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# Analysis of the development of physical qualities in 5-7th grade students in relation to their participation in static activities

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## Abstract

*Purpose:* Analysis of the development of physical qualities characteristic of static activities of students of Grades 5-7 consists in learning.

*Methods:* A number of scientific sources on the impact of static exercises on the body of school-age children, the development of physical qualities characteristic of their static activities, and the possibility of using static exercises in physical education lessons to achieve high results in improving work capacity has analyzed.

*Results:* Comparing the pedagogical experiment results shows that, The indicators of static balance in the experimental group improved significantly compared to the control group (Table 4.2.1). The relative growth in the 5th grade of the experimental group was 13.05%, while in the control group it was 6.24%. In the 6th grade, the relative growth in the experimental group was 14.26%, and in the control group it was 6.59%. In the 7th grade, the relative growth in the experimental group was 16.10%, and in the control group it was 7.25%.

*Conlcusion:* At the end of the experiment, static endurance increased more in 6th-grade students - by 2.99 s, in 7th-grade students - by 2.54 s, and in 5th-grade schoolchildren, this indicator changed by a small amount - by 2.31 s. The relative growth was 15.28% in 5th-grade students in the experimental group, and 5.42% in the control group. In the 6th grade of the experimental group, it was 15.70%, and in the control group it was 5.32%. In the 7th grade of the experimental group, it was 17.03%, and in the control group it was 6.39%. Among the indicators that grew during the pedagogical experiment, the most reliable result was related to static endurance.

**Keywords:** Static tensions, static strength, static endurance, static flexibility, static balance

## Introduction

Nowadays the lack of physical activity among children is one of the urgent problems in the world. The lack of physical activity in child's life is increasing the amount of static activities. Also, as childen get older, passive activities performed while sitting in school's daily routine increases, its predominance in comparison to active activities increases too. The physical education process for schoolchildren does not fully meet their need for movement. According to several specialists, the amount of compulsory physical education in overall secondary schools is not enough to efficiently ensure the development of motor and functional abilities of schoolchildren during the educational process.

School practice shows that most teachers rarely use static exercises in physical education lessons and face methodological difficulties when using them. This situation has negative impact on the effectiveness of physical education lessons, the level of students' endurance to static exercises and the development of their physical qualities. The systematic use of static exercises during the lesson and the formation of a conscious and active attitude to the performance of static exercises in students is one of the most helpful means of developing their physical growth, readiness, and motor skills and abilities. This defines the importance of improving the technology of using static exercises in physical education lessons for school-aged students. [1,7].

Till these days during the analysis of studies and scientific research results on sensitive periods of the development of physical qualities of middle school students, comprehensive works dedicated to the study of sensitive periods of the growth of physical abilities of static activities ( static strength, static endurance, static flexibility, static balance) are rarely found [7].

Because of the need to maintain certain work postures for long periods of time due to the intensification of the educational process at school, the proportion of static muscle tension in the daily routine increases. The efficiency of mental and physical work ability of school students depends on the resistance to static loads.Analysis of literatures illustrates that, students need to adapt to the static component of motor activity.

## Methods

A number of scientific sources on the impact of static exercises on the body of school-age children, the development of physical qualities characteristic of their static activities, and the possibility of using static exercises in physical education lessons to achieve high results

in improving work capacity has analyzed.

The following specific tests were used to assess the level of development of physical qualities characteristic of static activities:

1. Exercise for assessing static balance:

Standing on one leg with eyes closed ( Romberg test, seconds)

2. Exercise for assessing static flexibility:

Bending forward from a gymnastic seat without bending the knees (measured from under the feet, cm)

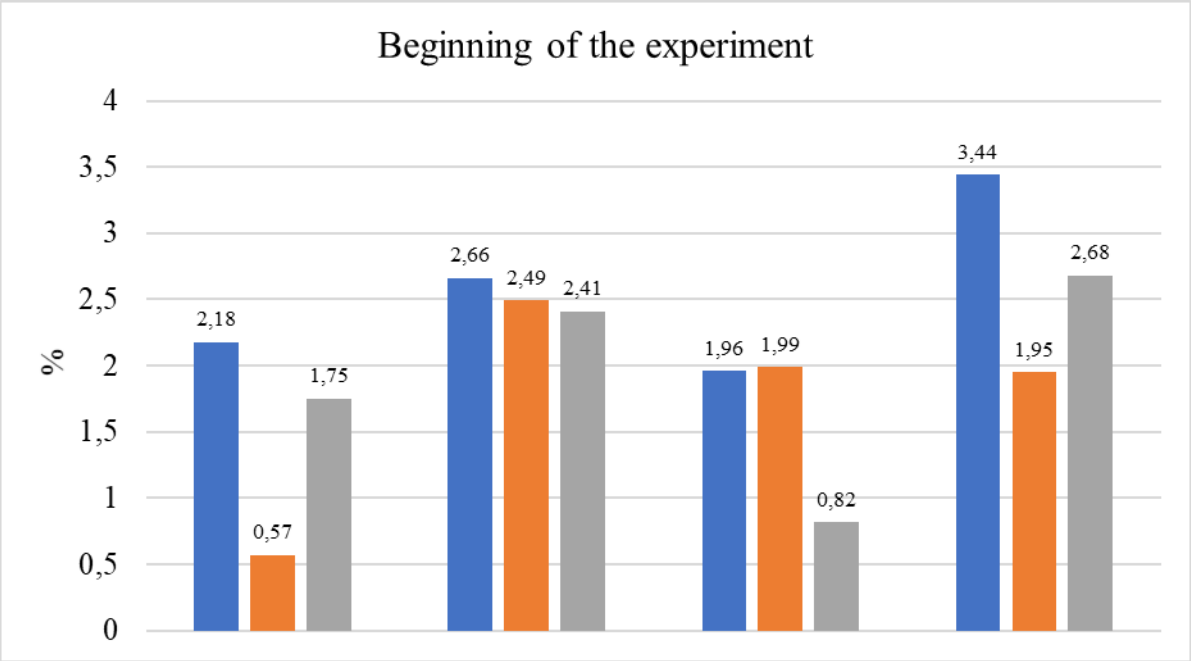
3. Exercise for assessing static endurance:

Holding the maximum 30% load in a static position with arms extended for as long as possible, seconds [5].

addition, they also encounter static tension situations during the performance of various motor activities. Moreover, the more muscles are involved in static tension, the faster fatigue occurs [6]. In children and adolescents, tiredness develops quickly due to low endurance to static tensions, which leads to a decrease in mental and physical performance [8], as well as problems in children's posture [3, 4].

The assessment was conducted at the beginning and end of the experiment. According to the results, there was almost no difference in the indicators of the students in the control and experimental groups at the beginning of the experiment.

**Fig 1. Analytical results of beginning of the experiment**




4. Exercise for assessing static strength:

Holding the maximum load in a static position with arms extended for 2 seconds, kg. [5].

The results of the conducted research were analyzed comparatively using statistical methods. In particular, for the statistical analysis of all the results, the arithmetic mean, standard deviation, coefficient of variation, and mean square error were calculated for each pair.

## Results and discussion

Static tensions play an important role in the lives of children. During the 5-6 hour school day, students sit at their school desks and spend about 80% of their time in a static position. In

between the average arithmetic values of the indicators recorded at the beginning of the pedagogical experiment for students belonging to the control and experimental groups. During the experiment, there was a reliable growth in the development of these physical qualities of the students (Table 1).

The results of the test exercise for assessing the students' static balance, standing on one leg with eyes closed (Romberg test, seconds), were as follows:

At the beginning of the experiment, the differences in the indicators of the control and experimental groups were not statistically significant (5th grade - $p>0.5$; 6th grade - $p>0.8$; 7th grade - $p>0.6$). At the end of the experiment, no sta-

**Table 1.** Statistical characteristics and dynamics of changes in special physical fitness indicators of students in experimental and control groups during pedagogical experiment.

| Special test exercises | Groups | TB | | | TO | | | Statistic indicators | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $\overline{X}$ | σ | V, % | $\overline{X}$ | σ | V, % | AO‘ | NO‘ | t | P |
| Standing on one leg with eyes closed (Romberg test, sec) | | | | | | 5-grade (n =34) | | | | | |
| | EG | 14,17 | 2,26 | 15,95 | 16,02 | 2,52 | 15,73 | 1,85 | 13,05 | 3,19 | <0,01 |
| | CG | 14,49 | 2,13 | 14,70 | 15,39 | 2,20 | 14,29 | 0,90 | 6,24 | 1,72 | >0,05 |
| | | | | | | 6-grade (n =34) | | | | | |
| | EG | 15,57 | 2,45 | 15,74 | 17,79 | 2,74 | 15,41 | 2,22 | 14,26 | 3,52 | <0,001 |
| | CG | 15,66 | 2,26 | 14,43 | 16,69 | 2,38 | 14,26 | 1,03 | 6,59 | 1,83 | >0,05 |
| | | | | | | 7-grade (n =34) | | | | | |
| | EG | 17,68 | 2,75 | 15,55 | 20,53 | 3,05 | 14,86 | 2,85 | 16,10 | 4,04 | <0,001 |
| | CG | 17,38 | 2,37 | 13,64 | 18,64 | 2,46 | 13,20 | 1,26 | 7,25 | 2,15 | <0,05 |
| Bending forward from a gymnastic seat without bending the knees (measured from under the feet, cm) | | | | | | 5-grade (n =34) | | | | | |
| | EG | 4,47 | 0,66 | 14,75 | 5,07 | 0,73 | 14,40 | 0,60 | 13,34 | 3,54 | <0,001 |
| | CG | 3,04 | 0,41 | 13,60 | 3,25 | 0,43 | 13,31 | 0,22 | 7,14 | 2,11 | <0,05 |
| | | | | | | 6-grade (n =34) | | | | | |
| | EG | 4,47 | 0,61 | 13,64 | 5,02 | 0,66 | 13,15 | 0,55 | 12,22 | 3,55 | <0,001 |
| | CG | 4,36 | 0,59 | 13,52 | 4,69 | 0,62 | 13,30 | 0,33 | 7,45 | 2,21 | <0,05 |
| | | | | | | 7-grade (n =34) | | | | | |
| | EG | 4,67 | 0,68 | 14,57 | 5,39 | 0,75 | 13,91 | 0,72 | 15,50 | 4,17 | <0,001 |
| | CG | 4,56 | 0,67 | 14,70 | 5,02 | 0,72 | 14,34 | 0,46 | 10,17 | 2,75 | <0,01 |
| Holding the maximum 30% load in a static position with arms extended for as long as possible, seconds | | | | | | 5-grade (n =34) | | | | | |
| | EG | 15,10 | 2,56 | 16,95 | 17,41 | 2,87 | 16,48 | 2,31 | 15,28 | 3,50 | <0,001 |
| | CG | 14,81 | 1,87 | 12,62 | 15,62 | 1,92 | 12,29 | 0,80 | 5,42 | 1,75 | >0,05 |
| | | | | | | 6-grade (n =34) | | | | | |
| | EG | 15,61 | 2,62 | 16,78 | 18,06 | 2,96 | 16,39 | 2,45 | 15,70 | 3,61 | <0,001 |
| | CG | 15,31 | 1,95 | 12,74 | 16,12 | 1,97 | 12,22 | 0,81 | 5,32 | 1,71 | >0,05 |
| | | | | | | 7-grade (n =34) | | | | | |
| | EG | 15,36 | 2,55 | 16,60 | 17,98 | 2,89 | 16,07 | 2,62 | 17,03 | 3,96 | <0,001 |
| | CG | 15,49 | 1,98 | 12,78 | 16,48 | 2,02 | 12,26 | 0,99 | 6,39 | 2,04 | <0,05 |
| Holding the maximum load in a static position with arms extended for 2 seconds, kg.. | 5-grade (n =34) | | | | | | | | | | |
| | EG | 7,39 | 1,18 | 15,98 | 8,42 | 1,31 | 15,56 | 1,03 | 14,01 | 3,42 | <0,01 |
| | CG | 7,14 | 1,04 | 14,57 | 7,59 | 1,09 | 14,36 | 0,45 | 6,30 | 1,74 | >0,05 |
| | | | | | | 6-grade (n =34) | | | | | |
| | EG | 8,77 | 1,37 | 15,62 | 10,07 | 1,54 | 15,33 | 1,30 | 14,78 | 3,66 | <0,001 |
| | CG | 8,61 | 1,24 | 14,41 | 9,18 | 1,31 | 14,27 | 0,57 | 6,67 | 1,86 | >0,05 |
| | | | | | | 7-grade (n =34) | | | | | |
| | EG | 9,07 | 1,41 | 15,55 | 10,43 | 1,54 | 14,77 | 1,36 | 15,04 | 3,81 | <0,001 |
| | CG | 9,32 | 1,27 | 13,63 | 9,93 | 1,22 | 12,29 | 0,61 | 6,58 | 2,03 | <0,05 |

tistically significant changes in the test results were observed in the control groups. Statistically significant changes were recorded in the indicators of the experimental group.

Comparing the pedagogical experiment results shows that, The indicators of static balance in the experimental group improved significantly compared to the control group (Table 4.2.1). The relative growth in the 5th grade of the experimental group was 13.05%, while in the con-

trol group it was 6.24%. In the 6th grade, the relative growth in the experimental group was 14.26%, and in the control group it was 6.59%. In the 7th grade, the relative growth in the experimental group was 16.10%, and in the control group it was 7.25%.

From this we can say that, If the changes in experimental groups are associated with the effect of the lessons conducted with static exercises, then in the control group they are associated only with age-related changes and the use of balance exercises as part of the school curriculum. We can conclude that the use of static exercise tools in physical education lessons with 11-14 year old schoolchildren can improve static balance. The information obtained can be used by specialists in the field of physical education of 11-14 year old schoolchildren.

Static flexibility indicators in the experimental group improved significantly compared to the control group (Table 1). The relative growth in the 5th grade of the experimental group was 13.34%, while in the control group it was 7.14%. In the 6th grade, the relative growth in the experimental group was 12.22%, and in the control group it was 7.45%. In the 7th grade, the relative growth in the experimental group was 15.50%, and in the control group it was 10.17% (Diagram 1). The reason for these reliable indicators can be associated with the effectiveness of the static stretching exercises used in the preparatory part of the lessons.

Static strength and endurance qualities were assessed using the following control exercises to describe natural abilities:

In the initial tests, students stand upright, lower their arms, and raise their arms horizontally until they can no longer do so. They hold the maximum weight they can lift with one arm for 2 seconds, which is equal to 30% of the maximum result they were able to achieve in the initial tests. For example, a student lifted 8 kg with each arm in the initial test. Therefore, the weight for the static exercise will be 2.4 kg (30% of 8 kg). Static endurance involves holding the maximum static strength weight at 30% of its weight for as long as possible and breathing freely during the exercise.

As can be seen from the table above, static strength increases with age. There were no significant differences in the initial indicators of the control and experimental groups. Thus, at the beginning of the experiment, this indicator was 7.39 kg for 5th-grade students in the experimental group, 1.38 kg for 6th-grade students, and 1.68 kg for 7th-grade students. In all cases, the differences in static strength between age groups were statistically significant. At the end of the experiment, the most significant increase in static strength was observed in 7th-grade students in the experimental group (1.36 kg) (5th grade - 1.03 kg, 6th grade - 1.3 kg).

The relative growth in 5th-grade students in the experimental group was 14.01%, while in the control group it was 6.30%. In the 6th grade of the experimental group, it was 14.78%, and in the control group it was 6.67%. In the 7th grade of the experimental group, it was 15.04%, and in the control group it was 6.58%. Based on this, our research correctly assessed the natural age-related factors of changes in some of their physical abilities to describe the physical fitness of schoolchildren in accordance with changes in static strength.

As noted above, in static exercises, it is important to consider not only the weight of the weight but also the time it is held in a static position. The duration of static exercises can be assessed by the schoolchildren's static endurance. For this, we used the exercise "Holding the maximum 30% weight in a static position for as long as possible (seconds) with arms outstretched."

According to it, the highest endurance in the initial test was shown by students of the 6th grade of the experimental group - 15.61 s, students of the 7th grade were slightly lower - 15.36 s, and students of the 5th grade - 15.10 s. The results in the control group were also recorded accordingly. The differences in indicators of endurance under static stress between age groups were statistically insignificant.

## Conclusion

The use of static exercises developed and recommended according to the age and functional characteristics of schoolchildren's bodies has shown high efficiency in increasing the level of their physical development, motor readiness, and mastering the program material in physical education. Static exercises are a means of increasing the efficiency of the entire educational and pedagogical process without increasing the number of weekly physical education lessons and without changing their main tasks.

The most appropriate option for developing physical qualities of static activities is the complex impact on different muscle groups during the lesson, rather than a more selective impact on one muscle group.

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