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CORRECTION OF POSTURE DISORDERS WITH SPORT AND BALLROOM DANCING

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Abstract. Correction of posture disorders with sport and ballroom dancing. Grygus I., Nesterchuk N., Hrytseniuk R., Rabcheniuk S., Zukow W. Introduction – to develop a program for the prevention and correction of posture disorders in children through the wide introduction into the process of physical education of sports and ballroom dancing. In the pedagogical experiment, 169 children were randomly divided to control (n=85) and main (n=84) groups (age 11-12). All children attend secondary school. Several diagnostic tests were conducted with children and the control exercises were analyzed. With the help of the performed factor analysis, the correlation of the means to be implemented in the process of using the dance in relation to prevention and correction of posture disorders was calculated. The program of prevention and correction of posture disorders in children was based on methods of diagnostics of the functional state of the spine, the purpose, tasks and content of sports ballroom dance classes and included seven sections. The main components of the program are highlighted, its influence on the correction of posture disorders, functional state of children were experimentally tested. The main focus is on correctional dance events; measures aimed at forming skills of performing simple dance moves; measures aimed at the general physical development of children; measures aimed at preventing specific anatomical and physiological abnormalities. The program of correction of posture disorders through the introduction into the educational process of sports and ballroom dancing was based on the results of the diagnosis of the functional state of the spine, including complimentary goals and objectives. Introduction to the educational process of sports and ballroom dancing included seven sections with active involvement in this process not only children but also their parents and teaching staff.

Реферат. Корекція порушень постави спортивно-бальними танцями. Григус І.М., Нестерчук Н.Є., Гриценюк Р.А., Рабченко С.В., Жуков В. Мета – розробити програму профілактики та корекції порушень постави в дітей за допомогою широкого впровадження у процес фізичного виховання спортивно-бальних танців. У медико-педагогічному експерименті брали участь 169 дітей загальноосвітньої школи, яких методом рандомізації розподілили на контрольну (n=85) та основну (n=84) групи (вік 11-12 років). З дітьми проведено ряд діагностичних тестів та проаналізовано виконання контрольних вправ. За допомогою виконаного факторного аналізу було розраховано співвідношення засобів, які необхідно впроваджувати у процес застосування танцю для профілактики та корекції порушень постави. Програма профілактики та корекції порушень постави в дітей базувалася на методах діагностики функціонального стану хребта, меті, завданнях і змісту занять зі спортивно-бальних танців та включала сім розділів. Висвітлені основні компоненти програми, експериментально перевірено її вплив на корекцію порушень постави, функціональний стан дітей. Основний акцент зроблено на корекційні танцювальні заходи, спрямовані на: формування навичок виконання нескладних танцювальних рухів; загальний фізичний розвиток дітей; профілактику окремих анатомо-фізіологічних відхилень. Програма профілактики та корекції порушень постави за допомогою впровадження в навчальний процес занять зі спортивно-бальних танців базувалася на результатах діагностики функціонального стану хребта, включала взаємодоповнюючі мету та завдання. Впровадження в навчальний процес спортивно-бальних танців включало сім розділів з активним залученням до цього процесу не лише дітей, а також їхніх батьків та педагогічного колективу. Підтверджено позитивний вплив занять спортивними танцями на корекцію порушень постави в дітей.

Among today's schoolchildren, the proportion of children with chronic illnesses increases from 30-35% among first-graders to 37-48% among graduates. The proportion of children with low levels of physical health increases from 30.5-38.0% in primary grades to 53.1-65.9% in older ones. Such negative dynamics of indicators of morpho-functional status and adaptive capacity of schoolchildren stipulates the need to develop and implement health-saving technologies for the organization of modern educational process [3, 8, 12].

Posture disorders have not only a negative impact on the appearance and aesthetics of the body, but above all on the functional state of individual systems and organs, leading to disorders of physical development, and also cause overload of the musculoskeletal system, which causes its diseases [3]. Dance training is an effective tool not only for physical but also intellectual, moral and aesthetic

education, it creates favorable conditions for disclosure of the creative potential of the child [5].

The analysis of scientific-pedagogical, methodical and medical literature shows that scientists widely carry out research in the direction of the following issues: correction of posture disorders in children, search for new ways of physical education of schoolchildren [1, 13, 20].

Functional disorders of the posture are one of the common abnormalities of the musculoskeletal system in young children of school age. The close relationship between posture and human health has been proven by numerous studies, which emphasize that the absence of abnormalities in the condition of the musculoskeletal system is a prerequisite for the normal functioning of organs and systems, the development of the body as a whole, improving the performance of children and strengthening their health. In recent years, many researchers have

addressed the problem of prevention and correction of posture disorders in younger students [2, 8, 14, 15].

Systematic dancing eliminates a number of physical deficiencies, contributes to the correct posture, gives the appearance of elegance. Since the educational process takes place in a team and has a collective character, dance activities contribute to the development of responsibility before comrades, the ability to take into account their interests. Moderation, irreproachable courtesy, a sense of measure, attention to others, their mood, kindness, friendliness – these are the traits that are brought up by students in the process of dancing and become an integral part of the character of the person in daily life [5-7, 9-11, 16-19].

Objective – to develop a program for the prevention and correction of posture disorders in children through widespread introduction of ballroom dancing to the process of physical education.

MATERIALS AND METHODS OF RESEARCH

In the medical-pedagogical experiment, during the 2017-2018 academic year, 169 children attending secondary school in Rivne took part. The study included lessons in sports ballroom dances aimed at posture correction during the educational process (in physical education lessons) in children of the main group; children of the control group attended regular physical education lessons and in their free time – sports ballroom dancing.

All children were randomly divided to the control (n=85) and main (n=84) groups (aged 11-12 years) according to the principles of bioethics. Informed

consent was obtained from the parents of all persons included in this study.

The experimental bases of the study were school N 12, school N 26, the club of sports and ballroom dancing "Flash" in Rivne.

Researchers conducted sports ballroom dancing with children, advised parents on the tasks of correcting posture disorders at home, actively participated in seminars, open classes, discussions with parents, formed homework for children.

All children were examined by an orthopedist who oversaw children throughout the study.

To assess the functional condition of the spine, a series of tests were used which enable to assess the mobility of the spine in all its physiological bends, namely: chin-sternum; chin-jugular test; Otto's test; Schober's test; Tomeyer's test; Sedin's test; vertebral index (VI).

In the course of the research, the results of factoring of the experimental data were generalized and a matrix of the main factors characterizing the state of postural disorder was developed (Table 1). This made it possible to separate the factors that need to be influenced during posture correction. Among them, the main factors were found to be: spine flexibility (14.51%), static endurance of the muscles of the front of the trunk and legs (12.31%), static endurance of the muscles of the back of the trunk and legs (11.1%), dynamic endurance of abdominal muscles (9.56%), strength endurance of upper extremities (8.21%).

Table 1

Matrix of the main factors that characterize state of children with posture disorders

% of the total variance	Factors (% of the total variance of the sample)				
	I	II	III	IV	V
(55.69)	Flexibility of the spine (14.51%)	Static endurance of muscles of front of the trunk and legs (12.31%)	Static endurance of muscles of back of the trunk and legs (11.1%)	Dynamic endurance of abdominal muscles (9.56%)	Power endurance of upper limbs (8.21%)

With the help of factor analysis, the ratio of measures to be taken in the process of using dance to prevent and correct posture disorders was calculated (Fig. 1):

- aimed at overall physical development (16%): strengthening of muscles, improvement of physical abilities, mobility and speed;
- aimed at preventing anatomic and physiological abnormalities (18%): strengthening of the muscles

that hold the spine in the correct position, increasing the mobility and flexibility of the spine, strength of individual muscle groups and the elasticity of the ligaments;

- aimed at developing the skills of performing simple dance movements (18%): upbringing interest in dance activities, developing aesthetic feelings and artistic taste, forming culture of behavior and culture



of clothing, upbringing moral and volitional qualities;

- focused on musical and motor development (20%): development of the ability to navigate in space while performing different types of musical and rhythmic movements;

- corrective dance activities (28%): formation of skills for performing simple dance movements, ability to hold the spine back, know the correct position of hands and feet, convey the imaginative

and rhythmic structure of movement, disclose children's creative potential, develop imagination and a sense of artistic and choreographic image, master simple etude forms and dances of figurative and vivid nature, built on dance movements accessible for perception and performance.

The predominant orientation of the recommended measures for the correction of posture disorders among schoolchildren is presented in Fig. 1.

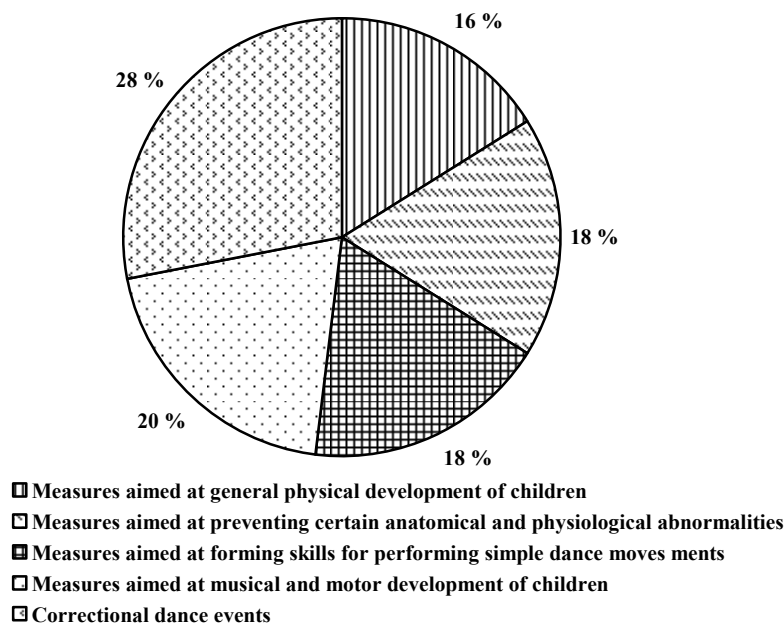


Fig. 1. Ratio of recommended measures for correction of posture disorders in children

Thus, the results of factor analysis were taken into account during the development of the program of prevention and correction of posture disorders (Fig. 2).

During the lessons, children acquired basic motor abilities, skills and abilities, and considerable attention was paid to the physical development and training of endurance, coordination of movements, agility, balance.

Classes in sports ballroom dancing began with teaching children the language of dance - learning the language of human feelings, dance movements.

The content of the lessons in sports ballroom dancing made it possible to acquaint children with simple, accessible elements of classical, ballroom dance, choreographic terminology. Dance classes for correction of posture disorders were divided into seven sections. Adhering to their content, the trainer used imaginative approach conducting classes, guided by the general educational tasks.

The first section - "Rhythmoplastic" was aimed at musical and motor development of children. The second section - "Merry gymnastics" contributed to the general physical development of children, preparing the child to perform dance exercises and

prevent anatomical and physiological abnormalities. The purpose of the third ("Dance Alphabet"), the fourth ("Folk Patterns") and the fifth ("Dance Marathon") sections was to create skills for performing simple dance moves. The sixth section - "Dance Imaginations" - provided for the disclosure of the creative potential of children, the development of fantasy and the sense of artistic and choreographic image. The seventh section - "Dance Games Store" - was aimed at assimilating of simple etude forms and dances of figurative-vivid nature, built on accessible for perception and execution of dance moves.

At "Dance Correction" classes, students should be dressed in a light, aesthetic comfortable clothes. Also, the main tasks that were solved in sports ballroom dancing were identified: strengthening of the core; upbringing the ability to hold a correct posture while dancing; normalization of muscle tone; general physical development; music-rhythmic education, formation of skills to move properly and steadily in different rhythms; mastering basic movements, figures and compositions of sports dancing; positive emotions at each session; motivation to physical activity.

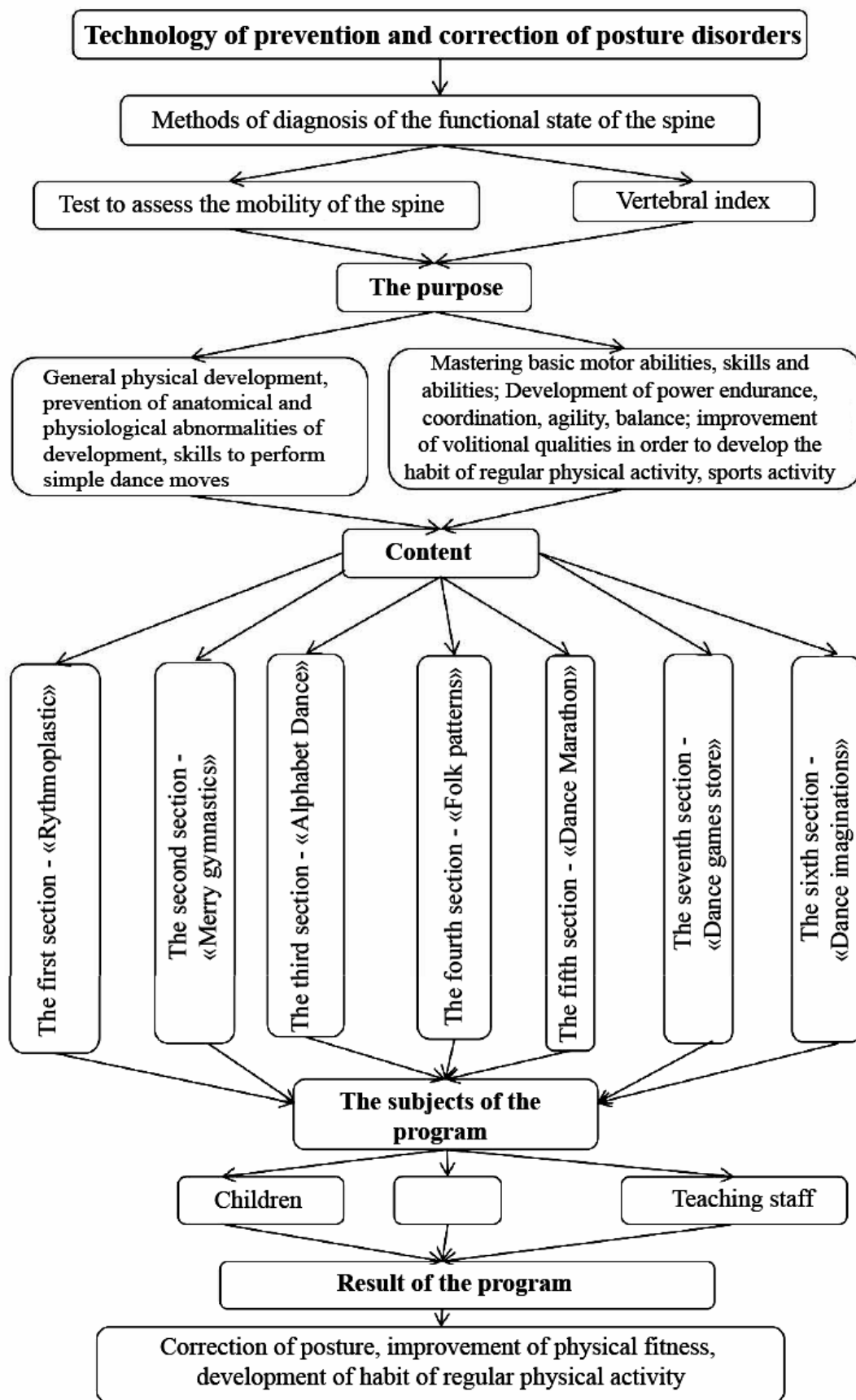


Fig. 2. Program of prevention and correction of posture disorders

Musical and rhythmic training played a leading role in the educational process. At the beginning of each lesson, 15-20 minutes were devoted to performing rhythmic exercises and music-rhythmic games. At the lessons the children were given the following tasks: to move in accordance with the character, tempo, dynamic sound colors of the musical work, with the structure of the musical work; distinguish durations, simple rhythmic patterns, be able to perform them in motion.

The main focus was on the training of children to mind the position of the body, to move easily and freely, to coordinate the movements of the hands and feet when walking, to elastically low down on toes after the jump, to understand the concept of "support leg", "working leg", "center of gravity", "step". At the lessons floor barre was widely used. An important stage of the lessons with children was game. In the process of correction of posture disorders a considerable attention was paid to psychological aspects and taking into account the psychological characteristics of children of this age.

RESULTS AND DISCUSSION

According to the statistical analysis of the obtained data, it was established that the indicators of the functional state of the spine of the examined children at the beginning of the study were not significantly different (Table 2).

There was no probable difference only for the indicators of spine mobility in the cervical spine by the chin-chest indices in the boys of the control and the main group.

Otto's test was used to assess spine mobility in the thoracic department. The results obtained at the beginning of the study indicate an inadequate level of spinal mobility in the thoracic department both in the boys: control group – 3.12 ± 0.17 ; the main group – 3.27 ± 0.12 ; and in girls: control group – 2.29 ± 0.08 ; the main group – 2.12 ± 0.10 , at a rate of 4-5 cm. At the end of the study, the results of this test showed that in the boys and girls of the main group, spine mobility in the thoracic department was significantly higher compared with those of the control group ($p < 0, 05$): control group – 3.37 ± 0.10 (boys), 2.68 ± 0.08 (girls); main group – 4.56 ± 0.11 (boys), 3.94 ± 0.12 (girls).

Analyzing spinal mobility in the lumbar spine based on the Schober test, we found that at the beginning of the study there was an inadequate level of spinal mobility in the lumbar spine in the boys: control group was 3.37 ± 0.10 ; the main group – 3.32 ± 0.12 ; virtually the norm was in girls: the control group was 4.09 ± 0.11 ; the main group –

4.13 ± 0.12 , at a norm of 4-5 cm. At the end of the study, the results of this test showed that in the boys and girls of the main group, the spine mobility in the lumbar spine was significantly higher compared with those of the control group ($p < 0.05$): control group – 3.35 ± 0.12 (boys), 4.11 ± 0.22 (girls); The main group – 4.35 ± 0.09 (boys), 5.89 ± 0.13 (girls).

Tomayer's test results show a reduction in spinal mobility in children of both groups at the start of the study. So, in boys: control group – 8.37 ± 0.13 ; the main group – 8.54 ± 0.12 ; and in girls: control group 6.87 ± 0.17 ; the main group – 6.42 ± 0.14 at 0 cm. At the end of the study, a reliable difference of total spine mobility towards its more significant restriction in the control group ($p < 0.05$) was revealed: the control group was 8.42 ± 0.11 (boys), 4.11 ± 0.22 (girls); main group: 3.40 ± 0.14 (boys), 2.32 ± 0.12 (girls).

At the beginning of the study in both groups, the progressive restriction of the spine movement was detected using the vertebral index: in the boys of the control group it was 18.61 ± 0.45 ; main group – 18.03 ± 0.53 ; and in girls: control group – 19.96 ± 0.82 ; the main group was 21.57 ± 0.83 , with a norm of 27-30 cm. At the end of the study, a significant difference ($p < 0.05$) of the spinal index with significant improvement was observed in the children of the main group: control group 18.40 ± 0.55 (boys), 19.34 ± 0.63 (girls); main group: 28.42 ± 0.34 (boys), 28.54 ± 0.49 (girls).

To study the spine mobility in the sagittal plane, we also used the Sedin's test (Table 3). At the beginning of the survey, the restriction of the spinal mobility in the sagittal plane of both groups, both forward and reverse, was revealed, respectively: the control group was 5.49 ± 0.13 and 3.60 ± 0.10 (boys), 4.46 ± 0.11 , and 2.50 ± 0.10 (girls); The main group: 5.45 ± 0.15 and 3.59 ± 0.10 (boys), 4.30 ± 0.13 and 2.41 ± 0.09 (girls).

Analyzing the results at the end of the study, it was found that in boys and girls of the control group there were significantly ($p < 0.05$) lower indicators of body tilt forward and backward compared with boys and girls in the main group, the control group was 5.52 ± 0.18 and 3.57 ± 0.16 (boys), 4.65 ± 0.17 and 2.71 ± 0.16 (girls); The main group: 6.55 ± 0.07 and 4.85 ± 0.12 (boys), 7.70 ± 0.11 and 4.90 ± 0.08 (girls).

To determine the presence of asymmetry of blades in children with posture disorders, we measured the distance from the projection of the sphincter CVIII to the lower corners of the right and left shoulders (Table 4). Usually, these distances must be equal

Table 2

Parameters of functional state of the spine (M±m)

Parameter	Study stage	Control group (N=85)	Main group (N=84)
		Boys	
		n=43	n=42
Test chin-sternum, cm	early	0.73±0.02	0.78±0.05
	in the end	0.69±0.04	0.35±0.03*
Test chin-jugular notch, cm	early	15.43±0.26	15.24±0.36
	in the end	15.38±0.27	17.42±0.30*
Otto's test, cm	early	3.12±0.17	3.27±0.12
	in the end	3.37±0.10	4.56±0.11*
Schober's test, cm	early	3.37±0.10	3.32±0.12
	in the end	3.35±0.12	4.35±0.09*
Tomayer's test, cm	early	8.37±0.13	8.54±0.12
	in the end	8.42±0.11	3.40±0.14*
Vertebral index, cm	early	18.61±0.45	18.03±0.53
	in the end	18.40±0.55	28.42±0.34*
Parameter	Study stage	Girls	
		n=42	n=42
		Test chin-sternum, cm	early
in the end	1.51±0.11		0.38±0.06*
Test chin-jugular notch, cm	early	15.83±0.21	16.00±0.20
	in the end	16.03±0.25	17.21±0.24*
Otto's test, cm	early	2.29±0.08	2.12±0.10
	in the end	2.68±0.08	3.94±0.12*
Schober's test, cm	early	4.09±0.11	4.13±0.12
	in the end	4.11±0.22	5.89±0.13*
Tomayer's test, cm	early	6.87±0.17	6.42±0.14
	in the end	6.22±0.15	2.32±0.12*
Vertebral index, cm	early	19.96±0.82	21.57±0.83
	in the end	19.34±0.63	28.54±0.49*

Note. * - significant change in the index compared with the control group (p<0.05).

Table 3

Parameters of functional state of the spine by Sedin's test (M±m)

Parameter	Study stage	Control group (N=85)	Main group (N=84)
		Boys	
		n=43	n=42
Inclination forward, cm	early	5.49±0.13	5.45±0.15
	in the end	5.52±0.18	6.55±0.07*
Inclination backward, cm	early	3.60±0.10	3.59±0.10
	in the end	3.57±0.16	4.85±0.12*

Parameter	Study stage	Girls	
		n=42	n=42
Inclination forward, cm	early	4.46±0.11	4.30±0.13
	in the end	4.65±0.17	7.70±0.11*
Inclination backward, cm	early	2.50±0.10	2.41±0.09
	in the end	2.71±0.16	4.90±0.08*

Note. * - significant change in the index compared with the control group ($p < 0.05$).

At the beginning of the test, the test revealed the presence of distinct asymmetry of the blades in the examined two groups. So, in boys: control group 2.26 ± 0.18 ; the main group is 2.35 ± 0.20 ; in girls: control group 2.31 ± 0.20 ; the main group is 2.14 ± 0.15 , with the norm 0 cm.

There was a significant difference ($p < 0.05$) of the indicators at the end of the study in children of the main group compared with the control group in boys: control group was 2.31 ± 0.24 ; the main group is 1.02 ± 0.14 ; in girls: control group 2.42 ± 0.27 ; the main group is 0.62 ± 0.14 , which indicates a significant decrease in the asymmetry of shoulder blades in children of the main group.

During the experiment, the effectiveness of the program for correction of posture disorders was confirmed through the introduction into the educational process of sports ballroom dance classes ($p > 0.05$).

The effectiveness of the developed program of correction of posture disorders gives grounds to state the improvement of all indicators of spine mobility in the children of the main group.

Analysis of the results of the implementation of the program for correction of posture disorders in sports ballroom dances gives grounds to state its effectiveness in the development of proportional figure, the development of correct posture, increased spinal mobility, decreased asymmetry of shoulder blades.

For the first time, the effectiveness of the developed correction program for posture disorders has been theoretically substantiated and experimentally confirmed with the help of introducing sports ballroom dance lessons into the educational process. The positive influence of sports dances on the children's organism, which was based on the systematic approach to the process of work, adherence to the generally accepted conditions for engagement in motor activity of school age children was substantiated.

According to our research, most of the indicators that characterize the parameters of the functional state of the spine in children of the main group, are significantly different from the same indicators of children in the control group at the end of the study, which proves the effectiveness of the implemented program.

Table 4

The results of tests to establish asymmetry of scapulae (M±m)

Parameter	Study stage	Control group (N=85)	Main group (N=84)
		Boys	
		n=43	n=42
Distance CVII – low angle of the left scapula, cm	early	13.04±0.29,	13.07±0.28
	in the end	13.12±0.23	13.11±0.15
Distance CVII – low angle of the right scapula, cm	early	12.09±0.25	12.18±0.35
	in the end	12.13±0.34	12.87±0.31
Difference	early	2.26±0.18	2.35±0.20
	in the end	2.31±0.24	1.02±0.14

Parameter	Study stage	Girls	
		n=42	n=42
Distance CVII – low angle of the left scapula, cm	early	11.93±0.22	11.98±0.19
	in the end	12.23±0.14	12.17±0.11
Distance CVII – low angle of the right scapula, cm	early	10.24±0.27	10.17±0.17
	in the end	10.67±0.16	11.89±0.12
Difference	early	2.31±0.20	2.14±0.15
	in the end	2.42±0.27	0.62±0.14

Note. * – significant change in the index compared with the control group (p<0.05).

CONCLUSIONS

1. The program of correction of posture disorders through the introduction into the educational process of sports ballroom dancing was based on the results of the diagnosis of the functional state of the spine, including complimentary goals and objectives. Introduction to the educational process of sports ballroom dancing included seven sections with active involvement in this process not only children but also their parents and teaching staff.

2. During the formation of the content of each class, the individual features of the functional state of the organism, as well as the functional state of the muscular and cardiovascular systems, were taken into account.

3. After analyzing the results of our studies, we came to the conclusion that most of the indicators

that characterize the parameters of the functional state of the spine in children of the main group significantly differ from similar indicators of control group at the end of the study, which proves the effectiveness of the implemented program.

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