

Correcting the physical health in 10–12-year-old schoolchildren through a creative approach to health-focused physical education

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Abstract:

Improving the physical health and postural status of schoolchildren continues to be an important and popular problem of physical education. **Purpose.** To improve the physical education and health-improving methodology for increasing the level of physical health and postural status in 10–12-year-old schoolchildren. **Material and methods.** The experiment involved 87 schoolchildren aged 10-12 years, who studied at a secondary school (Siberia, Russia). The children were divided into an intervention group (IG, n=45) and a control group (CG, n=42) and attended mandatory physical education classes, which were held 3 times a week for 45 minutes each according to the traditional curriculum. The improved methodology provided for the use of a set of static-dynamic, coordination exercises and balance loads in the structure of the physical education curriculum. The set of exercises was performed for 15 minutes in the main part of each physical education lesson. In addition, the IG children independently performed the proposed set of physical exercises at home under the supervision of their parents. Boundary testing of the main motor skills, balance, posture, and strength of the spine and abdominal muscles was conducted. **Results.** At the end of the school year, the results of testing the proposed methodology were analyzed. Reliably higher values of the indicators in the tests of general physical fitness, static and dynamic balance, posture, and strength of the spinal muscular corset were found in schoolchildren in the implementation group compared to the result in the control group. In IG, the number of schoolchildren with symptoms of postural status disorders decreased by 2.4 times compared to children where physical education was conducted according to the traditional program. **Conclusions.** Testing of the proposed method for improving the level of physical fitness and postural status showed high efficiency, which allows us to recommend its use in other schools.

Key Words: physical fitness, creative approach, posture, schoolchildren, physical education

Introduction

Currently, issues related to the study of the characteristics of the modern course of processes of formation of physical health of schoolchildren continue to be relevant. It seems important to assess new patterns of influence of various factors on the body of children (Filippova et al., 2021). This is due to the deep complication of the lifestyle of young people and the intensification of environmental influences during their education at school. Such an impact requires significant stress on the adaptive mechanisms of children, which often leads to its breakdown and the development of various diseases. Modern scientific research shows a decrease in the physical fitness of children worldwide (Romanova et al., 2023; Hui et al., 2024) and especially cardiorespiratory endurance (Weisstaub et al., 2025).

One of the reasons for the deterioration of physical status in children is hypokinesia. According to A.M. Alonso-Martínez et al. (2023), more than 80% of children and adolescents in the world are not physically active

enough (Bull et al., 2020). These data are confirmed by numerous observations of scientists in many countries around the world (Virgara et al., 2021; Alalawi et al., 2024; Ituen et al., 2025).

Schools create a physical education and health environment that develops children's physical activity. However, many activities to improve children's physical fitness in schools are ineffective, there is a lack of a creative approach (Porter et al., 2024), which negatively affects their health. (Virgara et al., 2021; Liu et al., 2023; Alalawi et al., 2024). This has a particularly negative effect on the musculoskeletal system (Glavaš et al., 2023; Ozyemisci Taskiran et al., 2023). The most frequently recorded are scoliosis of varying degrees and postural status disorders (de Assis et al., 2021; Qi et al., 2023; Khadour et al., 2024). The causes of scoliosis and other diseases of the musculoskeletal system, in addition to hypokinesia, are the incorrectly chosen height of the school desk (Khadour et al., 2024). A large amount of time spent sitting in class in an incorrect posture plays a role, which causes an imbalance in the trunk muscles while sitting (Marijančić et al., 2023; Ozyemisci Taskiran et al., 2023). The impact of these negative factors against the background of rapid physical growth in childhood contributes to the rapid development of disorders of the musculoskeletal system (Metalnikov et al., 2024). In this regard, it is important to search for ways to improve physical education and health activities, use creative methods for conducting classes aimed at improving the physical health and postural status of schoolchildren. Scientists propose to start improving the physical education of schoolchildren at the class level (Zhou et al., 2025). For this purpose, it is proposed to include jumping exercises and balance exercises in the physical education curriculum for schoolchildren (Park et al., 2024). The positive effect of breathing exercises is known, which improve not only physical health, but also the postural status of a person (Csepregi et al., 2022). All specialists in the field of physical education support the conclusion about the importance of using coordination and balance exercises to correct the postural status (Wilczyński et al., 2023; Tymoshenko et al., 2023; Muehlbauer et al., 2024). The use of innovative programs in physical education of schoolchildren has a positive effect on cardiorespiratory endurance, muscle strength and motivation for physical activity in children (Noordstar et al., 2025; Kudryavtsev et al., 2024). Support from children's parents plays a great role in the formation of a healthy lifestyle and regular physical activity (Ha et al., 2022; Alonso-Martínez et al., 2023). Extracurricular physical activity has an additional positive effect on physical health and the formation of correct posture (Mischenko et al., 2021, 2023). Despite the extensive scientific material available on the physical condition of children and adolescents, the issue of using static-dynamic exercises in the curriculum of their physical education to correct physical fitness, postural status and activity in schoolchildren aged 10-12 years remains insufficiently covered. We believe that studying these issues will improve the physical health of schoolchildren and correct the state of children's posture.

Research aim. To improve the physical education and health methodology for increasing the level of physical health and postural status for schoolchildren aged 10-12.

Material & methods

The research project involved 87 schoolchildren aged 10-12 years (11.4 ± 0.8) who studied at a secondary comprehensive school in the city of Barnaul (Siberian Federal District, Russia). Of all the children, 42 were boys (48.2%) and 45 (51.8%) were girls. All parents gave written consent for their children to participate in the research project, which does not violate the principles set out in the Helsinki Declaration of 2008. The study involved specialists and scientists from various universities in Russia and Kyrgyzstan.

At the beginning of the experiment, during a routine examination of schoolchildren by pediatricians, 44.8% were found to have disorders of the musculoskeletal system, in particular, idiopathic scoliosis of the First (1) degree, stoop, round or flat back and other posture disorders. To conduct an experiment to improve physical health and correct posture, children were randomly assigned to an intervention group (IG, $n=45$) and a control group (CG, $n=42$). Children in both groups attended physical education classes, which were held 3 times a week for 45 minutes each according to the traditional curriculum (Lyakh, 2021).

The improved methodology included two components. The first component involved the use of a set of static-dynamic, coordination exercises and balance loads in the structure of the physical education curriculum. Children performed this complex for 15 minutes in the main part of each lesson. The second component included independent performance of the proposed set of exercises at home under the supervision of parents.

An important section of the proposed methodology was the use of static and dynamic physical exercises with a local focus on the muscles of the trunk, upper and lower extremities. Static exercises for each muscle group were performed with three amplitudes of limb position levels ($15-20^\circ$, $30-35^\circ$, $45-50^\circ$). Physical work of skeletal muscles lasted for 10 seconds at each level and without rest passed from one limb position to another. The number of isotonic exercises in one lesson was from 5 to 7 (1-3 series). Rest between series was no more than 30 seconds. After static-dynamic loads, schoolchildren performed coordination exercises and exercises for vestibular stability, which ensure that children maintain their postural status. For these purposes, exercise complexes on the Bosu Balance Pod (bosu) hemisphere were used. Exercises in the amount of 12 types were

aimed at developing static and dynamic balance. In each lesson, children performed 4 types of exercises. Various exercises were performed standing on the toes of both feet on bosu, standing on the soles of both feet and alternately on one leg, with the hands on the belt in the other case, moved to the sides. The exercises were performed with open and closed eyes. The duration of each exercise was 20 sec, the number of repetitions was 3 times with a rest interval of 30 sec between them. The same exercises were performed for 20 sec in various movements of the legs and arms to develop dynamic coordination.

To improve the level of physical health, a set of physical exercises was developed for independent performance at home. It contained physical exercises for all muscle groups of the children's body and was primarily aimed at developing general physical fitness, coordination and balance skills in children. The set of general physical exercises contained 8-10 exercises for all muscle groups. It was performed by the child for 7-8 minutes in his free time and ended with coordination exercises. This included jumping exercises and loads with a skipping rope, exercises with weights, overcoming obstacles and outdoor games. All children in the experimental group kept a diary of activities at home, where they noted the performance of recommended physical activities. The diary was monitored daily by parents, who were assigned an important role in improving the level of physical health of children. Parents were recommended to include in the diet foods that contain a large amount of animal proteins, macro- and microelements, especially calcium and vitamins.

Monitoring the effectiveness of the proposed method was carried out at the beginning and end of the school year. The following motor tests were used for the main motor skills: 30 m run from a high start, s; 1000 m run, m/s; 3x10 m shuttle run, s; arm flexion and extension in a support position lying on the floor, number of times; number of trunk flexions and extensions from a supine position to a sitting position (hands behind the head), number of times; standing long jump, cm. Static balance was assessed based on the results of the Romberg-2 functional test, s, and for dynamic balance, the "turns on a gymnastic bench" test was used, 4turns /s.

Postural status was assessed based on the results of control exercises for active flexibility of the spinal column in the "forward bend from a standing position on a gymnastic bench" test, cm; "walking on a gymnastic bench without a load", "walking with a load on the head on two hoops ("eight")", "walking with a load on the head in a snake", points. The functional state of the muscular corset of the trunk was assessed by the tests: "holding the body in a horizontal position lying in support on the hips", m; "holding the legs in the air at an angle of 45 ° in the supine position", m.

The obtained digital data were processed using parametric statistics with the calculation of the arithmetic mean, its error and sigma. To determine the reliability of group differences, Student's t-test was used. The difference was considered reliable at $p < 0.05$.

Results

The results of the motor tests of schoolchildren in both experimental groups at the beginning and end of the experiment are presented in Table 1.

Table 1. Results of the boundary motor test of children in both experimental groups, M±m

No. p/p	Control exercise	CG, n=42		IG, n=45	
		At the beginning of the project	At the end of the project	At the beginning of the project	At the end of the project
Boys					
1.	30 m run from a high start, s	7.55±1.12	6.43±0.95	7.42±1.02	5.60±0.3*
2.	1000 m run, m/s	6.57±0.33	5.73±0.29	6.59 ± 0.34	5.54±0.23*
3.	Shuttle run 3x10 m, s	10.41±1.16	9.45±0.78	10.24 ± 1.14	8.20±0.52*
4.	Arm flexion and extension in a lying position on the floor, times	12.0±0.98	14.5±0.55*	11.0±0.32	15.0±0.21*
5.	Number of trunk flexions-extensions from supine to sitting position, times	26.5±2.89	29.5±3.65	27.0±3.12	39.0±3.48*
6.	Standing long jump, cm	134.5±4.87	146.6±4.12*	132.8±4.57	154.2±5.24*
Girls					
1.	30 m run from a high start, s	7.72±0.40	7.15±0.36	7.83±0.42	6.23±0.33*
2.	1000 m run, m/s	6.45±0.43	5.72±0.66	6.89±0.22	5.64±0.34*
3.	Shuttle run 3x10 m, s	11.22±0.22	10.36±0.20*	11.43±0.23	9.62±0.21*
4.	Arm flexion and extension in a lying position on the floor, times	6.3±1.48	10.5±0.65*	6.0±1.52	14.0±1.62*
5.	Number of trunk flexions-extensions from supine to sitting position, times	15.5±2.13	22.0±2.14*	16.0±2.24	27.0±2.37*
6.	Standing long jump, cm	125.5±4.16	133.8±4.92	124.6±4.31	143.3±4.32*

*Note. * reliability of difference in threshold values of indicators, $p < 005$*

At the beginning of the experiment, no reliable differences in the values of the indicators were found between the children of both experimental groups, $p > 0.05$. This indicates approximately the same level of development of their basic motor skills, which allowed us to conduct further scientific observations.

Physical education classes at school had a positive effect on the level of development of physical fitness of all children. In both experimental groups, boys and girls showed an increase in the values of the indicators in all motor tests. At the same time, a reliable increase in the values of the indicators in the control tests was recorded in CG boys in two tests, in girls in three tests, $p < 0.05$.

At the same time, in IG boys and girls, a reliable increase in the values of the indicators was found in all motor tests, $p < 0.05$. In this group, the greatest increase in the values of all testing indicators was noted at the end of the experiment.

The implementation of the physical education educational program among the children increased their balance indicator values, Table 2.

Table 2. Results of the balance testing of children in both experimental groups, M±m

No. p/p	Test	CG, n=42		IG, n=45	
		At the beginning of the project	At the end of the project	At the beginning of the project	At the end of the project
Boys					
1.	Romberg-2 test, sec	38.5±3.34	44.5±4.55	37.0±3.21	65.3±5.43*
2.	Turns on a gymnastic bench, 4 turns / s	12.0±1.30	11.0±1.24	12.5±1.31	9.3±0.62*
Girls					
1.	Romberg-2 test, sec	28.5±2.23	34.2±3.76*	29.0±2.31	45.5±4.92*
2.	Turns on a gymnastic bench, 4 turns / s	13.9±1.58	13.0±1.43	14.0±1.67	11.5±1.22*

*Note. * reliability of the difference in the threshold values of the indicators, $p < 0.05$*

At the beginning of the research project, the level of development of both types of balance in the control and intervention groups was approximately the same and did not differ significantly from each other, $p > 0.05$.

At the end of the experimental study, an increase in the values of static and dynamic balance indicators was noted in children in both experimental groups. A reliable increase in the values of balance testing indicators was recorded only in IG, $p < 0.05$. In this experimental group, the increase in the values of the indicators at the end of the experiment was greater compared to CG, Figure 1.

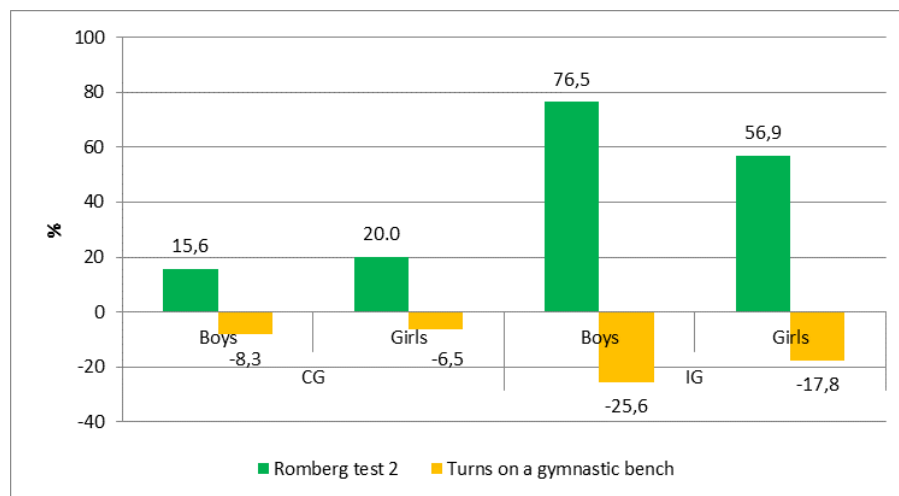


Fig. 1. Increase in balance indicator values at the end of the experiment

The greatest increase in balance indicator values was found in children in IG. In this group, the increase in the Romberg-2 test was 4.9 times greater for boys, and 3.1 times greater in the gymnastic bench turns test compared to the control group. For girls in IG, the increase was 2.8 to 2.7 times greater (respectively), compared to CG. Improvement of static and dynamic balance, general physical fitness and coordination skills improved the postural status of boys and girls in both experimental groups, as well as the strength of the abdominal muscles and spine, Table 3.

Table 3. Milestone results of the study of postural status and the state of the muscular corset in children in both experimental groups, M±m

No. p/p	Тест	CG, n=42		IG, n=45	
		At the beginning of the project	At the end of the project	At the beginning of the project	At the end of the project
Boys					
1.	Forward bend from a standing position on a gymnastic bench, cm	10.0±1.4	12.1±1.1	10.5±1.5	14.1±1.2*
2.	Walking on a gymnastic bench without a load, points	2.3±0.11	4.0±0.37*	2.4±0.12	4.4 ±1.43*
3.	Walking with a weight on the head on two hoops ("figure eight"), points	2.3±0.34	3.3±0.67	2.2±0.21	4.1±1.32*
4.	Walking with a weight on the head "snake", points	2.2±0.27	3.2±0.88	2.3±0.28	4.3±1.41*
5.	Holding the body in a horizontal position lying down in support on the hips, min	1.4±0.21	1.7±0.45	1.4±0,22	2.3±0,35*
6.	Holding the legs in the air at an angle of 45° while lying on the back, min	1.0±0.17	1.3±0.22	1.0±0.16	1.6±0.32*
Girls					
1.	Forward bend from a standing position on a gymnastic bench, cm	13.3±1.60	15.6±2.12	13.0±1.53	18.5±1.25*
2.	Walking on a gymnastic bench without a load, points	2.7±0.19	4.2±0.43*	2.6±0.42	4.8 ±1.49*
3.	Walking with a weight on the head on two hoops ("figure eight"), points	2.5±0.38	3.6±0.78	2.4±0.36	4.7±1.63*
4.	Walking with a weight on the head "snake", points	2.5±0.28	3.6±0.98	2.6±0.48	4.9±1.62*
5.	Holding the body in a horizontal position lying down in support on the hips, min	1.2±0.19	1.5±0.34	1.1±0,22	1.8±0,35*
6.	Holding the legs in the air at an angle of 45° while lying on the back, min	0.8±0.16	1.0±0.20	0.8±0.17	1.2±0.32*

*Note. * reliability of the difference in the threshold values of the indicators, p < 005.*

At the beginning of the experiment, the values of the postural status and strength qualities of the trunk and spine muscles were approximately the same in children in CG and IG, p>0.05.

After the completion of the experiment, children in both experimental groups showed an improvement in the values of the posture and muscle corset of the spine and abdominal muscles. In children in CG, a reliable increase in the values of the indicators was noted only in one test in boys and girls. In children in IG, an increase in the values of the indicators was found in all control tests, p < 005. In boys of this group, active flexibility improved by 34.3% and in girls by 42.3% compared to the beginning of the experiment, p < 005. In CG, this increase was smaller and amounted to 21.0 and 17.3%, respectively. At the end of the experiment, all IG children had significantly higher values of the indicators in the exercises that characterize the state of posture compared to these indicators in schoolchildren in CG.

At the end of the research project, the strength indicators of the abdominal muscles and the muscular corset of the spinal column increased. At the same time, a reliable increase in strength qualities was recorded in boys and girls of the intervention group, p < 0.05. At the end of the experiment, a significant increase in the value of the indicators in the motor tests was also established in this group compared to CG. In boys, the increase in the value of the indicator in the test "holding the body in a horizontal position lying in an emphasis on the hips" was 64.3%, in girls 63.6%. In the test "holding the legs in the air at an angle of 45° in the lying position", the increase in boys was 60.0%, in girls 50.0% compared to the beginning of the experiment. In the control group of children, this indicator was significantly lower, p > 0.05. A medical examination of all observed children conducted at the end of the school year revealed an improvement in postural status in 86.6% of children using the improved technique and in 35.7% of children in the control group. These data indicate a greater effectiveness of the proposed technique for improving the level of physical fitness and postural status of schoolchildren.

Discussion

The unfavorable situation with morbidity in children and adolescents in many countries of the world (Roma-nova et al., 2023; Hui et al., 2024; Weisstaub et al., 2025) necessitates the development and modernization of methods and technologies for correcting physical health. The problem of correcting postural status in children remains relevant, which is associated with the widespread prevalence of musculoskeletal disorders among modern schoolchildren. This is reported by numerous researchers (de Assis et al., 2021; Qi et al., 2023; Khadour et al., 2024). The results of our studies are consistent with the opinion of the authors that this pathology is one that is often encountered among children. According to our data, 44.8% of schoolchildren aged 10-12 years have postural status disorders. Among them, scoliosis of the first degree and other posture disorders are most often registered. Therefore, the topic of this study is timely and necessary for physical education specialists. To improve the health of children and adolescents, various jumping and balance exercises are used, which are included in the physical education curriculum for schoolchildren (Park et al., 2024). The scientific literature contains information on the use of breathing exercises that improve not only physical health, but also the postural status of a person (Csepregi et al., 2022). Such physical activity has a positive effect on the functional state of the chest, increases the strength of the respiratory muscles and trunk muscles. However, most researchers pay more attention to the correction of posture using coordination and balance exercises (Wilczyński et al., 2023; Tymoshenko et al., 2023; Muehlbauer et al., 2024), noting their high efficiency. Taking into account these recommendations and taking into account the task of improving physical health, we have improved the methodology for correcting the physical status and posture in 10–12-year-old schoolchildren. It provides for the use of static-dynamic and coordination exercises in the educational process of physical education. In addition, the methodology provides for independent performance of a set of general physical and coordination exercises at home under the supervision of parents. At the same time, the involvement of parents, in our opinion, is an important factor in physical education and health activities. This is consistent with the findings of other researchers (Ha et al., 2022; Alonso-Martínez et al., 2023; Kudryavtsev et al., 2024), who indicate the need for widespread involvement of parents or guardians in improving the health of children.

The proposed improved methodology showed significant effectiveness in correcting the physical status and posture of schoolchildren compared to the result of using the traditional physical education curriculum. According to our data, schoolchildren who used the proposed methodology had higher values of general physical fitness, static and dynamic balance, the state of the muscular corset of the spine and posture. In all tests and samples used for control, a reliable increase in the values of the indicators was noted compared to the beginning of the experiment. In the control group of schoolchildren, where traditional physical education classes were used, the positive result was less. Our data confirm the opinion of the authors that traditional physical education is important and necessary for improving the health and physical activity of children in schools, but is ineffective (Porter et al., 2024). This requires a non-standard solution to the problem of physical activity of young people. According to J.J. Noordstar et al. (2025), the implementation of innovative programs in physical education of schoolchildren has a positive effect on physical status, posture, cardiorespiratory endurance, muscle strength and motivation for physical activity in children. This conclusion is confirmed by the results of our study, which were obtained at the end of the experiment. According to our data, the use of an improved method for correcting physical health and postural status allowed us to improve not only the physical status indicators, but also significantly reduce the number of schoolchildren with symptoms of postural disorders. According to our data, at the end of the experiment, posture improvement was found in 39 (86.6%) children, where the improved method was used, and in 35.7% of schoolchildren in the control group, which indicates significant effectiveness of the proposed method. The positive results of testing the improved method allow us to recommend its use in physical education lessons for schoolchildren.

Conclusions

To improve the physical fitness and postural status in 10–12-year-old schoolchildren, an improved methodology has been tested and included in the curriculum for physical education of schoolchildren. The methodology involves the use of a set of static-dynamic, coordination exercises and balance loads in physical education classes. To reduce hypokinesia, complexes of general physical exercises and coordination loads have been introduced for independent performance at home under the supervision of parents.

A comparative analysis of the results of testing the proposed methodology showed its effectiveness in tests of general physical fitness, static and dynamic balance, strengthening the muscular corset of the spine and improving the state of posture compared to the result of children in the control group. At the end of the experiment, an improvement in the state of posture in children in the implementation group was recorded 2.4 times more often compared to this indicator in children in the control group.

The positive results of testing the improved methodology for correcting the physical health and postural status of children allow us to recommend it for use in other schools.

Conflicts of interest. The authors declare no conflict of interest.

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