


The influence of Burpee on the stability of attention of schoolchildren

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Abstract - Aim: To determine the influence of the «Burpee» exercise on the indicators of endurance and stability of attention in children aged 15-16. **Methods:** the pedagogical experiment was carried out based on a comprehensive school, in the city of Kirov, Russia. The study involved children 15-16 years old in the amount of 52 people. Children from the experimental group additionally performed the “Burpee” exercise. Endurance in children was determined by the test “2000 m”, and the stability of attention was determined by the test “Bourdon test”. 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 “Bourdon test” by 5.9% ($p > 0.05$). In the experimental group, the performance improved significantly in the “2000 m” test by 9% ($p < 0.05$) and in the “Bourdon test” by 20% ($p < 0.05$). **Conclusion:** if 15-16-year-old schoolchildren perform the “Burpee” exercise in physical education classes, then the indicators of endurance and stability of attention will improve significantly.

Keywords: burpee, crossfit, schoolchildren, endurance, individual approach.

Introduction

A person constantly upgrades various processes in order to reach the desired goal in a short and high-quality way. Physical culture and sports are no exception. Athletes and coaches are always in search of exercises from which the body gets its useful maximum. One of the modern and popular physical exercises all over the world is “Burpee”. The author of the exercise is an American physiologist from New York, Royal Nadleston Burpee, who invented it in the early 1930s. Today, the “Burpee” exercise is so popular that online challenges are being held on the Internet in which participants compete for the maximum number of repetitions. “Burpee” is a functional exercise that accelerates the work of the heartbeat and at the same time a fairly large group of muscles is involved in it: shoulders, biceps, pectoral muscles, abdominals, back muscles, gluteal muscles, quadriceps thighs. The indisputable advantage of the “Burpee” exercise is the ability to perform it anywhere without the presence of special sports equipment and a trainer. Athletes who practice CrossFit have long appreciated the benefits and high efficiency of “Burpee”, while the exercise has a lot of modifications. It can be performed both in light conditions and in complicated ones^{1,2}.

The “Burpee” exercise can be effective for the safe development of the muscles of adolescents, as they work with their weight. Strength training with barbells and dumbbells in adolescence is not recommended because it can harm a person's growth and development. However,

for the correct and intensive performance of the “Burpee” exercise, a large amount of effort and a good level of physical fitness are required. At the proper level, most physical qualities should be developed. Considering 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 a regular school. At this age, there is a rather intensive development of the muscle mass of schoolchildren, a favorable development of most physical qualities, especially endurance^{3,4}.

If at primary school age a differentiated approach and coordination training prevail, then at senior school age an individual approach is more often used. Although the “Burpee” exercise is quite popular all over the world, we were unable to find scientific studies that show effective components of physical activity for schoolchildren. In all likelihood, such an activity will be more effective individually for each student^{5,6}.

In addition, some studies have proven the effective influence of physical activity on the indicators of mental processes in children of different ages. This is especially important at the age of 15-16 since, after the end of the 9th grade, children go to colleges or the 10th grade⁷⁻⁹.

Burpee can be an alternative exercise for children because a large group of muscles is involved in this physical exercise. In addition, the exercise is easy to perform and does not require special equipment. Therefore, this study aimed to determine the influence of the «Burpee»

exercise on the indicators of endurance and stability of attention in children aged 15-16. Our hypothesis is 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 stability of attention indicators.

Methods

Participants

Schoolchildren 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. This study was approved by Research Ethics Committee, Vyatka State University. From the record of the meeting of the ethics committee on January 17, 2022 n. 1.

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 min 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 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 while, 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](#).

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” performed less than 60 s will be ineffective, however, if it is performed in the first month for more than 60 s, then most of the students will stop. Gradually, the activity increased, and the rest time decreased. More than three series with sufficiently high intensity, most of the students physically could not endure. At the same time, the “Burpee” exercise needed not to interfere with the implementation of the main physical education curriculum at school.

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 s | 90 s | 120 s | 120 s |
| | Rest | 60 s | 60 s | 90 s | 60 s |
| 2nd series | Burpee | 60 s | 90 s | 120 s | 120 s |
| | Rest | 90 s | 90 s | 120 s | 90 s |
| 3rd series | Burpee | 60 s | 90 s | 90 s | 120 s |
| | Rest | 120 s | 120 s | 120 s | 120 s |
| Total time | | 7 min 30 s | 9 min | 11 min | 10 min 30 s |

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 s.

2. Stability of attention was determined according to the test “Bourdon test”¹¹.

Procedure: Numbers from 1 to 9 are shown in random order on a piece of paper (Table 2).

For 2.5 min, children should cross out any number, for example, “4”.

The result is determined by the formula

$$S = \frac{(0.5N - 2.8n)}{t}$$

where *S* is an indicator of attention stability, *N* is the number of numbers viewed during the operation, *t* is the working time, and *n* is the number of errors made during

Table 2 - Fragment of the “Bourdon test”.

| |
|---|
| 9 6 5 2 1 4 5 3 2 5 6 9 4 1 2 3 6 5 8 4 9 6 5 7 4 1 2 0 3 6 5 4 8 5 4 1 0 2 |
| 3 6 5 4 1 2 5 5 6 4 8 9 3 2 1 5 4 8 7 4 5 2 1 3 6 5 1 2 5 4 8 9 3 5 4 6 9 8 |
| 4 5 6 3 2 1 4 1 5 8 9 6 5 4 7 9 8 7 8 9 7 6 8 4 6 5 4 6 5 4 9 8 7 4 6 5 4 6 |
| 5 4 6 1 6 8 4 8 4 8 9 4 6 5 4 9 8 7 9 7 9 8 0 7 7 4 9 8 7 4 9 8 4 9 8 0 4 4 |
| 6 5 4 6 5 4 6 5 0 4 6 5 4 6 5 4 6 8 5 4 9 6 8 4 6 4 6 5 8 6 8 4 6 8 6 5 4 1 |
| 6 3 5 4 1 6 5 1 6 5 4 0 1 5 6 4 1 4 |

operation (missing necessary numbers or crossing out unnecessary numbers).

After that, you need to draw a graph of attention stability with indicators *S* (up) every 0.25 points and *t* (to the right) every 30 s.

5 points - the line does not go beyond one zone (an excellent indicator of attention stability).

4 points - the line does not go beyond the two zones.

3 points - the line does not go beyond the three zones.

2 points - the line does not go beyond the four zones.

1 point-the line does not go beyond the five zones.

Mathematical and statistical processing of results

The indicators of all participants were recorded in a Microsoft Excel spreadsheet, and 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 ($p > 0.05$).

Results

Before the start of the pedagogical experiment and after its completion, all students took control tests. 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 “Bourdon test” became higher by 5.9% ($p > 0.05$) 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 “Bourdon test” became higher by 20% ($p < 0.05$) 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.

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

| Test | Control group (n = 25) | | | | The experimental group (n = 27) | | | |
|-----------------------|------------------------|-------------|-----|----------|---------------------------------|-------------|----|----------|
| | Before | After | % | p | Before | After | % | p |
| Run 2000 m (min s) | 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 |
| Bourdon test (points) | 3.4 ± 0.2 | 3.6 ± 0.3 | 5.9 | p > 0.05 | 3.5 ± 0.1 | 4.2 ± 0.2 | 20 | p < 0.05 |

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 many muscles^{1,2}. Exercise “Burpee” requires a fairly good level of physical fitness, while the exercise itself can be in different variations. First, 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 Cross-Fit, 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, the approximate physical activities for the “Burpee” exercise for children aged 15-16 were noted in 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 note the effective impact of physical activity on mental and cognitive processes⁷⁻⁹. The indicators of children from grade 9b confirm these data since their stability 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. Thus, the purpose of the study was achieved, and the proposed hypothesis was solved.

In order to adjust the work program on physical culture at school, several problems often arise: the exercise is difficult to perform, the exercise requires expensive or complex equipment, the exercise is aimed at some not numerous muscles and is not effective enough, unlike the “Burpee” exercise. Of course, several techniques complement the work program on physical culture at school, however, in our opinion, the exercise «Burpee» has undeniable advantages, namely, accessibility for children of any age and gender, it does not require special equipment,

the student works with his weight and involves a very large group of muscles.

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 stability 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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