

Study of Non-Verbal Activity in Children with Sensorone Hearing Loss

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Ishanxodjayeva Gulchexra

Tashkent Medical Academy, Tashkent

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Abstract

The problem of sensorineural hearing loss (NHL) in children is an urgent problem both in otolaryngology and in pediatric neurology, occupying a central position [1,9]. The formation of sensorineural hearing loss during the formation of mental activity leads to neuropsychiatric changes, which in turn lead to low cognitive activity, mental retardation, impaired functional state of the brain, which affects the physical health of the child. This in turn leads to deterioration in the quality of life of the child.

Any hearing impairment in childhood leads not only to a delay in the rate of speech development, but also to a disruption in the development of the psycho-emotional sphere of the child as a whole and is a significant medical and social problem, since it leads to possible limitations of life, in particular in the field of education, communication and inclusion of children. in a world of hearing people [2,4,8].

A number of studies have confirmed the effect of hearing loss on the ability to differentiate between non-speech and speech sounds, the analysis of the temporal characteristics of sound sequences, and the formation of a child's active vocabulary and communication skills. Children with almost identical indicators of auditory sensitivity, both with normal hearing and with its impairment, show significant differences in the results of perceptual analysis of speech signals. These differences are especially pronounced when the conditions of perception become more complex (background noise, complex acoustic scene), which confirms the proposition that their manifestations are due to the state of both peripheral and central hearing mechanisms, which are closely related to the cognitive abilities of the child. At the same time, the age period up to 6 years can be considered as the stage when corrective and compensatory measures aimed at developing analytical auditory perception are the most effective. Significant differences in the characteristics of the sound analysis of speech signals in preschool children with normal and impaired hearing are shown. [5].

The authors studied the psychophysiological development of children with NST and found that the origin of sensorineural hearing loss affects the formation of intra- and interhemispheric connections. Functional immaturity of the anterior central cortex in these children was confirmed by a decrease in the number of intra- and interhemispheric coherent connections in the EEG alpha-frequency range in the dynamics of psychological testing. In addition, interhemispheric asymmetry of evoked potentials was revealed: with acquired neurosensory hearing loss, the left temporal region became more important in the formation of auditory evoked potentials, with congenital - the right [6].

When conducting a neuropsychological study in children with NST, a number of characteristic features arise, which limits the range of methods used. So, during the examination, speech disorders (limitation of the dictionary, impaired pronunciation), certain features of the emotional-volitional sphere, underdevelopment of the intellect, violations of the formation of higher mental functions (imagination, thinking, attention, memory), low communication ability limit the use of most standard experimental techniques. Accordingly, non-verbal methods are effective in diagnosing the intellectual development and emotional state of children. [3,7].

The aim of our study was the neuropsychological study of the non-verbal component of mental activity in children with NST of varying degrees.

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1. Material and Research Methods.

We examined 55 children with NST of varying degrees, aged 5 to 10 years. The control group consisted of 30 children of the same age with intact hearing. Of the neuropsychological tests, we used the Wechsler test adapted for children. From the Wechsler test, we applied a non-verbal group of subtests. The nonverbal part of the test consists of 6 subtests. When analyzing the results, most attention was paid to subtest scores, and not to the child's IQ level.

2. Results and Discussion.

Neuropsychological symptoms occur not only with gross organic focal lesions of the brain, but also with

more subtle functional changes in the state of the brain tissue, and reflect the pathological state of the brain structures more subtly than technical diagnostic tools. The most reliable method for determining cognitive impairment in both cases are neuropsychological tests.

During the clinical and psychological examination of children with NST, a number of disorders of the emotional and behavioral sphere were revealed - rapid mental and even physical fatigue, nervousness, refusal to contact a doctor, decreased concentration of attention and poverty of other psychomotor reactions. In the studied groups, in the course of performing non-verbal tasks, erroneous performances on the Missing Details test, low quality in Folding Shapes, Koos Cubes and Coding were very often observed.

Table 1 Indicators of non-verbal subtests of the Wechsler method in healthy children and in children with sensorineural hearing loss (M±m)

№	Wexler subtests	Control group (n=30)	(n=30) Main group (n=55)
1	"Missing Details"	12,78±0,60	7,25±0,33
2	"Sequential Pictures"	11,47±0,58	6,79±0,43
3	"Cubes of Koos"	11,02±0,38	3,61±0,68
4	"Folding Shapes"	10,18±0,46	6,44±0,65
5	"Coding"	15,45±0,72	6,01±0,52
6	"Labyrinths"	12,47±0,53	7,85±0,67

Non-verbal intelligence is based on visualization and reflects the level of visual memory and attention, constructive thinking, visual-effective thinking, which is associated with the ability to add volumetric schemes and the ability to operate with spatial images.

Another subtest widely used to determine the intellectual level and development of children " Koos Cubes" confirmed our assumptions about varying degrees of impairment of mnestic-intellectual processes in children with NST. In the psychophysiological structure of the "Koos Cubes" subtest, the leading role is played by arbitrary organization and regulation of activity, a schematic

representation of space, operations of spatial analysis and constructive thinking (it is necessary to mentally divide the sample into parts corresponding to the elements of the structure, i.e., outline in advance the principle of constructing the structure). In healthy children, the best results were obtained when testing with Koos cubes: their average total score was 11,02±0,38, while in children with NST this indicator was 3 times lower, 3,61±0,68. Only 39% of children with NST performed these tests accurately. The rest of the children worked with Koos blocks with errors, which indicates a partial disruption in the formation of the program and the choice of means for solving the problem, according to A.R. Luria, about the violation

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of the stage of developing a general strategy of thinking (2002). Complicating the conditions for completing tasks with Koos cubes, the number of correctly completed tasks sharply decreased to 35% in children with NST.

At the same time, 35% of children with NST successfully coped with the "Coding" subtest, while 65% of children had difficulties in completing it. Successful completion of this subtest is ensured by sufficient maturity of voluntary regulation of activity, complexly coordinated hand movements, the ability to retain a sequence of symbols in memory, i.e., short-term visual working memory and hand-eye coordination.

When working with the subtests "Coding" and "Labyrinths", children with NST experienced more difficulties than children from the control group, since it was necessary to solve the problem sequentially, to keep their actions within the limits set by the verbal instruction. This requires the skills of verbal formulation of the strategy of their actions, anticipation of their consequences, a high level of development of the regulatory function of speech. When performing the Sequential Pictures subtest, children with NST organized parts of the picture into a single whole worse than children from the control group.

The success of the Missing Details subtest depends on the volume of perceptual attention included in the visual recognition of familiar objects, spatial perception and the ability to differentiate the essential and the secondary in visual images. This subtest in hearing-impaired children was $7,25 \pm 0,33$, while in the control group it was $12,78 \pm 0,60$.

Thus, the conducted neuropsychological study showed that in children with NST there is a slowdown in the development of the nominative function of speech, which is associated with a defect in auditory perception. In children with intact hearing, higher rates of non-verbal tests were obtained.

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