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MOTOR ACTIVITY FOR SPINAL DEFORMITIES IN CHILDREN OF PRE-SCHOOL AGE

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Abstract

Motor activity for children with vertebral distortions is a major factor in general strengthening, proper development and stimulation of the whole organism. This helps to overcome spinal problems, improve the function of the lungs and the chest and create a strong muscle corset. The aim of the present study is to diagnose spinal deformities and to extend the professional competences of the students of specialty "Medical rehabilitation and ergotherapy" for work with children. The subject of the study is 248 children aged 6 and 7 from the kindergartens on the territory of the town of Stara Zagora during the clinical practice of the students. The analysis of the most common types of spinal deformities was the basis for compiling and conducting a program to increase the motor activity of children. Through a motor activity, swimming and sports games, the tone of the spinal muscles is improved, the muscle imbalance is overcome and the movement of the chest is stimulated. A healthy muscular corset is created and the neuropsychological development of the children is stimulated. Involvement of students in preventive actions to combat vertebral distortions is an innovative approach to practical training that stimulates motivation and improves practical skills.

Keywords: Motor activity, early diagnostics, spinal deformities.

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1. Introduction

Several authors point to six major factors determining the anomalies of growth and deformities of the spinal cord and thorax. These are: the genetic factors affecting the growth and development of the locomotory system; hormonal and metabolic dysfunctions affecting calcium-phosphate metabolism; biomechanical factors due to decreased motor activity; environmental factors and lifestyle related to children's eating habits; abnormal skeletal growth and congenital abnormalities associated with the nervous system. Modern NMR studies of children with vertebral distortions confirm this thesis (Zadeh & Gleiber, 2015; Chu, Rasalkar, & Chen, 2011; Woggon & Martinez, 2013).

Signs of scoliosis begin in early childhood, may develop during growth and become permanent if not treated. These occur in children aged 5 to 6 years, but the spinal curve is labile, decreasing in the pelvic position and corrected for mobilization of the musculature (Filkova, 2013, 2017). A thorough postural evaluation is required to check if the problems are related to lower limbs, pelvis, shoulder belt, torso, upper limbs, or functional reasons only. A thorough postural evaluation is required to check if the problems are related to lower limbs, pelvis, shoulder belt, torso, upper limbs, or functional reasons only (Vieira et al., 2015; Vacheva, 2013).

The poor posture is characterized by the weakness of the whole body, especially the muscular system, a disturbance of the static position of the spine and other parts of the locomotory system (Pfeiffer, Kotz, Ledl, Hauser, & Sluga, 2006). The motor and sensor systems involved in the posture stability pass through a transition period of 4-6 years to maturity at the age of 7-10 years. Rapid growth from childhood to adolescence occurs at the age of 9-12 and can cause enormous changes in the position, shape and size of the spine, muscular strength and flexibility that affect postural instability (Konieczny, Senyurt, & Krauspe, 2013; Melo et al., 2017).

The basic principles defining the correct approach to correcting the disturbed posture and overcoming the spinal deformities are limited to: maintaining the motor activity of all the structures of the spine - intervertebral discs, joints, ligament apparatus and muscles; overcoming muscle imbalance because hypertonic muscles hamper flexibility and hypotonicity of spine stability; overcoming ligament abnormalities associated with bone growth and stimulation of postural control, nervous system and equilibrium reactions (Paskaleva, 2012; Ilieva & Paskaleva, 2010; Platikanova, 2015).

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Spinal deformities are among the most prevalent diseases in childhood and adolescence. Contemporary lifestyle and reduced motor activity are factors that provoke the appearance of irregular posture and various deformities of the spine and thorax in preschool children. The physical development of children and adolescents correlates with their motor and diet regime, with their constitution, with the hardening, early detection, prophylaxis and treatment of the acute and chronic diseases accompanying the

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growth (Koleva, 2009; Koleva, 2010). A thorough postural evaluation is required to check if the problems are related to lower limbs, pelvis, shoulder belt, torso, upper limbs, or functional reasons only (Bogdanović, Mavrić, & Mavrić, 2017; Chiwaridzo & Naidoo, 2016).

2. Problem Statement

Early diagnostics, systemic monitoring, treatment, and the actual motor regimen contribute to the favorable outcome of disturbed preschool posture in children (Mollova & Uzunova, 2017; Platikanova, Karabayeva & Naneva, 2015). Of particular importance is the good organization of healing and healing measures including a timely diagnosis to prevent gross spinal and thoracic deformities with subsequent complications leading to severe disability (Paskaleva, 2015; Platikanova, & Karabayeva, 2015).

3. Research Questions

The presence of symmetry of the body is evidence of a perfect posture. The presence of asymmetry results in a spine deviation in the frontal plane and is evidence of scoliosis - lateral spine distortion.

4. Purpose of the Study

The aim of the present study is to study the physical development of pre-school children aged 5-6 and to define the factors leading to the spinal distortion and impaired posture.

5. Research Methods

The subject of the study is 248 children aged 6 and 7 from the kindergartens on the territory of the town of Stara Zagora during the clinical practice of the students.

The analysis of the most common types of vertebral distortions was the basis for compiling and conducting a kinesitherapeutic program to increase the motor activity of children

5.1. Methodology of the study. Before the diagnosis, children were selected by tracking physical development and observation from behind, from the side and in the front. Of the 1,200 examined children aged 6-7, targeted for measurement were 248 children. For this purpose, a special map for child-related diagnosis is compiled. Measurements and studies of the spine and thorax were performed by measuring the mobility of the cervical spine, and the tests of Ot, Tom Mair, Schober, Moshkov's quadrangle, chest circumference (X1, X2, and X3) and manual-muscular test for abdominal, dorsal and sedative muscles, Chinzin's planogram. Written informed consent of the parents for the participation of the children in the rehabilitation events was made. Measurements and studies are reported in a special diagnostic card for each child.

5.2. The statistical analysis was performed using SPSS version 16.0 (SPSS Inc., Chicago, IL). Quantitative data were presented as average and standard deviation if they were normally distributed or otherwise median and range. They were compared to the Man-Whitney rank test.

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Normality is assessed by the Kolmogorov-Smirnoff test. Accurate data were analysed by Fisher's exact test. Cramer's V was used as a post-test to determine the strengths of association after the exact Fisher test that determined the significance. A value of the 2nd $p < 0.05$ is considered significant.

6. Findings

Of the 248 children surveyed, only 75 children (30%) had no asymmetry of the blades at Moshkov's quadrangle. This corresponds to the studies of Figure 1 for the distribution of the types of distortion. In the remaining 70% of the children there is an asymmetry of the blades, with 34% of the children having a higher right-handed blade, and 36% of the higher children are the left blade. The posture of the children changes in the same direction (Table 01, Figure 01).

Table 01. Results of the study of Moshkov's Quadrangle

	Number	Percentage
a<b	84	33,7%
a=b	75	30,2%
a>b	89	36,1%
Total	248	100,0%

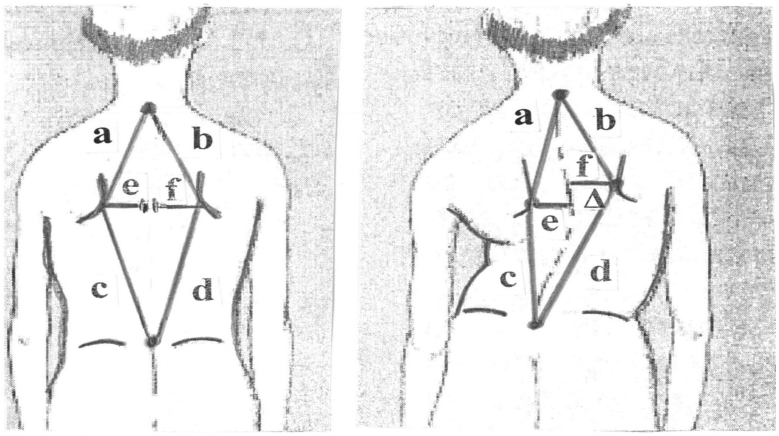

Figure 01. Moshkov's Quadrangle in Norm and Pathology

When testing the vertebral distortion by the Moshkov's quadrangle from a posture stand with a denture pencil, the points of the spines of the vertebrae C7 and L5, as well as the lower medial corners of the blades. The sides of the thus formed quadrangle at the normal position of the body are symmetrical to the spine, i. E. the left part of the quadrangle is symmetrical on the right-hand side of the quadrangle. In the presence of spinal distortion symmetry is distorted to varying degrees. This method is particularly well suited to measuring various disorder disturbances of children aged 5-6. The presence of symmetry of the body is evidence of a perfect posture. The presence of asymmetry results in a spine deviation in the frontal plane and is evidence of scoliosis - lateral spine distortion (Paskaleva, 2012; Paskaleva, 2015).

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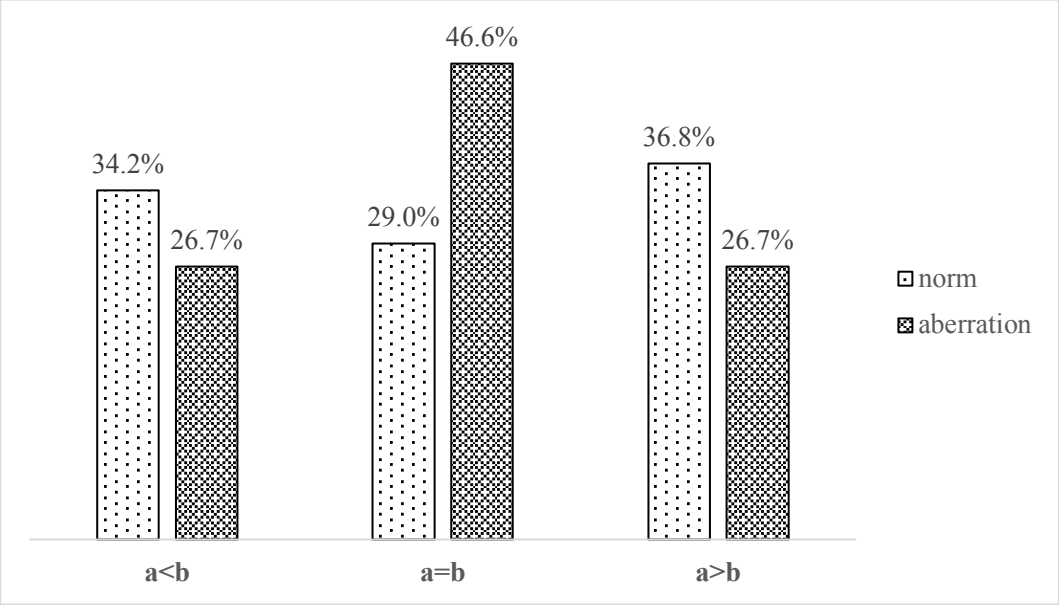

Figure 02. Evaluate the variable a b relationship and the disordered posture

There is no statistic relationship between a b and the disordered posture (Figure 02) ($\chi 2 = 0.081$; $p = 0.987$). The author's thesis confirms that the disordered posture is a vicious position of the body most commonly seen in preschool children and is the result of poor musculature, changes in various compartments, the motor apparatus and the nervous system (Melo et al., 2017).

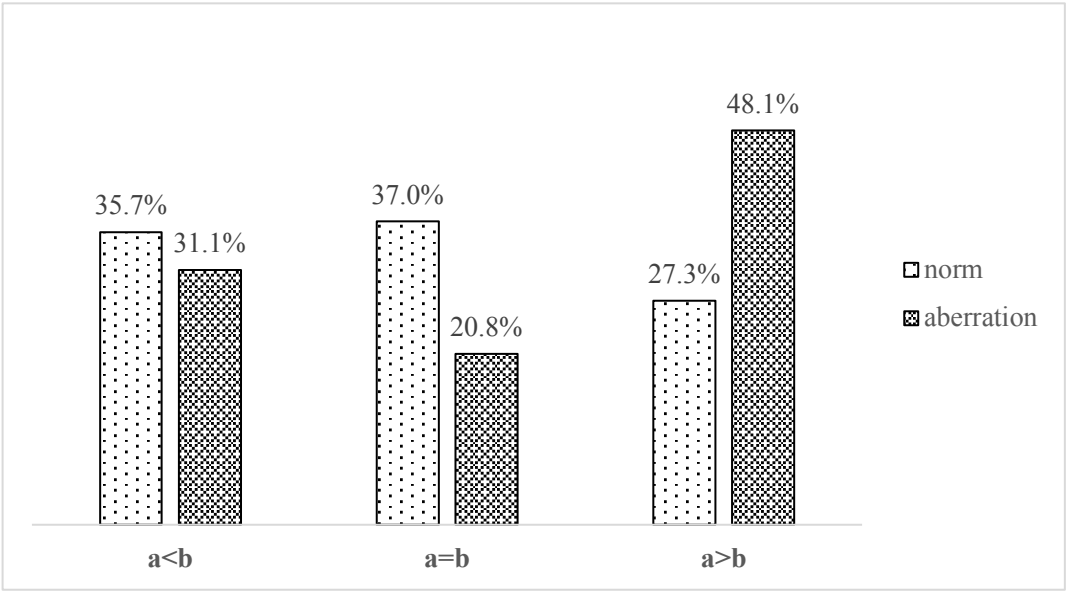

Figure 03. Evaluation of the relation of the variable ab and asymmetry of the shoulder lines

In Figure 03 we find a weak statistical relation between ab and asymmetry of shoulder lines ($x2 = 13.012$, $p = 0.002$, Cramer's $V = 0.229$). The distribution of asymmetry of the shoulder lines is according to the groups. It can be seen from the graph that the deviation predominates over the norm in patients with a> b. These data confirm the fact that the asymmetry of the blades determines asymmetry of the shoulder lines.

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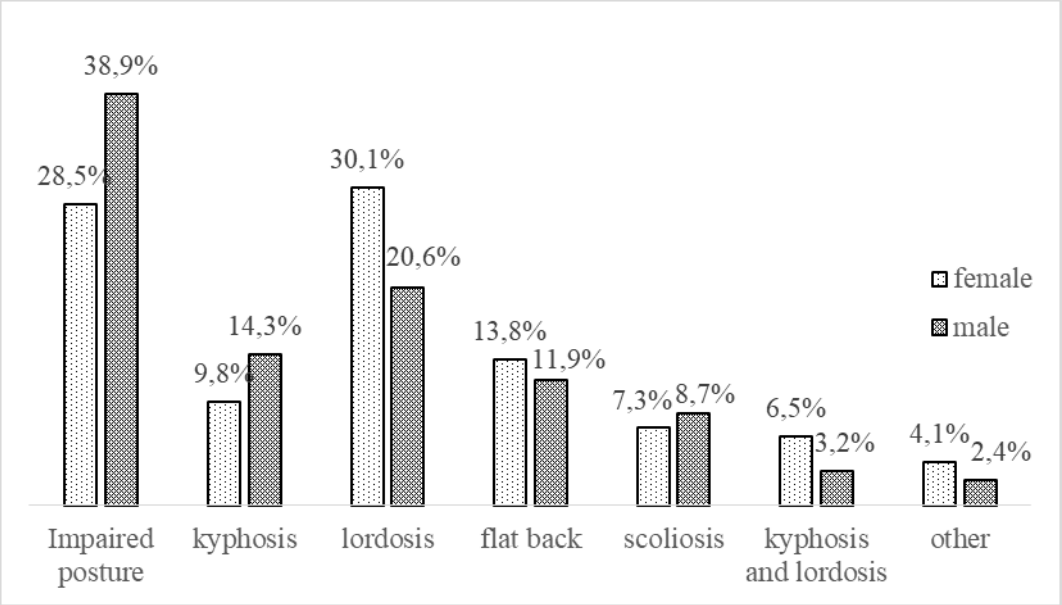

Figure 04. Evaluation of the relation of the variable ab and asymmetry of the shoulder lines

Depending on the type of distortion, the results of the study (Figure 04) rank first with the largest share of the children with disorder (38% of the boys and 28% of the girls). This is a confirmation of the authors' view that the wrong position of children during the session and reduced motor activity worsen posture and are prerequisites for more serious spinal deformities. The second place is the increased lordosis (30% of the girls and 20% of the boys) given the fact that many of the girls of this age are engaged in ballet or gymnastics and these sports lead to the increase of lordosis. Third, flat backs (14% of girls and 12% of boys), this spine has reduced physiological curvature (kyphosis and lordosis), most often combined with flat chest and weak muscles. There is no statistical dependence between gender and the type of distortion ($\chi 2 = 7.529$; $p = 0.273$), as evidence that the sex is not sex, but the motor activity and the position of children in everyday life.

Early diagnostics, systemic monitoring, treatment, and the actual motor regimen contribute to the favorable outcome of disturbed preschool posture in children (Mollova, Uzunova, Popov, & Milcheva 2017; Platikanova, Karabayeva, & Naneva, 2015). Of particular importance are the good organization of healing and healing measures including a timely diagnosis to prevent gross spinal and thoracic deformities with subsequent complications leading to severe disability (Platikanova & Karabayeva, 2015; Paskaleva, 2015).

7. Conclusion

Considering the widespread prevalence of vertebral distortions at preschool age in children aged 6 and 7 years there is a need for regular and systematic participation in prevention programs for the diagnosis and prevention of vertebral distortions carried out annually in order to prevent later onset orthostatic disorders. There is a need for continuous cooperation between kindergarten teachers and the public to increase the participation of children involved in various forms of sport, recreation and various types of motor activities.

There is a need for systemic kinesitherapy, swimming and sports games to improve back muscular tone, overcome muscle imbalance and stimulate chest mobility. This creates a healthy muscular corset, stimulates the nerve-psychological development of the children and prevents the increased spinal deformities.

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