

## DIFFERENTIATED CORRECTION OF JUNIOR SCHOOL AGE CHILDREN'S POSTURE AT PHYSICAL CULTURE TRAININGS

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**Abstract.** *Purpose:* to show peculiarities of differentiated correction of junior school age children's posture, considering tonic vibration reflex. *Material:* the research was conducted with participation of 62 junior school age children (7-10 years old boys and girls). All children have no sport training experience. All children were preliminary examined by qualified medical doctors. Tonic vibration reflex of lumbar spine was registered. Children fulfilled test exercises, which characterized power endurance of abdomen muscles, side of torso and back muscles. *Results:* external signs of posture disorders were absent in frontal plane. In 35 persons (65.8%) we registered one-side increased reflex excitability of nervous centers: from right side of backbone – in 28 children (72%); from the left side in 17 children (28%). Correction of posture with the help of correcting exercises can give steady effect only with simultaneous formation of correct posture habit. For this purpose it is necessary to create muscular-joint sense of separate body parts' position. *Conclusions:* for determination of functional potentials of in-born muscular corset it is recommended to fulfill special test exercises. For local influence on lumbar spine muscles it is recommended to use exercise of asymmetric character.

**Key words:** correction of posture, tonic, vibration, reflex, scoliosis, schoolchildren.

### Introduction

Problems of control, diagnostic and accounting of pathologies with scoliosis deformations have acquired great importance. Rehabilitation treatment of schoolchildren is of not less importance. All these witness about society's and state demand in prophylaxis of posture abnormalities and scoliosis; their diagnosing and treatment.

The researches of V.K. Veltchenko [1, pg. 85] showed importance of early diagnosing of posture disorders. It will permit to recover them in due time. The author notes that selection of correcting exercises shall be determined individually, considering the character of posture disorders. In this case shape of back is the only sign of scoliosis. It permits to determine correctness of means and methods of trainings. However, visible signs of backbone deformation signal about posture disorders. That is why for effective prophylaxis of posture disorders it is necessary to have method, which could ensure exact detection of first signs of muscular functioning imbalance at early stages.

Different authors conducted researches in this aspect. For example, A.A. Potapchuk and M.D. Didur [3, pg. 98] outlined requirements to methodic of children's medical examinations for posture disorders:

1. Determination of minimal symptoms of posture disorders and physical condition (early diagnosing);
2. Determination of the weakest links in organism's systems, responsible for formation and support of posture that permits to work out individual correction program (general assessment and individual approach); systemic assessment of health related measures' effectiveness and correction of program (operative and integrative control).

Among other publications results of domestic [8, 12, 13, 15-20, 22, 25, 31] and foreign [9, 23, 27-30] authors attract attention. Most authors agree that this pathology takes place in every population and does not depend on race and geographical location. For ensuring of early diagnostic and organization of correcting preventive measures it is necessary to practice constant monitoring of physical condition, physical fitness and physical potentials of children. The authors note that it is necessary to implement complex preventive programs, facilitating more effective correction of body space organization's disorders and permitting to neutralize negative influence of school risk factors. Besides, they note that for improvement of children's lungs and cardio-respiratory systems' functional state it is necessary to use exercises with breathing pauses.

The mentioned researches do not solve completely the problem of scoliosis prophylaxis and treatment by means of physical education. That is why it is required to continue researches in the mentioned above aspect because it is an urgent problem for school age children.

### **Purpose, tasks of the work, material and methods**

*The purpose of the work Мета дослідження* – is to show peculiarities of differentiated correction of junior school age children’s posture, considering tonic vibration reflex.

The research was approved by ethic committee of Chernigov National Pedagogical University, named after T.G. Shevchenko. We received written consents of parents for their children’s participation in experiment.

The research was conducted with participation of 62 junior school age children (7-10 years old boys and girls). Before experiment, for control over posture of experimental groups’ children we examined them for presence or absence of visible signs of posture disorders. The examination was fulfilled by qualified medical doctors. From 62 examined junior school age children in 48 there were found no visible disorders of posture. In this group of children we conducted registration of tonic vibration reflex of lumbar spine. On the base of initial measurements we formed groups: control (12 persons) and experimental (12 persons). All children had no visible signs of posture disorders in frontal plane.

Medical examination was carried out twice: at the beginning of pedagogic experiment (September) and at the end of experiment (May).

### **Results of the researches**

Medical examination showed that in 35 persons (65.8%) we registered one-side increased reflex excitability of nervous centers: from right side of backbone – in 28 children (72%); from the left side in 17 children (28%). With the help of registration of tonic vibration reflex (TVR) of lumbar spine symmetric muscles we found increased reflex excitability of right or left torso sides. As results of our researches showed confident information about early signs of imbalance of skeletal muscles’ functional state is carried by indicators of appropriate nervous centers’ reflex excitability. These indicators can be received in registration of tonic vibration reflex. We assumed that usage of TVR data for current control would permit to increase effectiveness of preventive measures by means of physical exercises of correcting orientation.

It is known that if formation of schoolchildren’s correct posture natural “muscular corset” participates. To large extent it determines stability of posture, ability to keep certain position during long time [2, pg.52]). For determination of “muscular corset” functional potentials control and experimental groups’ children were offered to fulfill test exercises for power endurance of abdomen muscles, torso sides and back strength.

Comparative analysis of results of back power endurance testing determined insufficient level of power endurance of the mentioned muscles (see table 1).

**Table1.** Comparative analysis of power endurance indicators of control and experimental groups’ children’s torso muscles before pedagogic experiment (by methodic of I.D. Loveyko and M.F. Fonariov)

<b>Testing</b>	<b>Norm</b>	<b>Control group</b>	<b>Experimental group</b>
Power endurance of back muscles, sec.	60-120	41.6±1.6	39.2±2.2
Power endurance of torso side muscles, sec.	60-90	59.2±2.6	57.5±2.1
Power endurance of abdomen muscles, quantity of times	15-20	16.8±0.9	15.7±0.9

Statistic processing of results of torso side power endurance testing permitted to find the presence of asymmetry in static power endurance of torso right and left sides in most of the tested children. In average, in this test children of control group showed result  $59.24 \pm 2.6$  seconds; experimental group’s children –  $57.5 \pm 2.1$  seconds. Distinctions by level of torso sides’ muscles between groups were not confident ( $p > 0.05$ ). Comparative analysis of the received data (comparison with norms) (60-90 seconds: 2, pg. 54) also showed insufficient level of static endurance of torso side muscles’ static endurance (see table 1).

Testing of abdomen muscles’ power endurance showed that practically all tested coped with this test. Exclusion was only two children from experimental and 1 child from control groups. Mean quantitative indicators in

control group were  $16.8 \pm 0.9$  times and in experimental –  $15.7 \pm 0.9$  times. Distinctions were not confident paziv. ( $p > 0.05$ ). Normally, children of this age group shall fulfill this exercise 15-20 times [2, pg. 54].

Examination of functional potentials of back, abdomen and torso side's muscles permitted to observe dynamic of power endurance development during all pedagogic experiment. The examinations were used for determination of load parameters of correcting exercises for them to be adequate to children of control and experimental groups.

During year health related trainings, oriented on prevention from posture disorders in frontal plane were conducted by known methodic [2, pg. 54] with control and experimental groups' children. These trainings were practiced thrice a week with duration of f 30 minutes each. Main part of health related trainings of control and experimental groups' children consisted of correcting exercises (55-75% from total time of training), relaxation exercises (5-10%), general developing exercises (GDE) (10-15%), breathing exercises (BE) (10%) and mobile games (10-15%).

Distinctions in methodic of health related trainings in the tested groups were as follows. In control group correcting exercises were oriented on prevention from posture disorders, without consideration of detected one side increased reflex excitability of appropriate nervous centers. Instructor practiced traditional symmetric training of muscles (natural "muscular corset") with accent on training of strength and power endurance. In experimental group trainings were built on the basis of the received data of TVR of lumbar spine. With it indicators of one-side increased reflex excitability of motor centers were considered. For local influence on lumbar spine muscles we used asymmetric loads. These loads selectively strengthen and stretch muscles on the side of reduced reflex excitability and relax muscles on the side of increased reflex excitability. We assumed that such methodic approach would permit to reduce difference of impulse flow from periphery (muscles) from right or left torso sides to central nervous system (CNS). Besides, it could prevent from asymmetry of muscular tonus in the future.

To avoid wrong application of asymmetric exercises in group form of trainings their quantity is restricted [7 pg.52]. In this connection fulfillment of correcting asymmetric exercises was controlled by pedagogue. This control was conducted on the base of preliminary fulfilled measures on revelation of imbalance of lumbar spine motor centers' reflex excitability. To ensure visual character of exercises and increase of children's understanding of correcting exercises we put bright band on one of lower limbs of a child. The band pointed at localization of increased reflex excitability of appropriate nervous centers.

Technology of experimental group children's posture disorders' prevention was as follows. Registration and further computer analysis of electric myogram (EMG) permitted to determine the character of reflex excitability of child's motor centers. In its turn, it permitted to find out on what side from backbone reflex activity of skeletal muscles is increased. Accordingly, this side was selectively additionally loaded with stretching and relaxation exercises. On the side of weakened excitability of motor centers we added strengthening exercises. Thus, instructor's actions were directed at balancing of reflex excitability of nervous centers. For this purpose asymmetric loads were applied.

Alongside with asymmetric exercises we widely used symmetric correcting exercises. As S.B. Sharmanova [6, pg. 164] notes with defects of posture in frontal plane main role is played by symmetric exercises. They ensure balancing of muscular force and elimination of muscular tonus asymmetry.

Series of experiments resulted in finding that health related effectiveness of symmetric correcting exercises, used by children with one-side increased reflex excitability, is restricted due to weak muscles on one side of torso [5, pg.124]. Weakness of muscular groups on one side of backbone results in their quick fatigue as well as in unconscious deviation of backbone when fulfilling symmetric correcting exercises. In this case it is necessary to stop correcting exercise. It reduces the volume of the fulfilled work.

For junior school age children the most important element of health related methodic is choice of physical load level. Insufficient physical load will not result in expressed health related effect through insufficient mobilization of physiological functions. Excessive physical load can bring to unfavorable after effects in muscular skeletal apparatus and result in loss of children's interest to trainings.

In order to determine optimal load limits it is necessary to have clear knowledge of children's maximal potentials. This information can be obtained from control execution of main exercises. In compliance with it correcting exercises were dozed on the base of control testing of strength and power endurance of muscular corset. In complexes of correcting exercises we used power exercises of dynamic and static character. Static exercises were preceded by dynamic power exercises. Dynamic power exercises took approximately 95-85% from total quantity of correcting exercises. Static exercises took 5-15%. When fulfilling static exercises their dozing made 50-70% from maximal result of control testing.

With regular repetition of the same exercises the process of active adaptation to them takes certain period of time. It gives training effect. After it external influences stop being active irritators and their training role also stops. Further intensive growth of physical abilities does not take place. That is why with growing of strength and power endurance of muscles quantity of repetitions of every exercise also increases.

Quantity of repetitions and rest interval between exercises depended on functional potentials of tested children and was regulated by heart beats rate (HBR). According to recommendations of I.D. Loveyko and M.I. Fonariov [2, pg. 58], when fulfilling correcting exercises, pulse shall be in the range of 120-160 bpm. Restoration of pulse up to 110-120 bpm pointed at children's readiness for next series of exercises. We considered peculiarities of children's condition [7, pg. 69] in fulfillment of static correcting exercises. For example, time of passive rest was two times greater than the period of exercise's fulfillment.

With growing of strength and power endurance we used exercises with combination of different modes of muscles' functioning. Power exercises were combined with stretching and relaxation of actively working muscles.

For a child to master voluntary relaxation of muscles is rather difficult task. It requires certain motor experience and ability to control muscular tonus. Relaxation exercises ensured maximally possible reduction of tonic tension of muscles. They used in final part of training or in main part in rest intervals (after power exercises).

Most of specialists think that it is compulsory to include breathing exercises in health related complexes (L.A. Golobina, Yu.A. Kopylov, N.V. Skovorodnikova, A.P. Shkliarenko, A.P. Matveyev et al.). It is explained by the fact that the most often respiratory failure is combined with expressed somatic weakness of a child, functional failure of muscular-ligament apparatus against the background of relative circulatory failure. That is why in experimental group special attention was paid to formation of rational breathing skills during fulfillment of physical exercises. Children's conscious attitude to breathing exercises was formed. It was achieved through constant explanations of importance of correct "full" breathing for effective muscular work and the whole organism. When fulfilling static exercises children's attention was concentrated on impossibility of breathing pauses in static positions. For this purpose we used methodic technique, offered by M.V. Kuzmenko (2002). The author offers pronouncing of different sounds at exhaling.

Posture's correction with the help of correcting exercises can result in steady effect only with simultaneous formation of correct posture skill. For this purpose it is necessary to create muscular-joint sense of separate body parts' position (S.M. Popov, R.F. Valeyev). Formation of posture on the base of pro-prioceptive sense envisages observation of certain organizational-methodic requirements. These requirements imply presence of smooth wall without plinth. It permits for a child to stand with back in contact with the wall and take correct posture. Children shall feel five points of contact: the back of the head, shoulder blades, buttocks, shin muscles and heels. That is child feels correct position of own body in space. It creates pro-prioceptive sense, which, with multiple repetitions, is fixed in CNS.

At the end of academic year, after experiment we carried out experts' examination of children's posture in control and experimental groups and summarizing registration of TVR.

**Table 2.** Summarizing TVR of control and experimental groups' children after experiment

Group	Quantity of children with one-side				Quantity of children with posture			
	increased reflex excitability				disorders			
	At the beginning of		At the end of		At the beginning of		At the end of	
	pedagogic		pedagogic		pedagogic		pedagogic	
	experiment		experiment		experiment		experiment	
	n	%	n	%	n	%	n	%
Control	12	100	7	58.3	0	0.0	3	25.0
Experimental	12	100	4	3.3	0	0.0	0	0.0

### **Discussion**

Results of our research confirmed the data of other authors about complex control of children's posture (M.V. Kuzmenko, 2002; I.D. Loveyko, M.I. Fonariov, 1988; S. Sharmanova, A. Fedorova, G. Kalugina, 1999; A.P. Shkliarenko, V.A. Petkov, 2001; Sobera M., Siedlecka B., Syczewska M., 2011; Hagner W., Bąk D., Hagner-Derengowska M., 2011; Dockrell S. та інші., 2012; Czaprowski D. та інші., 2014; McKay S.M., Wu J., Angulo-Barroso R.M., 2014; Żukowska Hanna та інші., 2014; Tamozhanskaya A.V., 2015).

Approaches to building of methodic, oriented on consideration of children's individual potentials can be considered to be novelty. This methodic permit to achieve greater effectiveness in prevention from posture disorders of junior school age children.

Cultivation of correct posture shall be realized through imaginary and visual picture about it. Imaginary picture was formed with instructor's explanations about ideal positions of body parts in space (head, shoulders, torso and legs). Visual picture was created by direct example of instructor himself. At all trainings children should have seen correct beautiful posture of their instructor, who demonstrated it during all training session.

The content of health related trainings in control and experimental groups was practically identical. Peculiarities of experimental group's trainings implied that correcting exercises were selected for every child, considering one-side reflex excitability of appropriate nervous centers. We assumed that such methodic approach can permit for us to increase effectiveness of health related trainings for prevention from posture disorders in frontal plane.

### **Conclusions**

We think that the results, received by us, confirm one more the effectiveness of methodic of early diagnostic. This methodic is based on registration of tonic vibration reflex (TVR) for prophylaxis of posture disorders in frontal plane. It permits to obtain confident information about character of nervous centers' excitability that reflects functional activity of interconnected muscular groups. The methodic permits to practice current control of prevention measures' effectiveness by means of physical culture and introduce, is it is required, operative changes.

*The prospects of further researches* imply substantiation of practical recommendations for application of early diagnostic methodic in cases of children's posture disorders in conditions of comprehensive educational establishments.

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