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The influence of visual impairment on separate indicators of a functional condition of touch systems of pupils of middle classes

Abstract. Purpose: to define and to compare separate indicators of a functional condition of touch systems of pupils of middle classes with visual impairment and their contemporaries with normal vision. **Materials and Methods:** pupils of middle classes with visual impairment and pupils of middle classes with normal vision took part in the research. During the research such methods were applied: analysis and synthesis of references, perimetry, determination of visual acuity by means of a special table, acumetry, esthesiometry, determination of resistance of a vestibular mechanism to rotary loadings, methods of mathematical statistics. **Results:** the analysis of separate indicators of a functional condition of visual, acoustical, vestibular and tactile analyzers of pupils with visual impairment and without them is carried out. **Conclusions:** it is established that the studied indicators of a functional condition of touch systems at pupils of middle classes with visual impairment are better, than at their contemporaries with normal vision.

Keywords: a functional condition of touch systems, pupils of middle classes, visual impairment.

Introduction. Sense organs of a person are of great importance for the activity. By means of them it is learned not only the environment and those changes which in it happen, but also some processes in a human body. Functions of the majority of analyzers are of rather great importance for classes by physical exercises. However the most significant among them is the visual analyzer by means of which a person receives about 90% of information on the environment. The performance of exercises is impossible without a normal functioning of motive, visual, acoustical, vestibular and tactile analyzers [3].

Visual impairments detain the formation of movement skills, conduct to considerable decrease in physical and informative activity, violations of the correct pose during walking and run. Works of many researchers devoted to a question of a functional condition of the visual analyzer [1; 2; 5] in which it is established that physical exercises positively influence a functional condition of the visual system promote the prevention of visual fatigue and prevent violations of a visual function.

The development of separate analyzers passes not at the same time. The first among them structures of the vestibular analyzer ripen, then – olfactory, flavoring and tactile, after all – acoustical and visual. The development of functions of analyzers in a bigger measure depends on education and study of a child. According to V. D. Glebovsky (1988), the structural and functional development of the majority of analyzers is the share of the middle school age. At this age functions of touch systems reach a high level, come nearer to adult's indicators, remaining thus rather labile [9].

In knowledge of the environment, spatial and social orientation, hearing is of great value for blind and visually impaired. The increase of acoustical sensitivity at violation of sight arises due to more active operation of an acoustic analyzer in conditions which change, and are a consequence of a strengthened training orientations and studies [6; 8].

Children with visual impairments often use sound information. There is a sound on the basis of which it is possible to make an idea of a subject in the majority of exercises at interaction with a support or a subject. Sounds are used in quality prearranged signals which change visual representations. The possibility of regulation of speed of movements, an assessment of duration, frequency and a rhythm of separate movements are connected with a function of an acoustic analyzer.

The vestibular analyzer at visually impaired receives an additional information from different statoreceptors. It informs a brain on a position of a body in a space of rather surrounding subjects and, if necessary, it increases static sensitivity. At children who can see badly, the vestibular mechanism develops under other equal conditions, it is better, than in those who can see normally.

Visual impairments in the course of a spatial orientation compensate the increase of different types of sensitivity; ability to differentiate subtly an external influence considerably. It should be noted that a spatial orientation is provided with a joint activity of visual and vestibular touch systems in normal conditions [7].

The tactile analyzer is a powerful mean of compensation of weak vision. Tactile receptors by the mechanism of conditional communications join in the analysis of movements and this functional communication is a physiologic basis of the complex kinetic analysis of movements [3].

However in available to us literature few works are found [4; 10], devoted to the research and the comparison of a functional condition of touch systems of pupils of middle classes as with visual impairment, and such who have no deviations in functioning visual to the analyzer, as became a reason for studying of this problem.

Purpose: to define and to compare separate indicators of a functional condition of touch systems at pupils of middle classes with visual impairment and their coevals who can see normally.

Material and methods of the research: the analysis and synthesis of references, perimetry, determination of visual acuity by means of a special table, acumetry, esthesiometry, determination of resistance of a vestibular mechanism to rotary loadings, methods of mathematical statistics.

Pupils of middle classes with visual impairment and pupils who can see normally took part in the research.

The following violations of visual perception were observed at pupils with visual impairment:

- a child saw a subject, could describe its separate signs, but couldn't call and characterize this subject;
- a narrowing of a volume of visual perception;
- a loss of ability to distinguish a color.

Results of the researches and their discussion. During the research it was established that visual acuity at pupils

who can see badly, fluctuated in the wide range (from 0,09 to 0,4 units.) also depended on a disease, but not on an age and a sex of a child.

The research of visual acuity of pupils without deviations in functioning of the visual analyzer testifies to normal visual acuity both right eye, and left eye at pupils of the 5-6th classes and boys of the 7-8th classes, girls of the 7-8th classes and pupils of the 9th classes have a visual acuity both eyes the little lowered.

Comparison of visual acuity of boys and girls found out that boys have the best indicators in general. The exception is made by results of pupils of the 5-6th classes where some best visual acuity is noted at girls, but reliability of differences between indicators is absent ($p>0,05$).

With the age visual acuity both right eye, and left eye decreases, but reliability of differences between indicators isn't observed ($p>0,05$).

Indicators of a peripheral field of vision decided on the help of a perimeter of Forster. Their analysis at visually impaired pupils testifies that the widest borders of an image are observed by the right eye at pupils of the 6-9 classes, and the left eye – at boys of the 6th and 9th classes and girls – the 8th and 9th classes. The volume of a peripheral field of vision at boys and girls is almost identical. At the same time indicators of a peripheral field of vision of the investigated are much lower than the standard.

Borders of a field of vision of pupils, who can see normally, are also slightly lower than norm. The most considerable indicators of a peripheral field of vision both right eye, and left eye are observed at boys of the 8th class and girls of the 9th class. Comparing indicators of borders of a field of vision in the age aspect, it should be noticed that external borders of fields of vision of the right and left eyes at boys and girls extends with the age, and dynamics of indicators of others borders has a wavy character.

Indicators of a functional condition of the vestibular analyzer were defined by the results of deviations in walking before and after rotations in the chair Barany. The analysis of results of pupils with visual impairment to rotations testifies that the best are at boys of the 8th class ($17,9\pm 9,8$ sm) and at girls of the 7th class ($16,8\pm 4,9$ sm). The definition of indicators of firmness the vestibular analyzer after rotary loadings showed that the least impressionable to them boys of the 9th class ($84,8\pm 11,3$ sm) and girls of the 7th class ($67,6\pm 27,8$ sm). The comparison of results of boys and girls testifies that girls more resistant to rotary loadings, than boys.

The analysis of indicators of pupils with normal sight showed that to rotations the best they are at children of the 7th class ($20,89\pm 0,85$ sm) and girls of the 9th class ($18,64\pm 1,08$ sm). After rotations the best indicators were observed both at boys, and at girls of the 6th class ($97,17\pm 3,08$ sm and $88,31\pm 4,14$ sm respectively). Comparing indicators of firmness of the vestibular analyzer of pupils of middle classes in a sexual aspect, it should be noticed that results of deviations in walking both before and after vestibular irritation at girls is better, than at boys.

At the same time the research showed that pupils of middle school age with visual impairment in comparison with coevals without the noted deviations show a big resistance to rotary loadings.

Indicators of the tactile sensitivity are decided on finger-tips by means of the esthesiometry method on use of compasses of Weber. The analysis of a spatial threshold of the tactile sensitivity testifies that the best is at boys of the 6th class ($1,3\pm 0,5$ mm) and at girls of the 7th class ($1,2\pm 0,6$ mm). It should be noted that in 5–6 classes finger-tips are more sensitive at boys, and in 7–9 classes – at girls. In our opinion, it is explained that girls of this age in everyday life carry out a large number of the exact movements connected with a small motility of hands.

The analysis of results of the tactile sensitivity of pupils who can see normally, testifies that indicators is slightly better than at girls, however these differences have no reliable character ($p>0,05$). The best indicators of a threshold of the tactile sensitivity are recorded at boys and girls of the 8th class.

The age dynamics of the tactile sensitivity has a wavy character both at boys, and at girls. The reliability of differences is absent ($p>0,05$).

The results of the research testify that the tactile sensitivity of finger-tips is much higher at pupils with visual impairment, than at their coevals which have no deviations in functioning of the visual analyzer.

Indicators of a functional state of the acoustical analyzer are decided by results of duration of audibility of a sound at the air conductivity on application to a tuning fork. The most considerable indicators both right ear, and left ear, were noted at boys 9 and girls of 7 classes ($22,9\pm 1,1$ s and $25,7\pm 2,0$ s; $22,9\pm 2,63$ s and $25,9\pm 1,2$ s respectively). It should be noted that sound audibility duration indicators at the air conductivity are higher at girls, than at boys.

The most considerable indicators of duration of audibility of a sound at pupils who can see normally, recorded by the right ear at pupils of the 8th class ($6,94\pm 0,12$ s and $6,85\pm 0,09$ s), the left ear at pupils of the 9th class ($6,95\pm 0,08$ s and $6,89\pm 0,07$ s).

The comparison of results of the air conductivity in a sexual aspect says that they are a little higher at boys, than at girls. The exception is made by indicators of pupils of the 5th classes where results of girls are higher.

Sound audibility duration by the right and left ear increases at boys and girls with the age. The reliability of differences is observed only in results of pupils of 7-8 classes ($p<0,001$).

Sound audibility duration in many respects depends on frequency to a tuning fork therefore standard indicators exist for each separate device. In our case results of pupils were compared to defects of sight with results of pupils who can see normally. The comparison of indicators testifies to longer audibility of a sound at the air conductivity at pupils with defects of sight.

Thus, the results of the research showed that deviations in functioning of the visual analyzer influence separate indicators of a functional condition of other touch systems and promote the improvement of their work. It is necessary to notice that the best indicators of a functional condition of touch systems at pupils, who can see normally, are observed at boys and girls of the same age. The best indicators of the studied functions are recorded in the 7th class At girls with visual impairment, at boys – in the 6, 8 and 9 classes.

Conclusions:

1. The analysis of references testifies that there is not enough attention is paid to a problem of a functional condition of touch systems of pupils of middle classes both with visual impairment, and without.

2. The analysis of separate indicators of a functional condition of touch systems of pupils with visual impairment and pupils who can see normally in a sexual aspect showed that they are better at girls, than at boys.

3. At pupils with visual impairment, the best indicators of resistance to rotary loadings were recorded at boys of the 9 class and girls of the 7 class, the tactile sensitivity of finger-tips – at boys 6 and girls of 7 classes and duration of audibility of a sound at the air conductivity – at boys 8 and girls of 7 classes.

4. At pupils who can see normally, the best indicators of resistance to rotary loadings were observed at boys and girls of the 6th class, the tactile sensitivity of finger-tips, – boys and girls of the 8th class and duration have sound audibility at the air conductivity – boys and girls have the 8–9 classes.

5. The results of the research testify that resistance of the vestibular analyzer to rotary loadings, the tactile sensitivity of finger-tips, sound audibility duration at the air conductivity at pupils with visual impairment is much better, than at their coevals who can see normally.

Prospects of the subsequent researches. It is planned to investigate the influence of change of a functional condition of vestibular, acoustical and tactile analyzers on functioning of the visual analyzer of pupils who can see bad.

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