

Effect of Physical Exercises on the Indicators of Physical Development of Junior Schoolchildren With the Diseases of the Respiratory Organs

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Abstract

Health is a fundamental resource in the life of every person. Therefore, it is important to pay attention to health from an early age. Unfortunately, recently there has been a negative trend of a decline in children's health. The reason for this is not only an adverse ecological situation but also the attitude of parents to their health. Along with medicine, an effective way to strengthen and maintain health is physical culture, namely physical exercises. This scientific article deals with the study of the effect of special physical exercises on the physical development of children of primary school age suffering from respiratory diseases. The main causes that lead to this disease are certain types of viruses. The ingress of infection from the virus carrier is airborne. According to the results of numerous studies, children from 1 to 3 years old are at risk of high sickness rate, and subsequently, the risk of morbidity decreases several times. In most cases, children with low immunity are susceptible to respiratory diseases. Disease factors may be environmental pollution; congestion of children in institutions, urban transport; disturbance of nasal breathing, chronic diseases of the nasopharynx, a tendency to temperature rise. An experimental study was conducted in MBEE "Grammar School № 2" in Chistopol, the Republic of Tatarstan. For the sake of completeness and purity of the experiment, the experts from the medical department of the sports center of the Chistopol dispensary were involved in the work. Jointly with them we conducted an analysis of medical records and developed the methods of exercises which were further put into practice.

Keywords: Children of primary school age; Respiratory diseases; Bodily exercises; Health; Physical culture; Methods.



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1. Introduction

For the past few years, an unfavorable trend of increasing the number of children with respiratory diseases has been observed in the Russian Federation. According to Dubrovsky V. I. and Karmanova L.V., school graduates are not more than 15% of healthy children, and 38% have a kind of childhood pathology. In turn, 30% of graduates have a respiratory system pathology (Semyonov, 2006). The relevance of this study is due to the growing number of respiratory diseases in children of primary school age. In case of the development process of the respiratory organs is pathological, then in 80% there is a risk of damage to parts of the respiratory apparatus. If the process is started, then a combined lesion of its parts may occur. The following symptoms are typical to diagnose the respiratory diseases: shortness of breath, coughing, smothering, sputum, pain in the thoracic cage. When this disease occurs, the function of the entire respiratory system is disturbed on the whole, let alone its individual parts. And, as a result, we observe pulmonary ventilation impairment, gaseous metabolism disturbance, pulmonary insufficiency development (Aganyants, 2005; Shchetinin, 2011). The solution to the treatment of the diseases of respiratory system with the help of physical culture means static and static-dynamic respiration exercises. Thanks to them, shallow breathing is changed into a deep one, the inhalation and exhalation phases are extended or shortened, which leads to an improvement in the respiratory rhythm and in the ventilation of lungs.

Therapeutic exercises in rational combination of conditioning exercises with special breathing enhance the lymph and blood circulation in the lungs and thereby contribute to more rapid and complete resorption of infiltrates and exudates in the lungs and pleural cavity, prevent the formation of commissure in it, the inclusion of therapeutic gymnastics in the complex treatment of acute respiratory diseases significantly increases its effectiveness and keeps the patients' ability to work in the future (Aimbire *et al.*, 2008; Lipatov, 2007). In chronic lung diseases, normalization of impaired respiratory function can be achieved with the help of exercise (Ripa, 2007).

Physical training, the elements of sport in combination with training activities and massage increase the local and general immunity of the organism to the harmful effects of the external environment, make the body healthier (Chudnaya, 2000).

The main objectives of therapeutic physical training in bronchitis are:

- health resumption of the balance of excitation and inhibition processes in the cortex of the cerebral hemispheres,
- cancellation of pathological reflexes and restoration of the normal stereotype of the regulation of the respiratory apparatus;
- abatement of spasms of the bronchi and bronchioles;
- amelioration of ventilation of the lungs;
- activation of trophic processes in tissues;
- counteraction to the development of pulmonary emphysema;
- instruction in extended expiration (Masironi, 1985).

The course of medical physical culture in hospital is divided into three periods: sparing, functional and training.

The first two periods take place during patient's staying in hospital, the training period – in polyclinic or sanatorium.

The period of sparing medical exercises is used for familiarization with the patient's condition, history taking, determining its functionality (Hamre *et al.*, 2007).

In the second period, classes are held from starting sitting positions, standing with a chair support, standing. Here are used such forms of training as hygienic and therapeutic gymnastics. The difference lies in the fact that hygienic gymnastics has a restorative effect on the body, and treatment is prescribed for preventive purposes, taking into account the focus of the disease. It should be said that depending on the disease and the stage of the circuit, the content of the complexes and methods are different (Martin, 2004).

Another form of occupation that is used for children of this age is sport games and sports entertainment. Depending on the state of health, they must be dosed out and the conditions under which they will be held must be taken into account.

2. The Objective of the Research

To identify the feasibility of the use of special exercises in the physical development of children aged 7-10 years having respiratory diseases.

3. Results and Discussion

The experimental base of the research was Chistopol MBEE "Gymnasium №2", Chistopol, the RT. The experiment involved 40 children of primary school age. The participants in the experiment were divided into 2 groups. The experimental group (EG) was represented by the children of primary school age in number of 20 people who had respiratory diseases and they were assigned to a special medical group. The control group (CG) involved 20 children aged 7-10 years who did not have respiratory diseases, obvious diseases and were assigned to the main medical group.

Various special exercises developed in the medical department of a sports clinic with the participation of specialists in this area were used in working with children (EG) to promote the treatment of respiratory diseases.

It should be said that the identification of a small percentage of growth in tests in children with diseases of the respiratory system already testifies to the effectiveness of methods aimed at improving health and increasing indicators of physical development.

Table 1 presents the initial indicators of the physical development of children of junior school age in the experimental and control groups.

Table-1. Indicators of Physical Development of Children of Primary School at the Beginning of the Experiment

Indicators	Groups	
	EG	KG
Weight (kg)	29,7±2,1	33,9±1,09
Length (cm)	126,6±3,1	134,7±2,6
Vital capacity of the lungs (ml)	1010±21,2	1138 ± 19,5
Pulse (b/min)	87,5±5,2	80,4 ± 2,9
Volume of the chest at rest (cm)	59±3,1	63±3,3
Chest volume on inspiration (cm)	63±3,2	67±3,4
Chest volume in exhalation (cm)	58±3	61±3
Difference in chest volume on inhalation and exhalation(cm)	5±0,2	6±0,3
Test of Shtange (sek)	29±2,1	34±2,4
Test of Genche (sek)	15±0,9	21±1

This and subsequent tables and figures contain the indicators of the physical development of children of the experimental group that are lower than those of children in the control group, due to the negative impact of respiratory diseases.

From the presented data it is clear that children of EG suffering from diseases of the respiratory system have low indicators of weight of body and length of body.

Concerning the indicators of vital capacity of the lungs (VCL), then we observe the result of $1138 \pm 19,5$ ml in the CG, whereas in the EG – $1010 \pm 21,2$ ml.

Interesting data were obtained when measuring the heart rate (at rest) of junior schoolchildren of both groups. As it turned out, the diseases of the respiratory system have an adverse effect on the activity of the heart muscle, namely, on the heart rate. In the CG – 80,4, in the EG – 87,5 beats / min. As we observe, children of the control group have the heart working in a more economical mode.

The next indicator which is directly related to the development of the respiratory system and illustrates objective information is the chest volume. In this case, we observed it in various states (both at rest, on inhalation and on exhalation, and we determined its excursion).

So, at rest, CG showed the result of $63 \pm 3,3$ cm, EG – $59 \pm 3,1$ cm. The following results were obtained on inhalation: CG – $67 \pm 3,4$ cm, EG – 63 ± 3 cm. On exhalation: CG – 61 ± 3 , EG – 58 ± 3 . Chest excursion in CG was $6 \pm 0,3$, in EG – $5 \pm 0,2$ cm.

The next tests were tests for breath holding on inhalation (Shtange) and on exhalation (Genche).

Here, the children from EG also showed the worst results in comparison with those of CG ($29 \pm 2,1$ against $34 \pm 2,4$ seconds in the test of the Shtange and $15 \pm 0,9$ against 21 ± 1 seconds in the test of Genche).

Thus, based on the analysis of the data obtained, it can be concluded that children of primary school age suffering from diseases of the respiratory system are behind behind in physical development from the healthy children of the same age. In particular, this is indicated by the following research results: body weight - 29,7 against 33,9 kg; body length – 126,6 against 134,7 cm; VCL - 1010 against 1138 ml; HR – 87,5 against 80 beats / min; chest excursion – 5 against 6 cm; Stange’s test – 29 against 34, Genche’s test – 15 against 21.

The data obtained at the end of the experiment allow us to compare the physical development of children of primary school age who have different diagnoses of respiratory diseases in comparison to their healthy peers (Table 2).

Table-2. Indicators of Physical Development of Children of Primary School Age in the End of an Experiment

Indicators	Groups	
	EG	KG
Weight (kg)	$31,4 \pm 2,5$	$37,5 \pm 1,4$
Weight (cm)	$127,4 \pm 3,9$	$137,9 \pm 3,2$
Vital capacity of the lungs (ml)	$1135 \pm 28,4$	$1925 \pm 29,9$
Pulse (b/min)	$88,2 \pm 5,3$	$78,3 \pm 2,3$
Volume of the chest at rest (cm)	$61,2 \pm 3,4$	$65,7 \pm 3,5$
Chest volume on inspiration (cm)	$65,2 \pm 3,6$	$70,4 \pm 3,6$
Chest volume in exhalation (cm)	$58,9 \pm 3,2$	$62,8 \pm 3,2$
Difference in chest volume on inhalation and exhalation (cm)	$6,3 \pm 0,3$	7,6
Test of Shtange (sek)	$32 \pm 2,9$	$40,4 \pm 3,4$
Test of Genche (sek)	$17,2 \pm 1$	$25,3 \pm 1,3$

So, at the beginning of the experiment, in the experimental group, the body weight reached 29,7 kg, whereas in the control group – 33,9 kg. At the end we observe the following indicators: 31,4 and 37,5 kg, respectively.

In the control group, the most significant changes can be observed.

Regarding the length of the body during the experiment in the studied groups, the situation is similar. For the same reason for the decrease in motor activity, the children of the experimental group are significantly inferior to the children in the control group (Meyer, 2005).

The increase in body length in the EG is within the range of 126,6-127,4 cm, whereas in the CG, one traces the dynamics from 134,7 to 137,9 cm (Fig. 1).

Fig-1. Body Length Indicators in the Studied Groups (cm)

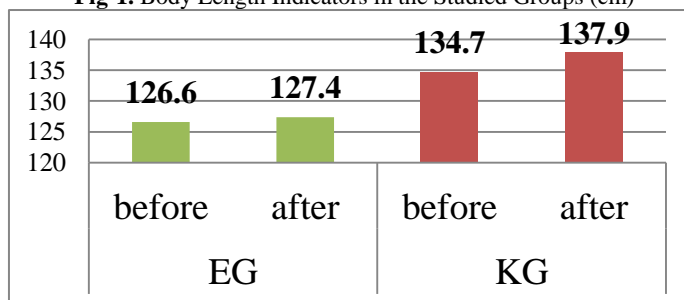
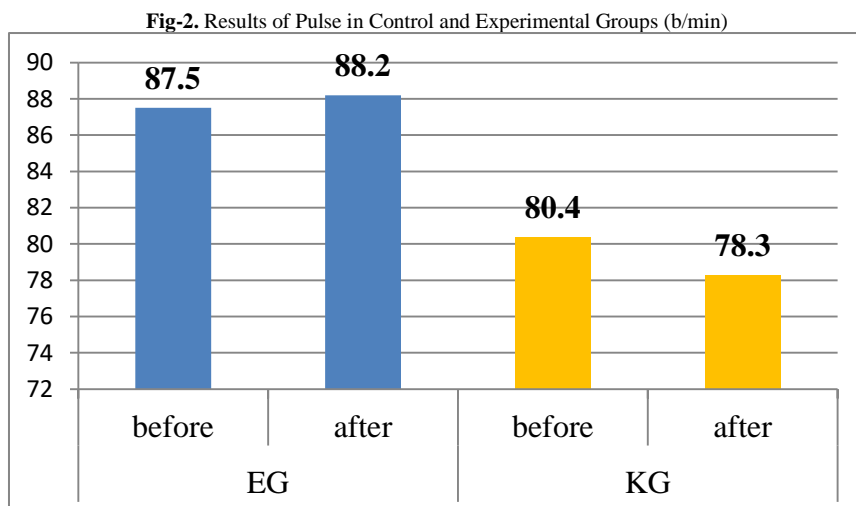
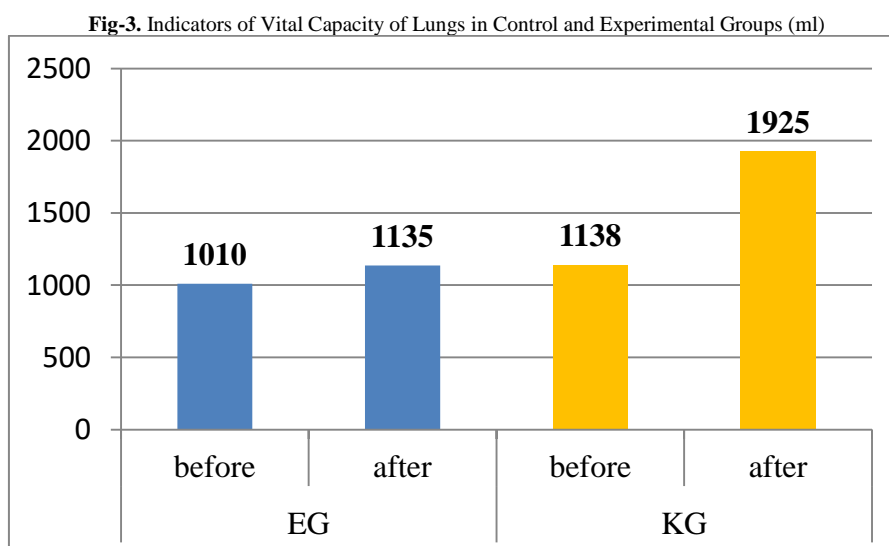


Figure 2 presents the results of heart rate. The experimental group had negative dynamics (heart rate increased from 87,5 to 88,2 beats / min), and the control group had, on the contrary, the decrease in heart rate from 80,4 to 78,3 beats / min.



A very different dynamic is observed when determining the vital capacity of the lungs. At the beginning of the experiment, the children of the experimental group lagged behind their peers in this indicator, however, the use of breathing exercises improved the results. Thus, the indicators of vital capacity of the lungs increased from 1010 to 11,35 ml, and in the control group from 1138 to 1925 ml.



The use of breathing exercises and special physical exercises had a beneficial effect on the development of the chest (Figure 5. 6).

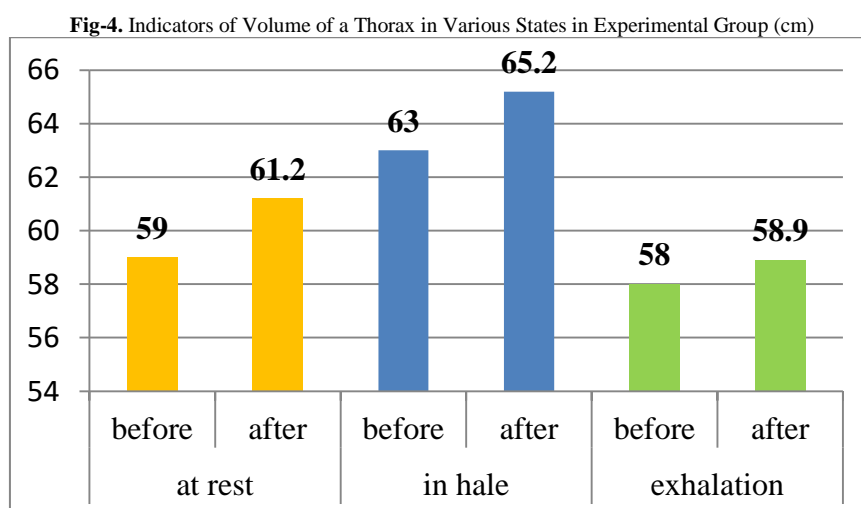
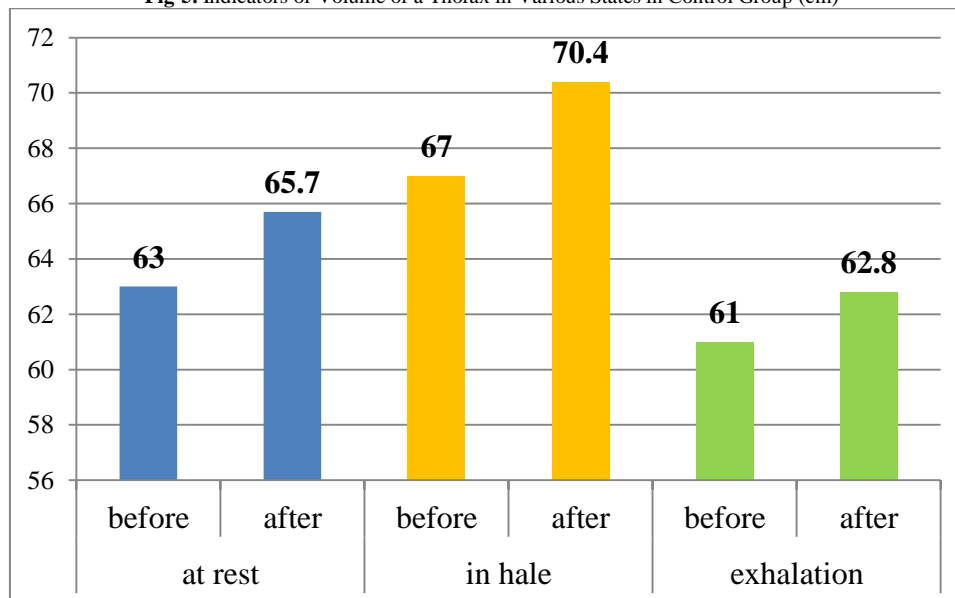
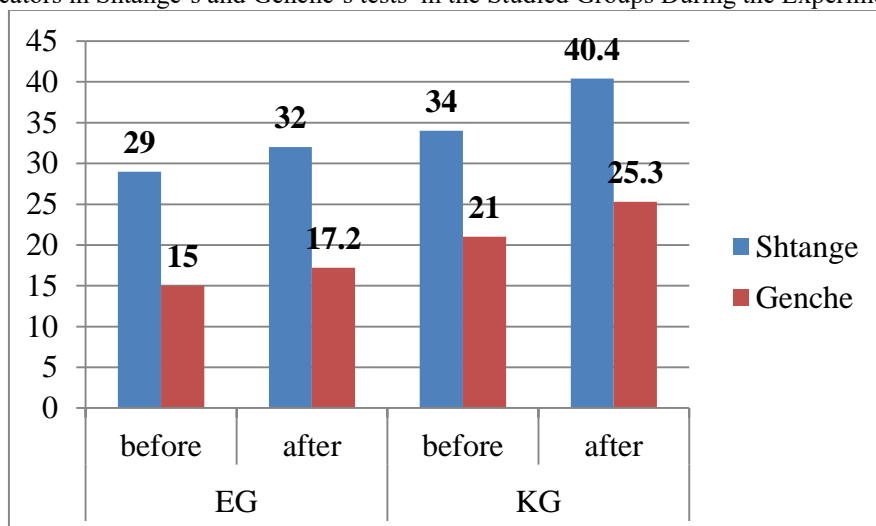


Fig-5. Indicators of Volume of a Thorax in Various States in Control Group (cm)



На рис 6. Представлены показатели тестирования проб Штанге и Генче. Наибольшая динамика наблюдается снова в КГ. В ЭГ проба Штанге в конце эксперимента 32 сек, тогда как в КГ – 40,4с. А проба Генче – 17,2 и 25,3 соответственно. Figure 6 presents the test indicators according to Shtange and Genche. The greatest dynamics is observed again in the CG. In the EG, the Shtange test at the end of the experiment was 32 seconds, whereas in the CG – 40,4 seconds. The test of Genche – 17,2 and 25,3, respectively.

Fig-6. Indicators in Shtange's and Genche's tests in the Studied Groups During the Experiment (sek)



4. Summary

Thus, the physical development of children of primary school age with diseases of the respiratory system is markedly different from the indicators of the physical development of their peers.

As shown by a comparative analysis, improper functioning of the respiratory system has an adverse effect on the physical development of the child. Children with the diseases of the respiratory system have low levels of thoracic organs, which in turn affects the results of heart rate, Shtange's and Genche's tests, as well as affect the body length and the body weight.

Summarizing the above, it can be stated that the use of special exercises had a beneficial effect on the physical development of children of primary school age with respiratory diseases. Positive changes occurred both in terms of length and weight of the body, and in terms of TO, VCL, and HR, in Shtange's and Genche's tests.

Exercises and medical procedures for diseases of the respiratory system should be systematic. It is these conditions under which an increase in physical development indicators can be observed.

5. Conclusion

Exercise is an indispensable tool in maintaining and promoting the health of children of primary school age. This age is very vulnerable to diseases of various kinds. Exercise on the human body has a comprehensive effect. They develop endurance, strength, mobility, improve the control of movements, which is carried out by the nervous system. Due to this, the human body better adapts to difficult conditions and heavy loads, it is more economical and

easier to move. Systematic exercise significantly affect the strengthening of the immune system and increase physical activity.

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