

PHYSICAL EDUCATION OF SECONDARY SCHOOL STUDENTS USING ULTIMATE FRISBEE

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Abstract. *The article theoretically substantiates, develops, experimentally verifies the effectiveness of Ultimate Frisbee authors' training program for secondary school students to improve fitness level. There was positive dynamics in fitness level in the experimental group. The research aim is to determine the effectiveness of Ultimate Frisbee equipment use in physical education of secondary school students. The fitness level has been determined and the effectiveness of the Ultimate Frisbee program in physical education of secondary school students was verified. 45 schoolchildren were engaged into the study. Research methods: literary sources analysis; methods of obtaining empirical data (determining fitness level by T. Krutsevich methods); pedagogical experiment; mathematical statistics methods. The program to introduce Ultimate Frisbee into the physical education lessons for secondary school students has been presented and scientifically substantiated. The content of the program included studying the history of the game, the basics of game technique and tactics, how to play Ultimate Frisbee, refereeing rules; development of competitive activity skills; increasing fitness level. The developed program has been implemented into the educational process and its effectiveness has been proven. The results of the study showed the positive effect on secondary school students fitness level, which was confirmed by the mathematical statistics methods.*

Keywords: *fitness level, secondary school students, Ultimate Frisbee.*

Introduction

Nowadays the problem of preserving and strengthening the health of the young generation is gaining special relevance. This is due to the fact that currently about 90% of schoolchildren have deviations in their health status, every fifth is assigned to a preparatory or special medical groups, and more than 70% of schoolchildren have a low and below average level of somatic health (Khanikiants, Konestyapin, Rymar, Yaroshyk & Sorokolit, 2021). The given statistics indicate the need to introduce innovative means and methods of physical education in order to increase the effectiveness of physical education lessons, since they are the main form of organization of the physical education process in general educational institutions (Traykova, 2021; Zavydivska, Rymar, Khanikiants, Malanchuk & Solovey, 2021). One of these modern types of motor activity is Ultimate Frisbee, which, in our opinion, will be able to improve the health, increase fitness level and the level of development of physical qualities of secondary school children. The research aim is to determine the effectiveness of Ultimate Frisbee equipment use in physical education of secondary school students. The following research methods were used: literary sources analysis; methods of obtaining empirical data (determining fitness level by T. Krutsevych methods); pedagogical experiment; mathematical statistics methods.

Analysis of recent research and publications

New and modern sports, which have great prospects for development due to the game rules, in comparison with the traditional ones are gaining great popularity nowadays. These are sports that do not require a large involvement of technical staff, judges, volunteers and technical support. In our opinion, Ultimate frisbee is one of those.

Ultimate frisbee is a relatively young sport, dynamic, fast and tactically complex, which requires speed of thinking and decision-making. Taking up Ultimate frisbee provide the necessary level of motor activity, physical development, promote health, develop physical qualities and intellectual potential.

In the scientific literature, there is a lot of data related to the study of the competitive activity of Ultimate Frisbee (Krustrup & Mohr, 2015), the development of physical qualities (Kenedi & Sulaiman, 2018; Portillo, Bravo-Sánchez, Abián, Dorado-Suárez & Abián-Vicén, 2022); improving fitness parameters by Ultimate Frisbee (Miller, Eather, Lubans, & Duncan, 2018), Ultimate Frisbee in the preschool physical education curriculum (Traykova, 2021). Many scientific works are dedicated to technique improvement (Ahmadi, Booshehry & Reza Dostan, 2019), but there are practically no data related to the study of the impact of Ultimate Frisbee classes on secondary school children fitness level.

Materials and methods

The research was conducted during 2022-2023. The fitness parameters of children aged 11-12(secondary school age students) were determined and the effectiveness of Ultimate Frisbee program was experimentally verified. 45 students (18 girls and 27 boys) were engaged into the research. The pedagogical experiment was conducted with secondary school age students (6th grade), who were assigned to the main educational department according to their health level. Physical education lessons with Ultimate Frisbee were conducted by a appropriately trained teacher.

To solve the goal, the following research methods were used:

- Analysis of literary sources was used to study the prerequisites for increasing the effectiveness of physical education lessons using Ultimate Frisbee.
- Methods of obtaining empirical data (determining the fitness level according to T. Krutsevych method), which involved the measurement of functional parameters and parameters of physical qualities development such as vital index (mL/kg) - the ratio of the vital capacity of the lungs to body weight; Ruffier index (relative units) – heart rate after relatively small loads with different recovery time; Robinson's index (relative units) – the product of heart rate and systolic blood pressure; strength index (relative units) - the ratio of the (stronger) hand strength to the body weight; speed-power index (relative units) - the ratio of the long jump result to the body length; speed index (relative units) – the ratio of the 30 meters speed running time to the body length; the reference standard for assessing the flexibility level is "Torse tilt". All the listed parameters were evaluated in relative units (points) according to T. Krutsevych fitness level determining method for children aged 11-12. We summarized the seven parameters results, compared them with the tabular scale and determined the fitness level of children aged 11-12 as low, below average, average, above average, high. The parameters were measured during school physical education lessons. The results were recorded in the protocols.
- Pedagogical experiment was used to check the effectiveness of the author's program “Ultimate Frisbee in physical education of secondary school age children”.
- Mathematical statistics methods. All statistical analyses were performed using SPSS Version 21. For each characteristic, average values, standard deviations, and student criterion for unrelated samples were determined. The 0.05 levels of probability were used to indicate statistical significance (Weir & Vincent, 2020).

Research results

Ultimate Frisbee is a non-contact team sport with a disc that is actively developing all over the world. It can be practiced all year long, on any flat surface. All you need for the game is a plastic flying disc. The rules of the game are easy to remember. At the heart of Ultimate Frisbee is the "spirit of the game", the essence of which is reflected in the sporting phenomenon of "fair play", where players are guided by ethical and moral laws established for nobility and justice. A positive aspect is that Ultimate Frisbee can be practiced not only indoor, but also outdoor.

We have developed a physical exercises program with the use of Ultimate Frisbee for secondary school age children, the purpose of which was to increase their fitness level. The pedagogical experiment was conducted in 2022-2023. So, 24 students (12 girls and 12 boys) of the control group (CG) and 21 students (6 girls and 15 boys) of the experimental group (EG) were engaged.

Ultimate is non-contact sport. There are rules for mixed (male and female) teams. The main condition is the same number of boys and girls in a team. Therefore, during lessons, we divided the group by gender to avoid injuries, since at this age anatomical and physiological differences between boys and girls are already significant.

EG schoolchildren practiced according to the proposed program 3 times a week for 45 minutes in accordance with the schedule. CG schoolchildren studied according to the traditional physical education program, which included a section of volleyball.

The developed program provided for the solution of educational and health-related tasks, in particular studying and improving the technical elements of the game; physical qualities development; formation of skills to interact in a team; development of moral and volitional qualities; formation of interest and need for physical education.

The program included compulsory and optional components. The compulsory part included theoretical and methodological knowledge, general physical fitness. The content of the optional component included the study and practicing Ultimate Frisbee.

The program was developed for a 10 week period (30 lessons) and divided into two stages: preparatory (9 lessons - 3 weeks) and main (21 lessons - 7 weeks). Tasks of the preparatory stage were studying the rules of the game, learning the technique of main elements (throwing and catching technique, attack and defense tactics), as well as the formation of a persistent interest in physical exercises. The task of the main stage was to improve the schoolchildren fitness level (functional and physical readiness parameters; technical and tactical training in Ultimate Frisbee).

Each lesson had a traditional structure and consisted of preparatory, main

and final parts. The preparatory part involved setting tasks, organizing students and warm-up in order to prepare the bodies for future loads. The main part involved special exercises that contributed to the learning and improvement of Ultimate Frisbee skills. The final part involved the exercises aimed at cooling down. During the implementation of the program, the safety rules and preparation of the place for Ultimate Frisbee lessons were strictly observed.

Verification of the effectiveness of the experimental research work regarding the use of Ultimate Frisbee in the physical education of children of secondary school age was carried out in the process of control comparison of the results of the ascertaining and formative stages of the study.

During the experiment, the effect of the proposed program on the children aged 11-12 fitness level was determined. A general check of the results of the formative experiment was carried out, the reliability of the obtained data was determined. The analysis of the research results showed that at the beginning of the experiment there were no significant differences between the parameters of fitness level in CG and EG. This allows us to state that the groups were homogeneous at the beginning of the experiment.

The analysis of the fitness level parameters of children aged 11-12 and the changes during the experiment allows us to note that as a result of Ultimate Frisbee lessons, there were positive changes in a number of parameters (Table 1). Thus, the analysis of the results of the vital index, which serves as an assessment of the functional capabilities of the respiratory system, showed that during the experiment, the EG parameters increased by 3.28 mL/kg, which was confirmed by statistical reliability ($t=2.62$; $p<0.05$). The CG parameters also tended to increase by 2.15 mL/kg, but the result was unreliable ($t=1.61$; $p>0.05$). The statistical improvement of vital index parameters in EG was due to the inclusion of a large number of special running exercises, various accelerations, movements, jumps, which increase the volume of lung breathing, strengthen respiratory muscles and improve respiratory function in general.

During the experiment, there were positive changes in the parameters of the Robinson index, which characterizes the criteria for the reserve of the human cardiovascular system. Thus, the analysis of the results established that there was a significant improvement in the parameters of EG children in the course of the study ($t=2.11$; $p<0.05$), in particular, it increased by 4.29 points. Positive changes also occurred in CG children by 2.5 units, but they were less significant ($t=1.29$; $p>0.05$).

Table 1 Fitness level parameters in experimental and control groups (made by authors)

№	Parameters	Before experiment		After experiment		p
		CG	EG	CG	EG	
1.	Life index, mL/kg	44,41±1,2	44,03± 1,09	46,56± 1,11	47,31± 1,09	p<0,05
2.	Robinson index, relative units	88,71±1,65	89,17±1,61	86,21±1,70	84,88±1,91	p<0,05
3.	Ruffier index, relative units	11,16±0,43	11,26±0,49	10,20±0,44	9,81±0,41	p<0,05
4.	Strength index, %	49,24±1,09	48,01±1,10	51,67±1,2	51,81±1,13	p<0,05
5.	Speed and strength index, relative units	1,07±0,03	1,05±0,01	1,12±0,04	1,13±0,03	p<0,05
6.	Speed index, relative units	3,6±0,08	3,5 ±0,09	3,8±0,14	3,8±0,12	p<0,05
7.	Test exercise "Torse tilt ", cm	3,9±0,41	3,7 ±0,39	4,1±0,44	4,1±0,41	p>0,05

(n=45)

During the experiment, there were positive changes ($t=2.78$; $p<0.05$) in EG children and in the parameters of the Ruffier index, which evaluates the physical capabilities of schoolchildren and the body's adaptation to intense physical loads. On the other hand, we do not observe such significant improvements in children of CG ($t=1.89$; $p>0.05$). Such a statistical increase in the parameters of the Robinson index and the Ruffier index in EG children can be explained by the fact that Ultimate Frisbee is a highly dynamic sport, which is characterized by such types of movements as speed race, jumps in motion and with rotations, fast stops for various throws and catches. So it serves as a kind of cardio training, which requires considerable endurance and, as a result, improves the children's cardiovascular system function.

The study of strength index parameters determined a significant influence ($t=2.77$; $p<0.05$) of lessons on the development and improvement of hand muscle strength of EG children, since the Ultimate frisbee exercises mainly focus on throws (accuracy/range) and catching the disc with the hands. However, it is worth noting that there were also positive shifts in the strength index parameters of the CG children, but the observed changes are unreliable ($t=1.94$; $p>0.05$).

In the course of the study, the dynamics of the speed-power index of children 11-12 years old was analyzed. It was found that in the course of the experiment there was a significant improvement in the parameters of the children of both groups, in particular, we note an increase in the parameter by 0.02 points in the EG children ($t=4.12$; $p<0.05$), in CG children by 0.01 relative unit ($t=2.44$; $p<0.05$). We associate such changes with the fact that both Ultimate Frisbee and volleyball contain a sufficient number of various jumping exercises which strengthen the leg and trunk muscles.

EG students achieved a significant growth in the speed index, which increased from 3.5 units. up to 3.8 units ($t=2.16$; $p<0.05$) and it was confirmed by the reliability of the discrepancy between the results of CG and EG ($p<0.05$). The improvement of EG children results can be explained by the fact that playing Ultimate Frisbee requires to react quickly to the opponents and partners actions, to change quickly the direction and speed of movements, the ability to accelerate, to perform defensive or offensive actions.

As a result of the experimental program, there were positive but unreliable changes in the parameters of the test exercise "torse tilt" in both groups children, in particular, in EG children the difference between the parameters was 0.4 cm ($t=1.99$; $p>0, 05$), in CG children - 0.2 cm ($t=1.61$; $p>0.05$). The above shows despite Ultimate Frisbee includes a large number of jumps, turns, twists, but this was not enough for a statistical increase in the results of children's flexibility development.

The specific parameters were evaluated in points according to T. Krutsevych method of children fitness level determining. According to the research results, it is established that systematic Ultimate Frisbee training allows to improve the fitness level. Before the experiment the value of EG children was estimated as "below average" (8.3 points), and after the experiment as "average" (15.1 points) (Fig. 1). Although the fitness level of CG students increased during the experiment and it was defined as "below average" at the beginning and at the end of the experiment.

Thus, it can be stated that the developed program with the use of Ultimate Frisbee in the process of physical education of secondary school age children is effective and it can be applied to improve secondary school age children fitness level.

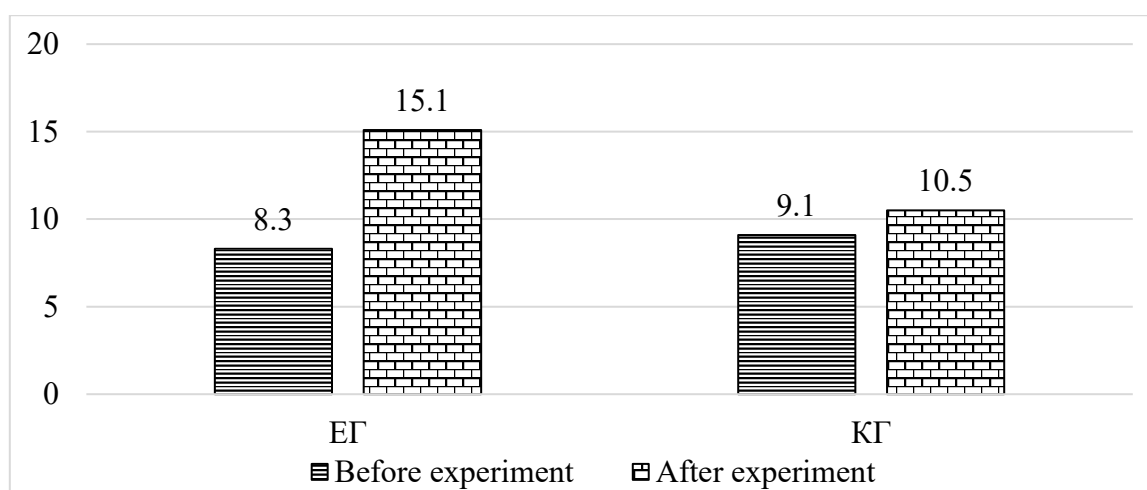


Figure 1 Dynamics of EG and CG children fitness level during the experiment, points (made by authors)

Discussion

Modern physical education is going through intensive transformations aimed at increasing the effectiveness of learning and increasing the motor activity of children. The researchers (Bodnar et al., 2015; Khanikiants et al., 2021; Kukhar, Sorokolit, Yavorsky & Khanikiants, 2021) indicate the importance of modernizing approaches to physical education. One of the key trends is the use of the modern means of physical education in the educational process. Such approaches give possibility to make physical activity more interesting and attractive for children, stimulating their active participation in lessons.

The researchers (Bodnarchuk, Rymar & Solovey, 2018; Sarkauskiene, Noble & Kardeliene, 2019) also indicate the importance of finding modern approaches to the organization of physical education. This includes the development of new methods aimed at attracting various kinds of motor activity, the introduction of the modern sports. The main goal is to create conditions for the development of comprehensive physical activity, which contributes not only to physical health, but also to the development of social skills and self-determination of students.

According to the research (Bodnar, Stefanyshyn & Petryshyn, 2016; Zavydivska et al., 2021), innovations in physical education and motor activity help to make learning more attractive and effective. The introduction of the modern means and methods of teaching becomes a key element of the successful development of physical education nowadays.

As a result of using the Ultimate Frisbee program, the vital index, Robinson index, Ruffier index, strength index, speed and strength index, speed index probably improved in EG children. The dynamics of the parameters of the test exercise "torso tilt" turned out to be positive, but statistically unreliable.

The obtained results prove the positive impact of the developed authors' program. The combination of a large number of special running exercises, various accelerations, movements, jumps in motion and with rotations, with fast stops, various throws and catches during lessons have a positive effect on the activity of the cardiovascular and respiratory systems, increase the level of physical qualities development, in particular endurance, strength, speed, flexibility.

There was a change in EG students from "below average" to "average" level during the experiment, so the positive effect on the children aged 11-12 fitness level was proven.

The developed program allows to solve comprehensively the tasks of physical education of secondary school age students, first of all by strengthening health, ensuring harmonious development, increasing fitness level during favorable periods for physical qualities development.

Conclusions

The Ultimate Frisbee is one of the modern means of physical education. Practicing Ultimate Frisbee increases fitness level, interest in motor activity, develops physical qualities, improves and expands motor experience. A variety of actions in rapidly changing game conditions help to improve the accuracy of movements, increase the speed of motor reaction, and improve the ability to navigate in space.

The developed Ultimate Frisbee program was aimed at improving the secondary school children fitness level. It consisted of compulsory and optional components and it was divided into two stages. During the lessons, the following tasks were supposed to be solved: studying the rules of the game, learning and improving the technique of the main elements performing (throwing and catching technique, attack and defense tactics), improving fitness level of children aged 11-12. Each lesson had a traditional structure and consisted of preparatory, main and final parts.

It was revealed that during the pedagogical experiment on the implementation of the program with the use of Ultimate Frisbee, a more pronounced nature of positive changes in the parameters of EG children compared to the parameters of CG children was observed.

The analysis of the results of the fitness level parameters showed that the parameters of the vital index improved significantly in EG by 3.28 ml/kg ($t=2.62$; $p<0.05$); Robinson's index by 4.29 points; Ruffier index by 0.08 points; strength index by 3.8 units; the speed-strength index by 0.02 units and speed index by 0.3 units, in the test exercise "Torso tilt" positive, but unreliable changes were revealed. During the experiment, it has been proven a positive effect on children aged 11-12 fitness level, as there was a change in EG children from "below average" to "average" level.

So, the research results listed above have proven the effectiveness of the Ultimate Frisbee program implementation and could be recommended for improving secondary school age children fitness level.

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