

Original article

The influence of Burpee on the volume of attention of schoolchildren

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Abstract:

Objectives: – to determine the influence of the «Burpee» exercise on the indicators of endurance and volume of attention in children aged 15-16. **Methods:** the pedagogical experiment was carried out on the basis of a comprehensive school, the city of Kirov, Russia. The study involved children 15-16 years old in the amount of 52 people. During the study period, 30 physical education lessons were held in each class. Children from the control group were engaged in the usual program, and children from the experimental group additionally performed the «Burpee» exercise. Endurance in children was determined by the test «2000 m», and the volume of attention was determined by the test «Schulte Tables». The study used Excel and BioStat to determine Student's T-test. **Results:** after the pedagogical experiment, the indicators in the control group in the «2000 m» test improved by 1.9% ($p>0.05$), and in the «Schulte Tables» by 4.8% ($p>0.05$). In the experimental group, the performance improved significantly in the «2000 m» test by 9% ($p<0.05$) and in the «Schulte Tables» by 15.8% ($p<0.05$). **Conclusion:** if 15-16-year-old schoolchildren perform the «Burpee» exercise in physical education classes, then the indicators of endurance and volume of attention will improve significantly. In this case, physical activity should be individual.

Keywords: Burpee; CrossFit; Schoolchildren; Endurance, Individual approach.

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Introduction:

Man is constantly improving and improving technological progress. Physical culture and sports are no exception. Athletes and coaches are constantly looking for new physical exercises that would be most useful. One of the modern and popular physical exercises all over the world is «Burpee». The author of the physical exercise «Burpee» is an American specialist and physiologist from New York, Royal Nadleston Burpee, he invented it in the early 1930s. Today, the exercise «Burpee» is quite popular all over the world, even online competitions are held on the Internet, in which people compete for the maximum number of repetitions of the exercise. «Burpee» is a functional exercise that certainly accelerates the

heartbeat and at the same time it involves a fairly large group of muscles: shoulders, biceps, pectoral muscles, abdominal press, back muscles, gluteal muscles, quadriceps muscles of the thighs and others. The obvious advantage of the «Burpee» exercise is the ability to perform it anywhere without the presence of special sports equipment or the presence of a coach. Athletes who are engaged in CrossFit have long appreciated the advantages and fairly high efficiency of the «Burpee», while the exercise has many different modifications. Such an exercise can be performed both in light conditions and in fairly complex^{1,2}.

The «Burpee» exercise can be effective for the safe development of adolescent muscles, as they work

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with their own weight. Strength training with a barbell and dumbbells in adolescence is not recommended, because it can harm the growth of the spine, disrupt metabolism and generally worsen the development of a teenager. At the same time, proper and intensive performance of the «Burpee» exercise requires a lot of effort and a good level of physical fitness. Most physical qualities, strength, speed, endurance and others should be developed at a good level. Taking into account the sensitive periods of development of such physical qualities as strength, speed-strength abilities and endurance, the age of 15-16 years was determined for the study, this is the 9th grade in an ordinary school. At this age, there is a fairly intensive development of muscle mass of schoolchildren, a favorable development of most physical qualities, especially endurance^{3,4}.

It should be noted that at primary school age, a differentiated approach (group work) and coordination training prevail, while at senior school age, an individual approach is more often used. Despite the fact that the «Burpee» exercise is quite popular all over the world, we have not been able to find scientific studies showing effective components of physical activity for schoolchildren. In all likelihood, such activities will be more effective individually for each learner^{5,6}.

In addition, some pedagogical studies have proven the interaction of physical abilities and mental processes of students of different ages. This is especially important at the age of 15-16, since after graduating from the 9th grade, children enter colleges or 10th grades⁷⁻⁹.

Purpose – to determine the influence of the «Burpee» exercise on the indicators of endurance and volume of attention in children aged 15-16.

Research hypothesis: it is assumed that if schoolchildren 15-16 years old use the physical exercise «Burpee» at every physical education lesson at school, then not only endurance indicators will improve, but also volume of attention indicators.

Methods and Materials:

Participants:

Schoolchildren of 15-16 years old, who studied at a regular Russian school in the city of Kirov, took part in the pedagogical experiment. In total, 52 schoolchildren took part in the study, these are boys and girls who studied in grades 9a and 9b. This served as the distribution of schoolchildren into

the control group (CG) and the experimental group (EG). Regardless of gender and level of physical fitness, only those schoolchildren who were admitted to physical education lessons by a doctor without any restrictions for health reasons took part in the study. In total, 32 students studied in grade 9a (CG), but 25 people (13 boys and 12 girls) were admitted to the study and were completely healthy. There were 33 students in the 9b grade (EG), but 27 students (13 boys and 14 girls) took part in the study.

All procedures met the ethical standards of the 1964 Declaration of Helsinki. Informed consent was obtained from all parents of the children included in the study.

Procedure:

The pedagogical experiment was conducted from September 1 to December 30, 2021 at a comprehensive school in the city of Kirov, Russia. All physical education lessons at the school were held 2 times a week for 45 minutes each lesson. During the period of the pedagogical experiment, 30 physical education lessons were held in each class; for 4 months, schoolchildren went to a physical education lesson at the same time. Children from grade 9a had their second lesson on Tuesday and the first lesson on Thursday. Children from grade 9b studied the first lesson on Tuesday and the second lesson on Thursday.

Schoolchildren from the CG (9a) were engaged in the usual physical education program at the school for students in grades 1-11¹⁰.

Schoolchildren from the EG (9b) studied according to the same program, but additionally performed the «Burpee» exercise at each lesson.

Execution technique

If we decompose the whole exercise in stages, then it consists of simpler exercises: squats, planks, push-ups and jumping out. The technique of the traditional exercise «Burpee»:

1. Starting position - stand up straight, feet shoulder-width apart.
2. Bend your knees and, in a squat position, rest your hands on the floor. Shift body weight onto hands.
3. Jump out with your feet back so that you are in a plank position with straight arms.
4. Do one push-up (flexion and extension of the arms in a lying position) and return to the plank position.

5. Jump to pull your legs to your hands and be in a squat position.
6. Jump up, raise your arms and clap above your head.

It is important to focus on the correct technique for performing the exercise, and not on the number of repetitions. However, to achieve the effect, it is necessary to maintain a sufficiently high intensity of the exercise.

Contraindications

With extreme caution, the «Burpee» exercise should be performed in some cases:

- joint problems, especially with the knee and hip;
- chronic heart disease or high blood pressure;
- excessive overweight (more than 30% of the normal weight);

It is important to ensure that when performing the «Burpee» exercise, conditions such as dizziness, nausea and chest pain do not appear. In such cases, the exercise should be stopped.

Exercise stress

The components of physical activity were individual, since each student had his own level of physical fitness. The exercise was performed for time, without counting the repetitions of each student and the teacher’s mental count. Over a period of time, students performed varying amounts of repetitions (approximately 15 to 25 repetitions per minute).

Depending on the objectives of the lesson, the exercise was performed either after the warm-up or at the end of the main part of the lesson. At the same time, of course, we were guided by the principle of gradualism. The physical activity components of the «Burpee» exercise are presented in Table 1.

Table 1. Components of physical activity exercise «Burpee» for children 15-16 years’ old

Number of series	Activity	September	October	November	December
1st series	Burpee	60 sec	90 sec	120 sec	120 sec
	Rest	60 sec	60 sec	90 sec	60 sec
2nd series	Burpee	60 sec	90 sec	120 sec	120 sec
	Rest	90 sec	90 sec	120 sec	90 sec
3rd series	Burpee	60 sec	90 sec	90 sec	120 sec
	Rest	120 sec	120 sec	120 sec	120 sec
Total time		7 min 30 sec	9 min	11 min	10 min 30 sec

It should be noted that the activity was selected according to the well-being of the majority of children in the class. So, for example, the exercise «Burpee» to perform less than 60 seconds will be ineffective, however, if it is performed in the first month for more than 60 seconds, then most of the students will stop. Gradually, the activity increased, and the rest time decreased. More than three series with a sufficiently high intensity, most of the students physically could not endure. At the same time, it was important that the «Burpee» exercise did not interfere with the implementation of the main physical education curriculum at school.

Before and after the start of the study, all children took two control tests:

1. General endurance was determined according to the test «Running 2000 m»¹⁰.

Procedure:

Running 2 km on the treadmill of the athletics arena. The test was performed from a high start position. At the command «Start!» students take their places in front of the start line. After the command «March!» they start running.

The result is recorded by the chronometer in minutes and seconds with an accuracy of 1 second.

2. Volume of attention was determined according to the test «Schulte Tables»¹¹.

Procedure: A sheet of A4 paper shows 25 squares on both sides. In the squares, the numbers are in different order from 1 to 25 (table 2).

Table 2. Fragment of the «Schulte Tables»

25	5	9	16	1		2	17	12	5	25
17	13	4	12	7		18	14	1	22	9
6	19	2	10	20		6	20	23	13	21
22	11	8	23	18		11	7	19	4	10
24	14	21	15	3		24	15	8	3	16

Option 1 Option 2

At the teacher’s signal, all schoolchildren must quickly cross out the numbers from 1 to 25 in each square. If a mistake is made, the test starts again. The result is the time taken to complete the test (s).

Mathematical and statistical processing of results

The indicators of all participants were recorded in a Microsoft Excel spreadsheet, the mean value and standard deviation were determined. The change in the indicators of schoolchildren from the beginning to the end of the study was determined as a percentage, and the significance of the values was determined by Student's T-test ($p>0.05$).

Ethical clearance:

This research was conducted in compliance with the needed research ethics. In addition, consent for participation was obtained from the participants before the beginning of their involvement in the study. All data were recorded and analyzed anonymously.

Results:

Before the start of the pedagogical experiment and after its completion, all students took control tests. The results are presented in table 3.

Table 3. The results of control tests in children aged 15-16

Test	Control group (n=25)				Experimental group (n=27)			
	Before	After	%	p	Before	After	%	p
Run 2000 m (min sec)	9.95±1.16	9.76±1.04	1.9	$p>0.05$	10.19±1.21	9.27±0.67	9	$p<0.05$
Schulte Tables (sec)	31.2±2.9	29.7±2.6	4.8	$p>0.05$	32.3±3.1	27.2±2.8	15.8	$p<0.05$

Table 3 shows that the performance in both tests, both in grade 9a and grade 9b, improved, but the improvements were different.

In children from the CG, the indicators in the «Run 2000 m» test improved by 1.9% ($p>0.05$), and the indicators in the «Schulte Tables» became higher by 4.8% ($p>0.05$) than before the start of the study. Such results may indicate a fairly good impact of a regular physical education curriculum on the physical qualities and mental processes of children aged 15-16. It should also be noted the natural increase and a favorable period for the growth and development of the studied indicators.

For schoolchildren in the EG, the indicators in the «Run 2000 m» test improved by 9% ($p<0.05$), and the indicators in the «Schulte Tables» became higher by 15.8% ($p<0.05$) than before the start of the study. Such results indicate the unconditional effectiveness of the use of the «Burpee» exercise in physical education classes at school and its impact on the physical qualities and mental processes of 15-16-year-old schoolchildren.

Discussion:

Every teacher and coach should be looking for the best use of time for the development of the physical qualities of their students. The popular and uncomplicated physical exercise «Burpee» can be called unique, since it does not require special and expensive equipment, does not require a lot of space for its implementation, and at the same time, it affects

a large number of muscles^{1,2}. Exercise «Burpee» requires a fairly good level of physical fitness, while the exercise itself can be in different variations. First of all, the exercise develops endurance, so the most suitable age is 15-16 years. We should not forget about the natural increase in indicators at this age, this was proved by children from grade 9a, who were engaged in the usual physical education program at school¹⁰. Data on the sensitive period of endurance development at 15-16 years are confirmed by some other studies^{3,4}.

Although some studies address the topic of CrossFit, there are no specific recommendations on the components of physical activity for people of different ages. Of course, such an activity should be individual, especially at senior school age^{5,6}. In our study, approximate physical activity's for the «Burpee» exercise for children aged 15-16 were noted at physical education lessons at school. In our opinion, using less time will not be effective. If more time is used on the Burpee, then the children will be physically and psychologically tired, and lose interest in the exercise, and there will not be enough time to implement the main physical education curriculum in the school¹⁰.

Some studies have proven that physical exercises and physical activity of students have a positive effect on their academic performance at school and the development of certain mental processes⁷⁻⁹. The indicators of children from grade 9b confirm these

data, since their volume of attention indicators have improved significantly during the study period. At the same time, children from the EG significantly improved their endurance indicators, which once again confirms the effectiveness of the introduction of the «Burpee» exercise into the educational process of schoolchildren aged 15-16. The new research has made it possible to achieve the goal of solving pedagogical tasks. Physical culture in general and its capabilities will certainly help solve a number of problems, such as the development of physical qualities, as mentoring, communication skills and solve some problems in learning¹²⁻¹⁴. Despite the active research in this direction. This is especially true in the period after the pandemic, during which the most important questions were also raised¹⁵⁻¹⁷.

Conclusion:

If the physical exercise «Burpee» is used in every lesson in physical education at school, then the endurance indicators of children aged 15-16 will improve significantly. At the same time, indicators of mental processes, such as volume of attention, will also improve significantly. Physical activity for the implementation of «Burpee» should be individual,

depending on the level of physical fitness of the student. A new study presents an example of physical activity for students in the 9th grade of a regular school.

This study is relevant and promising for study. In the future, it is possible to determine how «Burpee» affects other physical qualities or mental processes, the search for new, optimal options for physical activity for schoolchildren of different ages.

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Authors' contribution:

Data gathering and idea owner of this study: Polevoy G.G.

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