

Some Approaches to the Comprehensive Assessment of the Physical Development of Primary School Children

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Abstract: Monitoring the physical development of children is an integral part of the work of any educational institution. Since physical development is a dynamic process, accordingly, monitoring of this condition should be carried out regularly in order to respond as quickly as possible to identified deviations in the state of development. It should be taken into account the fact that each new generation of children differs significantly from the previous one, since all external factors and trends in the development of society have their influence on them. This is due to both ecology and the development of information technologies, which, unfortunately, does not always have a positive impact on children, especially from the side of physical development and the state of the musculoskeletal system. In our study, we followed the path of a comprehensive assessment: we assessed the functional development, the state of the musculoskeletal system and, based on the results obtained, offered some recommendations for further work with primary school children. Also, our study involves prolonging and in the near future conducting an assessment of physical qualities and a detailed assessment of the musculoskeletal system using laboratory techniques. All this will allow us to develop targeted recommendations: for physical education teachers, for parents and children themselves.

1 INTRODUCTION

Education for sustainable development is an education that provides real opportunities for a number of social transformations necessary to create more socially just societies and achieve sustainable development in society and in the process of realizing human potential. The main objective of sustainable development is the satisfaction of human needs and aspirations.


Thus, the role of ESD in the education system in the Russian Federation is manifested in the following:


- development of the educational system, its improvement and modernization in accordance with the requirements of modern realities;
- greening of the educational system;
- harmonious upbringing of the younger generation;
- the emphasis is not on the need to solve local and global problems. In our study, we focused on this

aspect within the framework of the education system of the Russian Federation (Mel'nik, 2014; Nemcev, 2014; Tokarev, 2019; Tokarev, 2019).

The Strategy for the Development of Education in the Russian Federation for the period up to 2025 (hereinafter referred to as the Strategy) was developed in pursuance of the National Strategy of Action in the Interests of Children for 2012-2017, approved by the Decree of the President of the Russian Federation of June 1, 2012. N 761 "On the National Strategy of Actions in the interests of children for 2012-2017", in terms of determining the guidelines of state policy in the field of education. The strategy creates conditions for the formation and implementation of a set of measures that take into account the characteristics of modern children, including the peculiarities of their physical development (Mel'nik, 2014; Nemcev, 2014; Tokarev, 2019; Tokarev, 2019).

It is worth noting that physical development is the most important component of the formation and

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development of personality. School years are a particularly important period in the life of children, since active growth, development of the main body systems takes place, and the foundation for comprehensive physical development is being created (Aleksandrova, Skotnikova, Solov'ev, Ovchinnikov, 2021; Aleksandrova, Skotnikova, Ovchinnikov, ZHumaev, 2020; Tokarev, 2019). A properly constructed and organized system of physical education at school should have a beneficial effect on the formation of a child. In our study, we identified primary school children, since this period is optimal for the development of physical qualities and mastering motor skills (Balandin, CHernyshenko, Prosoedova, 1999; Il'in, 2017; Skotnikova, Aleksandrova, Solov'ev, Ovchinnikov, 2021; Aleksandrova, Skotnikova, Solov'ev, Ovchinnikov, 2021; Aleksandrova, Skotnikova, Ovchinnikov, ZHumaev, 2020).

The purpose of the study: to conduct a comprehensive assessment of the level of development of younger schoolchildren.

We have identified the following research objectives:

- to assess the level of functional development of primary school children;
- to assess the condition of the musculoskeletal system of primary school children;
- to develop methodological recommendations for the correction and prevention of identified violations.

2 STUDY METHODS

To solve the tasks, we used the following methods:

Pedagogical testing. To evaluate functional systems, the following methods were used:

- respiratory breath holding tests;
- reaction of the autonomic system: orthostatic and clinostatic tests;
- the reaction of the cardiovascular system to the load: the Ruffier test;
- assessment of equilibrium: the Romberg test.

2) Somatoscopy. Assessment of the state of the musculoskeletal system by external impression: video analysis of walking, Adams test, squat test.

Organization of research. The study involved children of primary school age from 7 to 10 years. Total number of subjects: 300 people.

3 STUDY RESULTS

As a result of testing to assess the functional state, the following was revealed.

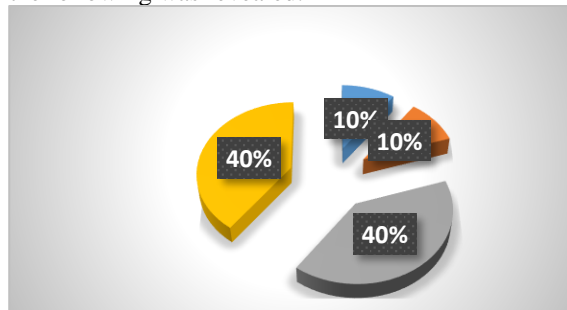


Figure 1: The results of respiratory breath holding tests of students in grades 1-4.

As can be seen from Figure 1, most of the subjects coped with breath holding tests unsatisfactorily 40% and satisfactorily 40%, only 10% of the children showed a good result. It is worth noting that the indicators of the second respiratory test were very similar, only 10% of the children coped well and perfectly, most of the 80% showed satisfactory and unsatisfactory results. From these results, we can draw a preliminary conclusion that the state of the respiratory system in children of primary school age requires special attention.

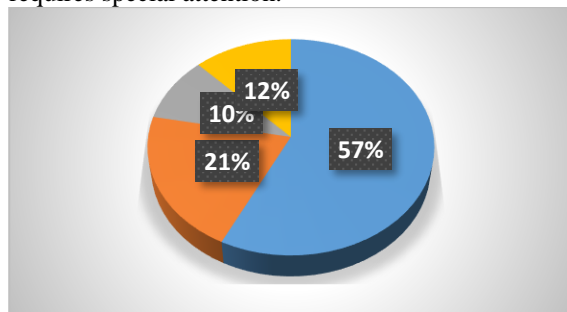


Figure 2: Results of testing of orthostatic sample of pupils of grades 1-4.

As a result of the conducted tests to assess the state of the autonomic system: orthostatic and clinostatic, we can conclude: the majority of the studied children – 80% showed a reaction to a change in body position within the normal range, this was reflected in the indicators of the increase in heart rate (HR), and in the time of recovery of heart rate to the initial level.

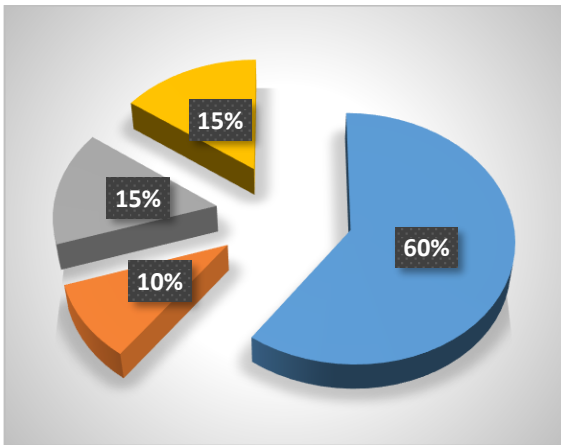


Figure 3: The results of the Martinet test of students in grades 1-4.

The Martinet test allowed us to evaluate the reaction of the cardiovascular system of children to the load. Such indicators as blood pressure (BP), heart rate, as well as recovery time after exercise were recorded. As a result of the test, it was revealed that the majority of all examined children - 70% showed results within the norms of "good" and "excellent". 15% showed the result "satisfactory". Since these were isolated cases in all classes, the recommendations were given individually, taking into account the characteristics of each child.

In the process of video analysis of walking, the following criteria were recorded:

- the position of the foot when walking;
- hand movements;
- pelvic position;
- head position

Figure 4 shows the results of this test for all four classes.

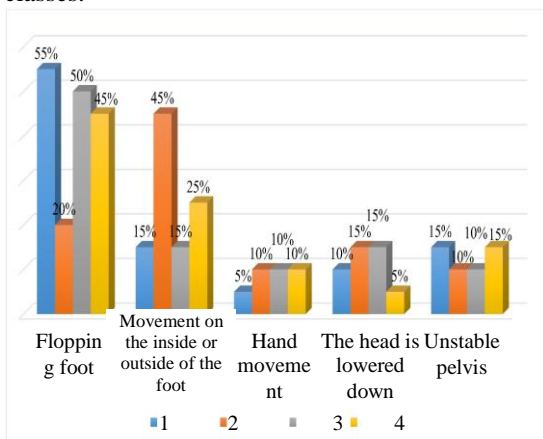


Figure 4: Results of video analysis of the walking of students in grades 1-4.

As can be seen from the picture, violations were recorded in different ways: most children had a "flopping foot", a syndrome that characterizes a malfunction of the articular ligamentous apparatus of the ankle and foot, which entails another criterion – a blockage of the foot inwards or outwards. Both of these criteria allow us to conclude that the majority of the examined children have flat feet. It is worth noting that these violations were almost equally detected in younger schoolchildren of different ages. This fact requires an examination using a plantoscope to make an accurate diagnosis.

The remaining criteria were fixed in almost equal percentages for all children of primary school age.

During the video analysis of squats, the following criteria were recorded:

- heel position;
- foot position;
- knee position;
- torso position;

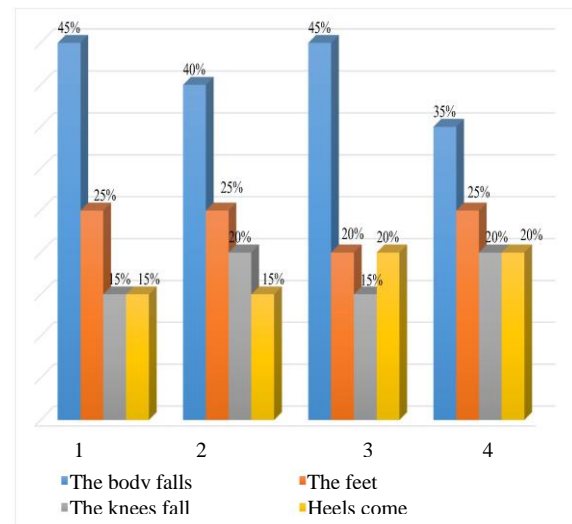


Figure 5: Results of video analysis of squats of students of grades 1-4.

As can be seen from the figure, the criteria responsible for the correct biomechanics of the foot when performing squats were revealed all in the direction of the violation, i.e. the heels came off the floor, the feet fell into the inner part, which, accordingly, led to a blockage of the knees. Considering this situation, it is necessary to note both the weakness of the ligamentous apparatus of the foot, and the weakness or malfunction of all the muscles of the lower leg. If we take into account the results of two tests using video analysis, then we can draw an

intermediate conclusion that the children under study have a violation in the biomechanics of the foot and flat feet.

The Adams test is a screening test for the detection of scoliosis. It is determined: the presence of an arc, a muscle roller, a rib bulge.

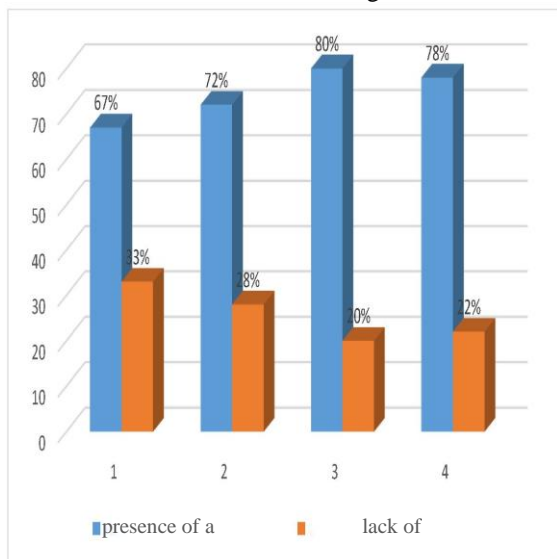


Figure 6: Results of the Adams test for students in grades 1-4.

Figure 6 clearly shows one of the criteria for scoliotic changes of the spinal column identified in the Adams test. As a result of the Adams test, it was revealed that 70% of all subjects had abnormalities in the state of the spinal column, characteristic of 1-2 degrees of scoliosis. This fact obliges to conduct more in-depth research on this issue: 3D scanning, MRI scanning, which will allow a more detailed assessment of this problem.

5 CONCLUSIONS

1. As a result of the respiratory tests, it was revealed that the majority of children 80.% showed satisfactory and unsatisfactory results according to their age standards.

2. Identification of the reaction of the autonomic system during orthostatic and clinostatic tests showed that these reactions in the examined children are within the normal range.

3. The results of the Martinet test revealed that 70% of children showed a good and excellent result, only a small part of all children 15% showed a satisfactory result.

4. As a result of tests to assess the state of the musculoskeletal system, it was revealed that 90% of the tested children have problems with the biomechanics of the articular ligamentous apparatus of the ankle and foot, and flat feet were also revealed.

5. As a result of somatoscopic methods, it was revealed that 70% of children already have spinal column disorders characteristic of 1-2 degrees of scoliosis.

Practical recommendations.

Since the results of the external respiration assessment tests turned out to be at a low level, as recommendations, we suggest that children of primary school age spend more time outdoors, including by increasing the number of training sessions and holding physical culture and sports events on outdoor school grounds.

To assess physical qualities in order to understand the overall picture of the state of physical development of primary school children.

Children with deviations in the state of the musculoskeletal system are recommended to undergo a detailed examination on the 3Dscanner and plantoscope hardware complex for a more detailed diagnosis of the spine and foot.

It is recommended to include sets of exercises aimed at strengthening the muscles of the back and abs, as well as the articular-ligamentous and muscular apparatus of the ankle and foot in the daily routine of primary school children. The sets of exercises developed by us will be presented in more detail in the following works.

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