 m, (s)	-0,30	-0,26	1	-	-	-	-	<0,01
Lifting the trunk from the prone position (once per minute)	0,29	-0,28	0,19	1	<0,01	<0,05	<0,01	-
Jumping rope (once a minute)	0,12	-0,22	0,05	0,36	1	<0,01	-	<0,01
Standing long jump, (cm)	0,28	0,16	-0,22	0,27	0,48	1	<0,01	-
Angle body from sitting position, (cm)	0,35	0,08	-0,19	0,61	0,20	0,50	1	<0,01
Shuttle run 4x10 m, (s)	-0,25	-0,19	0,52	0,18	-0,56	0,03	-0,07	1

Remark: for $n = 62$ at the critical value $r \geq 0,25$, $p < 0,05$; $r \geq 0,34$, $p < 0,01$.

Analysis of the physical development and physical readiness of schoolchildren 12-13 year olds engaged in Rugby-5 shows that there are unreliable differences from similar indicators for schoolchildren engaged in basketball. This indicates the equivalence of the rugby-5 game with other sports and the adaptation of Rugby-5 in the physical performance of the pupils. The results obtained make it possible to recommend game Rugby-5 as part of the program on physical education of schoolchildren.

To determine the level of recovery of the cardiovascular performance of 12-13 year old schoolchildren, four trials of Rufie were conducted during the experiment. The study of the heart rate (HR) was conducted to the lesson, after physical exertion and after the end of the lesson in the schoolchildren. The HR of

the schoolchildren in the group 1 (table 3) indicates an insufficient level of recovery and a low index of the Rufie Index (after 11 points is considered unsatisfactory).

Table 3. Study of the heart rate of schoolchildren

Heart rate index	I measurement	II measurement	III measurement	IV measurement
	M±m			
Group 1 – who were engaged in basketball				
At the beginning of the lesson, at rest	72,0±8,1	75,0±7,8	73,0±8,3	72,0±8,2
After exercise	110,0±12,0	108,0±13,0	106,0±12,0	112,0±12,8
At the end of the lesson after recovery	86,0±10,0	88,0±12,0	87,0±10,0	88,0±10,2
Rufie Index	9,2 – satisfactory	10,3 – satisfactory	10,2 – satisfactory	10,0 – satisfactory
Group 2 – who played in rugby 5				
At the beginning of the lesson, at rest	70,2±8,1	72,8±7,8	71,9±8,3	74,3±8,2
After exercise	104,6±12,0	102,4±13,0	110,5±12,0	106,1±12,8
At the end of the lesson after recovery	76,5±10,0	75,2±12,0	74,9±10,0	76,2±10,2
Rufie Index	5,1 – good	4,9 – good	5,5 – good	5,6 – good

The level of physical work done in rugby-5 is also high, as in other sports games. But at the same time, the restoration of the working capacity of the body systems is considerably better due to the correspondence of the presented load to the possibilities of work of the cardiovascular system of the body.

Analysis of the obtained indices shows that in the schoolchildren of the Group 1, who were engaged in basketball, the heart rate was restored to 75%, in the schoolchildren who were engaged in Rugby-5, the heart rate was restored after the end of the lesson by 95% (Fig. 1).

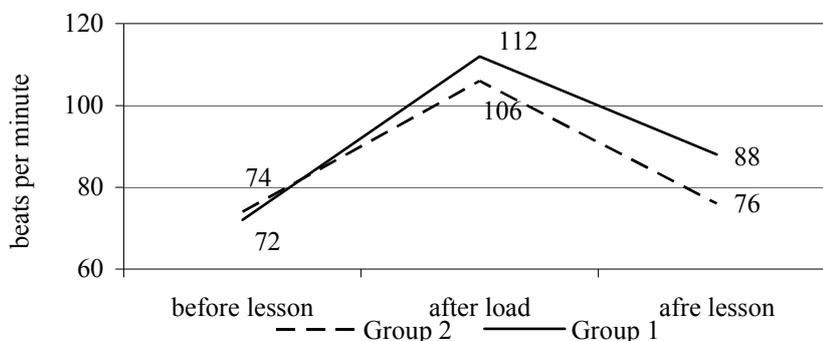


Fig. 1. Comparison of the average HR values of schoolchildren of the control and experimental groups under the influence of physical activity

The dynamics of changes in the heart rate is shown in the graph (Fig. 2). The heart rate was restored to the initial level in the students of group 1 under the influence of Rugby-5. Indicators of the Rufie index after the Rugby-5 sessions among the schoolchildren of the Group 2 (engaged in Rugby-5) is significantly better ($p < 0,01$) in restoring the working capacity of the organism and its adaptation to physical loads, than the similar index in schoolchildren of the Group 2 (were engaged in basketball).

Thus, it can be argued that the use of Rugby-5 contributes to the improvement of the functional state of the organism of pupils of 12-13 years old and contributes to their physical preparedness.

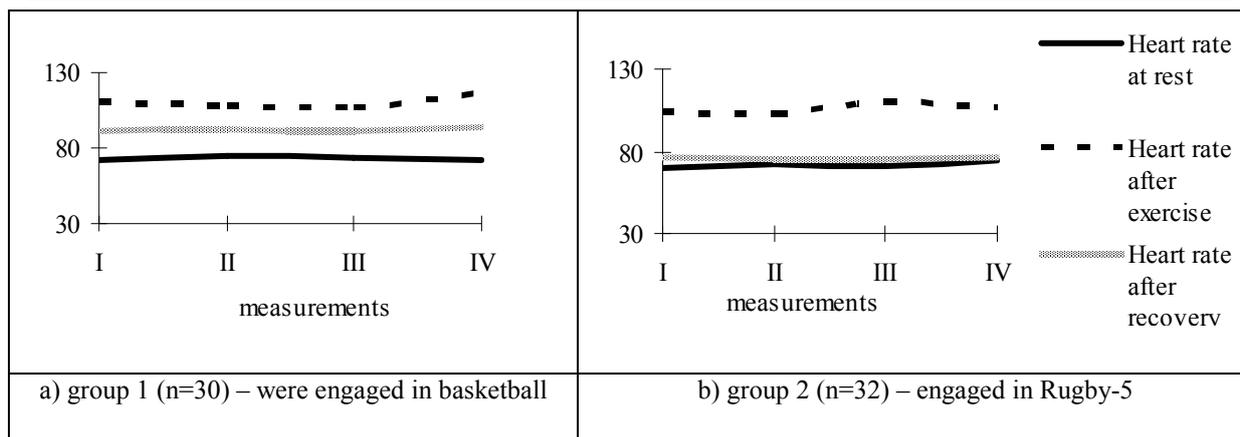


Fig. 2. Dynamics of changes in heart rate of students by the influence of physical education classes

In order to identify the attitude of the schoolchildren of the Group 2 to the Rugby-5, a survey was conducted. 74% of the respondents expressed high marks. 23% of the respondents rated "good". 3% of respondents rated "satisfactory". Rugby-5 did not receive negative reviews from interviewed schoolchildren. The obtained game scores in Rugby-5 is shown in Fig. 3. Answer to the question "Rugby-5 is worth studying" from 32 schoolchildren interviewed was answered "yes" – this is 87,5%, 3 people hesitated with an answer – 9,5%, and 1 answered "no" (3%). When asked about the extension of rugby-5 in the sports section and competition, 26 people agreed to continue playing at a higher level in Rugby-5 (83%), 4 people thought they only wanted to try (12,5%) and 2 schoolchildren refused to continue training in Rugby-5 in the future (4,5%).

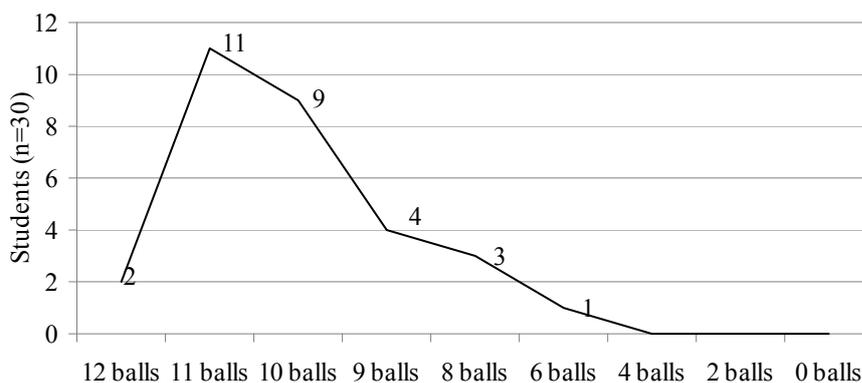


Fig. 3. The game ratings in Rugby-5 on a 12-point scale

The factor analysis of the results of the introduction of Rugby-5 into the physical education of schoolchildren of 12-13 years. The factor structure included 8 indicators, divided into two groups of factors. As a reliability criterion, a significance level $p < 0,05$ was chosen for $r > 0,800$. The expediency of choosing two factors is based on the fact that most of the indicators were group of the first factor – 45,8% (Table 4).

Table 4. Factor structure of physical development and functional state of the organism of pupils of 12-13 years under the influence of rugby-5 lesson (n=32)

Name of factor	Indicators	Factors	
		F1	F2
F1 – Functional state of health (45,8%)	HR	0,915	0,555
	Age	0,725	0,957
	Shuttle run 4x10 m	0,843	0,562
	Running on 30 m	0,818	0,781
	Standing long jump	0,489	0,891
F2 – Physical development (17,2%)	Body length	0,369	0,782
	Body weight	0,587	0,558
	Angle body from sitting position	0,658	0,826

Remark: for $n=32$ $p < 0,05$ at $r > 0,800$

The first group F1 – "Functional state of health" – includes the indicators of heart rate, shuttle run and run at 30 m. F1 affects the functional state of the cardiovascular system of the child's body. This indicates that Rugby-5 employment positively influences the formation of a child's body. The second group of factors F2 – "Physical development" – has the most influential indicator of the child's age. F2 affects the physical development and physical preparedness of schoolchildren by 17,2% under the influence of Rugby-5.

The obtained data confirm the results of our earlier studies on the introduction of Rugby-5 in physical education classes for the schoolchildren aged 10-11 (Filenko et al., 2018).

Discussion.

Rugby-5 helps to harmoniously form the child's body, aimed at increasing the physical, mental development of students, improving health. The children's version of rugby is intended for the preparation of youth teams in further professional training for Rugby-7 and Rugby (Martyrosyan et al., 2017).

The materials of our research testify to the positive trends in the introduction of the Rugby-5 into the schoolchildren' learning process and its active involvement in the school curriculum of schoolchildren in physical education. In the works of scientists Pasko V., Podolyaka A., Martyrosyan A. & Filenko I. (2012) and Pasko V., Martyrosyan A. & Mukha V. (2017), the main concepts and historical aspects of rugby development are indicated. Our research is carried out in accordance with these provisions.

Excessive physical activity often leads to a hypoxic reaction. To improve the adaptive capabilities of the cardiovascular system of the body of students of 12-13 years, a moderate approach to planning physical education classes should be used. In the works of Rovniy A. et al. (2017), it is pointed out that adaptation processes in the human body are directly related to the use of means of affecting the heart rate index, hypoxic reaction in the process of training loads. We confirmed the data of scientists on the need to take into account the functional state of the body of schoolchildren 12-13 years when planning physical activities, the duration of the session, the dosage periods of rest. The use of innovative teaching technologies, which include computer-based training programs, has increased the interest of students in physical education, Rugby-5. In the works of Kozina Z. et al. (2016), the mechanisms of attracting innovative technologies are detailed in the preparation of schoolchildren in physical education classes. Materials of our research are based on the development of these authors and are developing in the direction of the relevance of the use of Rugby-5 and confirm the data of the authors. The variety of sports allows the use of combined methods of training in physical culture aimed at improving the physical capabilities of students. Our researches are confirmed by the results of the authors Yefremenko A. et al. (2016), Bykova O. et al. (2017) and Shesterova L. et al. (2017) on increasing the level of physical development in children 12-13 years of age using means for using elements in various sports. It was found that the introduction of Rugby-5 sessions positively affects the physical development and physical fitness of the subjects, coincides with the work (Filenko, Filenko, & Martirosyan, 2013; Kvasnitsa, 2016, Pasko, 2016).

According to Ashanin V. et al. (2017), information technologies make it possible to optimize the educational process for physical culture in schoolchildren and schoolchildren, systematically regulate the level of physical development of the subjects and their health. In our studies, modern computer training technologies have been used to improve the theoretical training of schoolchildren in the introduction of motor rugby-5 in the educational process of physical culture.

Conclusions.

The analysis of the results of the research allowed substantiating the mechanisms of introducing rugby-5 into the educational process of physical culture in pupils of 12-13 years. Information technologies in the implementation of rugby-5 in the physical education of schoolchildren received high ratings of respondents (excellent – 74%, good – 23%, satisfactory – 3%). The level of physical development and physical readiness in pupils of 12-13 years did not have significant differences ($p>0,05$) under the influence of rugby-5 sessions, but the functional state of the child's organism received positive changes ($p<0,01$). This is evidenced by the recovery rates of the cardiovascular system after exercise. The analysis made it possible to determine two groups of factors (the first factor F1 – "Functional state of health" – 45,8%, the second factor F2 – "Physical development" – 17,2%), which contributed to the improvement of the cardiovascular system of the pupils 12-13 years.

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