CHARACTERISTICS OF VERTICAL STABILITY OF THE BODY OF HARD HEARING PRIMARY SCHOOL CHILDREN DURING PHYSICAL EDUCATION

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Annotation. Studied the specific features of the motor areas of hearing children of primary school age - the vertical stability of their body. In pedagogical experiment involved 58 hearing children of primary school age and 52 healthy student. The analysis of the amplitude-frequency characteristics of the common center of gravity of the body. Revealed a statistically significant difference in the sagittal and frontal planes between the studied parameters of the surveyed population. The data obtained can be used for quantitative assessment of the vertical stability of the body younger students. The results of the experiment can serve as a basis for the development of technology aimed at the formation of the orthograde posture younger students this nosology.
Keywords: vertical stability, younger students, hard of hearing, stabilography.

Introduction

As per recent evaluation of WHPO in the world there are more than 360 million of disabled owing to hearing problems and it is more than 5% of the planet population. With it, 32 million of children younger than 15 years old suffer from hearing problems. In Ukraine, at present time, there are 32 schools for deaf children, in which 4064 pupils study and 26 schools fro children with hearing problems, in which 3488 pupils study [2].

According to data of scientific-research and special literature children with hearing deprivation often suffer from reducing of static and dynamic balance [1,5,3,8,9]. For children with hearing problems typical abnormalities are disorders of vestibular apparatus's functions, delay in motor and psychic development, abnormalities of speech, memory, attention, thinking, communication, disharmonious physical development and disorders of posture as well as disorders of vertical balance [3,8]. Functions of keeping balance is ensured by vestibular apparatus and even insignificant disorders of vestibular apparatus can significantly influence on motor system of children with deceased hearing, that forces specialists in adapting physical education to pay attention to development of vertical balance of children with hearing deprivation.

At present time researches in the field of adapting physical culture for children with hearing problems are concentrated on increasing of health improving, correcting and socializing role of physical education, that is a base for full fledged development of children with hearing problems [6].

One of the most important problems od adapting physical education is creation of programs, methodic and complexes of exercises, which would consider peculiarities of disabled children, including children with hearing problems [3,5], while development of such programs stipulates using of adequate principles, means and methods, facilitating solution of the set tasks [7,10]. In its turn choice of appropriate means and methods is possible only on the base of objective criteria of evaluation of children's physical state and its changing in the process of physical education. As far as balance function is a factor, which reflects the state of human motor system, one of such criteria can be vertical stability of a child's body.

There are data, from which it is seen that deaf children have often secondary abnormalities in the form of posture's abnormalities both in frontal and in sagittal planes, that points at possible disorders of balance indicators in orthograde position [1,4]. Therefore, at present time it would be interesting to obtain objective data about indicators of vertical balance of weakly hearing children's body and comparing of these data with analogous indicators of practically healthy children; while application of the obtained results would permit to significantly optimize the process of adapting physical education of children with hearing problems.

The work has been fulfilled as per combined plan of scientific & research works in the field of physical culture and sports for 2006-2010 by subject 2.2.1 "Improvement of bio mechanical technologies in physical education and rehabilitation, considering space organization of human body" (state registration number 01060106U010786) and as per combined plan of scientific & research works in the field of physical culture and sports for 2011-2015 by subject " Improvement of bio-mechanical technologies in physical education, sports and rehabilitation, considering individual human features" (state registration number 0112U001860).

Purpose, tasks of the work, material and methods

The purpose of the research is to study peculiarities of vertical body balance of weakly hearing children of 7-10 years old in the process of physical education.

The methods of the research: analysis of special scientific-methodic literature, pedagogical observation, stability metering, methods of mathematical statistics. The research was carried out on the base of laboratory of bio-mechanical technologies in physical education and Olympic sports of national university of physical education and sports of Ukraine and consisted of two stages: the studied indicators were registered at the beginning and at the end of academic year.

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Results of the researches

As per the data of scientific-methodic and special literature, disorders of hearing analyzer's functions result in delay of development of a number of junior pupils' motion qualities. Children of 7-10 years old, having hearing problems, have also such peculiarities of motion sphere's development as: reduction of orientation in space, reduction of coordination abilities, slowing of some movements. However, in the opinion of some specialists, in first turn, for such children it is difficult to keep static and dynamic balance [8].

In order to chose adequate means of physical education for weakly hearing junior pupils, we carried out pedagogical experiment, in which 110 pupils of 7-10 years old took part, from whom there were 58 children with different hearing problems and 52 practically healthy pupils.

For determination of vertical body's stability of junior pupils with hearing deprivation we evaluated balance function in static and in dynamics with the help of strain-platform Kisler followed by comparative analysis of indicators in group of healthy pupils. The researches were carried out on the base of laboratory of bio-mechanical technologies in physical education and Olympic sports of national university of physical education and sports of Ukraine. Two tests were used: main position on immovable platform and main position on immovable platform with closed eyes. Every test took 10 seconds. In the course of testing we obtained indicators of amplitude (mm) and frequency (Hz) of general gravity center's (GGC) oscillations in frontal (x) and sagittal (y) planes as well as the length of trajectory of GGC travelling (see fig. 1).

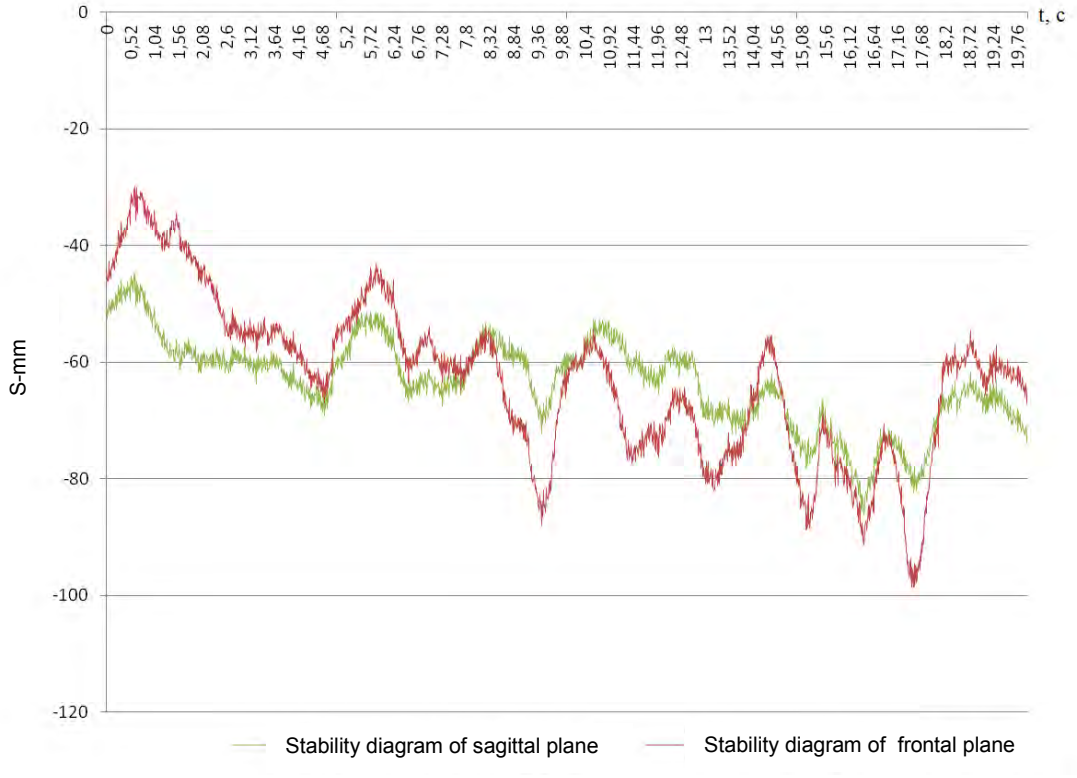

Fig.1. Dynamics of junior pupils' GGC projection's travelling in sagittal and frontal planes

The research showed that in the first test mean value of amplitude results of healthy children was 38,04 mm (oscillations forward-backward), and 36,12 mm (oscillations to the left-to the right), while this indicator of children with hearing problems was 38,33mm (oscillations forward-backward) and 37,00 mm (oscillations to the left-to the right). Mean value of frequency indicators in the same test was 10,99 HZ (oscillations forward-backward) and 12,33 Hz (oscillations to the left-to the right) for healthy children and 10,84 Hz (oscillations forward-backward) and 11,99 Hz (oscillations to the left-to the right) for children with hearing problems. It should be noted that the observed difference in both groups of the tested by amplitude-frequency characteristics was statistically not confident ($p>0.05$).

In the course of further work we studied dynamics of some indicators of amplitude-frequency characteristics of stability diagrams of the examined pupils, which were previously distributed by their age. For this purpose we regarded mean-statistic indicators of GGC frequency's amplitude in main position and in Romberg's test with open eyes in sagittal plane of practically healthy pupils of 7-10 years old and their peers with hearing problems at the first and at the second stages of the research. It should be mentioned that the first stage of the research was carried out at the beginning of academic year and the second – at the end.

It was established that practically healthy children of 7 years old had indicator of stability in main position reduced to 8,54 mm (S = 0,51 mm), and mean reduction of GGC frequency's amplitude was 0,73%. For 8 years old pupils this indicator reduced by 0,79% and was 8,82 mm (S = 0,84 mm). For 9 years old pupils we observed reduction

of indicator by 1,42% up to 8,50 mm (S = 0,31 mm), and for 10 years old pupil– by 1,23% up to 6,44 mm (S = 2,9 cm).

In the process of the research we noticed that GGC frequency's amplitude of practically healthy children is reducing under influence of physical education and owing to regularities of organism's physical development. I.e. very often formation of vertical stability of junior pupils happens in natural way. Though such regularities were not found concerning weakly hearing children.

At the second stage indicator of vertical stability of 7 years old children with hearing problems reduced by 0,17% and was 10,82 mm (S = 0,37 mm). For 8 years old pupils GGC frequency's amplitude was 10,18 mm (S = 0,52 mm) with reduction of indicator by 0,08%, for 9 years old - 9,85 mm (S = 0,55 mm) with reduction by 0,13%, and for 10 years old pupils amplitude was 9,70 mm (S = 0,55 mm), and reduction of indicators was 0,47% (see fig.2).

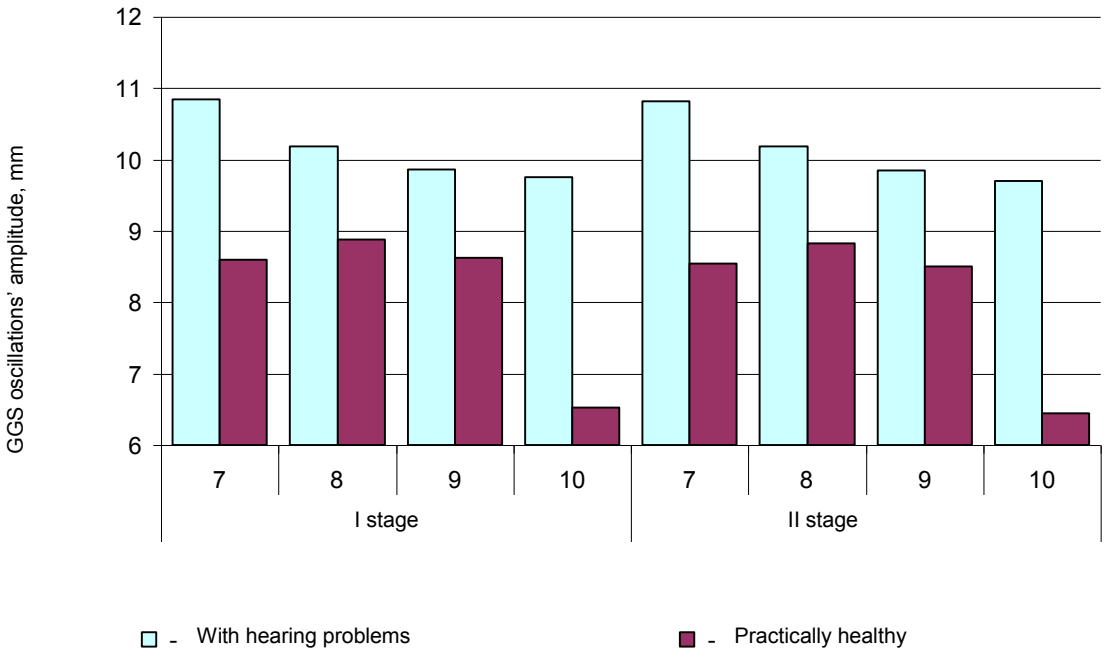

Fig.2 Dynamic of stability indicator of 7-10 years old pupils, n=110 (main position)

As we see in the diagram in every age group amplitude of oscillations of children with hearing problems is much higher than of their practically healthy peers, with it its improvement in the period from 1st to 2nd stages is not observed.

Comparative analysis of GGC oscillations' amplitude of junior pupils in main position at the first and the second stages of pedagogic experiment witnessed that this indicator of practically healthy pupils statistically significantly reduced in every age group ($p<0.01$), concerning weakly hearing pupils, such changes were not registered ($p>0.05$).

The research has shown that at the second stage of experiment practically healthy pupils of 7 years old had indicator of body stability in Romberg's test reduced up to 10,21 мmm (S = 0,23 mm), and mean reduction of child's GGC amplitude was 1,07%. Of other age group manifested the following dynamic of the studied indicator: 8 years old – indicator reduced by 0,94% and was 9,82 mm (S = 0,34 mm); 9 years old – by 1,16% and was 9,18 mm (S = 0,38 mm), 10 years old – by 0,92% and changed up to 8,59 mm (S = 0,34 c). However concerning children with hearing problems, dynamic of GGC frequency's amplitude is not so noticeable. At the end of academic year indicator of vertical stability of 7 years old children with hearing problems reduced by 0,29% and was 13,94 mm (S = 0,27 mm); the amplitude of GGC oscillations of 8 eras old children changed up to 13,41 mm (S = 0,54) with reduction of indicator by 0,08%, 9 years old– 14,84 mm (S = 0,51) with reduction by 0,16%, and 10 years old – up to 12,69 mm (S = 0,38 mm), with reduction of indicator by 0,19% (see fig. 3).

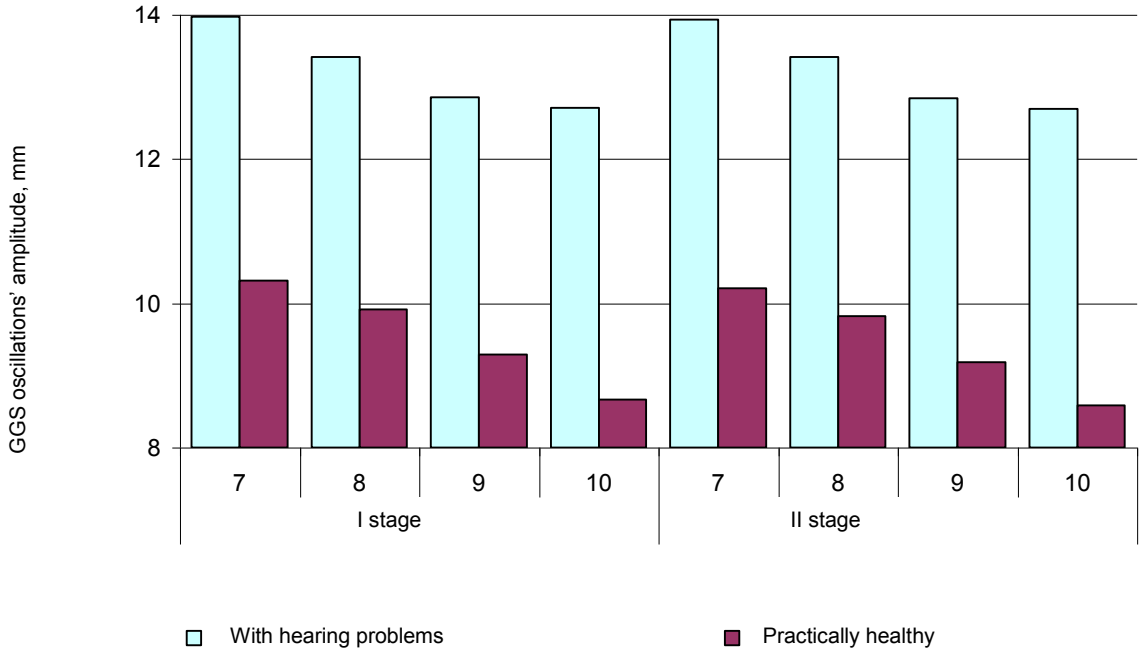

Fig.2 Dynamic of stability indicator of 7-10 years old pupils, n=110 (Romberg's test))

According to the researches' results, in contrast to practically healthy children, who manifested statistically significant reduction of amplitude of body GGC oscillations in Romberg's test ($p<0.01$), their weakly hearing peers showed no such changes ($p>0.05$).

The obtained results point that it is necessary to pay special attention to vertical stability of weakly hearing children's body in the process of their physical education.

Summary

Analysis of literature sources and documents witness that regulation of vertical position of human body belongs to most urgent biological and social-pedagogic problems of present time, because it is a substantial indicator of human health and motion function. The role of vertical stability is especially important, when we speak about children with hearing deprivation.

In the process of the research we obtained quantitative data, which characterize vertical stability of bodies of the examined children and found dynamics of GGC oscillations of weakly hearing children and practically healthy pupils depending on their age.

It has been proved that in contrast to practically healthy children, all age groups of whom showed statistically significant reduction of GGC oscillations' amplitude both in main position and in Romberg's test in the process of physical education and owing to natural development of organism ($p<0.01$), their weakly hearing peers did not manifest such changes ($p>0.05$).

It is purposeful to use the obtained data with evaluation of vertical stability of junior pupils, who have hearing problems, with planning of physical load for them; also these data can serve as the base for development of technologies, directed on optimizing of motion functions of children with such nosology.

The prospects of further researches imply theoretical grounding and experimental testing of technology of vertical stability's formation for pupils, who have hearing problems.

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