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Formation Of Sound Pronunciation Through Development Of Phonematic Hearing In Children With Cochlear Implants

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Abstract: This article discusses the importance and effectiveness of speech rehabilitation in children with hearing impairments after cochlear implantation. It also analyzes the role of cochlear implants in restoring hearing ability, the significance of phonemic hearing in speech development, pronunciation issues, and methods for their correction. Based on scientific literature and research findings, practical recommendations and modern methods used when working with children who have cochlear implants are presented. Furthermore, the article focuses on the impact of cochlear implants on hearing and speech, the developmental features of phonemic hearing, pronunciation difficulties and their solutions, as well as the psychological and pedagogical support provided to the child and their family.

Keywords: Cochlear implant, stimulation, child with hearing impairment, phonemic perception, sound pronunciation, speech development, social integration, rehabilitation, speech therapy sessions, social development, cognitive development, modern technology, interactive games.

Introduction: Hearing loss has a significant impact on language and speech development in children. In recent decades, cochlear implant technology has become an effective way to restore hearing in children with severe hearing loss or deafness. A cochlear implant converts sounds into electrical signals and stimulates the auditory nerve in the inner ear, allowing children to perceive sounds. However, implant placement alone does not ensure full speech development. Phonemic hearing – the ability to distinguish sounds and perceive them as speech units – is essential for accurate pronunciation and understanding of speech. Underdeveloped phonemic hearing leads to defects in sound pronunciation, limited vocabulary, and reduced communicative abilities. The development of phonemic hearing in children with cochlear implants requires special speech therapy approaches, because their auditory experience is different from that of children with natural hearing. This causes children with hearing impairments to lag behind healthy children in terms of speech, and also affects them psychologically and pedagogically. Cochlear implantation is one of the most effective methods today that allows deaf (deaf, hard of hearing) children to enter the world of hearing people and perceive the world through sounds and sounds. This tool, which provides unprecedented assistance to children in hearing voices, music, speech and other sounds and in being able to freely manage themselves in society and social life, is a discovery of great importance in the development of science and technology. The National Personnel Training Program, prepared in accordance with the provisions of the Law of the Republic of Uzbekistan "On Education", is based on the analysis of national experience and achievements in the education system, world-wide, and is aimed at forming a new generation of personnel who have a high general and professional culture, creative and social activity, the ability to independently set goals in socio-political life, and are able to put forward and solve future tasks. Not only children with

hearing impairments, but also children with other disabilities are no exception to this view. A cochlear implant is a complex medical-technological device that allows people with severe hearing loss to perceive sounds. It consists of an external part (microphone, sound processor and transmitter) and an internal part (receiver and electrode system), which converts sounds into electrical impulses and transmits them to the auditory nerve. Cochlear implant installation in children is usually carried out between the ages of 1 and 3, as this period is considered a critical period for speech and language development. The main advantage of a cochlear implant is that it is much more effective than traditional hearing aids, allowing children to distinguish speech sounds. Studies show that speech development in children implanted early improves significantly. For example, children implanted at 12 months of age demonstrate speech skills close to those of their peers with normal hearing by the age of 5. However, the success of the implant depends on a number of factors:

- Age of implantation;

- Quality of rehabilitation process;

- Participation of parents, deaf teachers, audiologists and speech therapists.

Along with the benefits, cochlear implants also have limitations. For example, the implant cannot transmit sounds as accurately as natural hearing, which affects the development of phonemic hearing. Therefore, long-term rehabilitation programs are necessary after implantation. Phonemic hearing is of great importance in improving the pronunciation of sounds and forming speech communication in children with cochlear implants.

Although a cochlear implant allows for the perception of sounds, the ability to distinguish phonemes is initially limited. For example, children may have difficulty distinguishing consonant sounds (for example, /p/ and /b/) or the pitch of vowels. Phonemic hearing is the ability to distinguish speech sounds (phonemes) and perceive them as units of meaning. This ability serves as the basis for the correct pronunciation of speech in children, the expansion of vocabulary, and the acquisition of grammatical structures. Studies show that the development of phonemic hearing in children with cochlear implants depends on the age of implantation and the intensity of rehabilitation. In children with early implantation, phonemic hearing approaches that of children with natural hearing, but this process requires long-term training. The development of phonemic hearing usually occurs actively between the ages of 3-5, but this process may slow down in children with cochlear implants. Because the age at which a cochlear implant is inserted into children with hearing loss is also of great importance in the development of phonemic hearing. If a cochlear implant is inserted into a child after the age of 3, the formation of phonemic hearing is delayed to the same extent.

The importance of phonemic hearing is reflected not only in the accuracy of speech, but also in the social and cognitive development of the child. Children who cannot correctly distinguish phonemes may have difficulties in reading and writing, which affects their success in reading and learning. The formation of sound pronunciation is also important after the development of phonemic hearing in children with cochlear implants.

Sound pronunciation is one of the most important components of speech, in which the ability to correctly articulate phonemes is of great importance. Problems with sound pronunciation in children with cochlear implants are often associated with insufficiently developed phonemic hearing. For example, children may have difficulty pronouncing sounds such as s, sh, and r. Studies show that the quality of sound pronunciation in children with cochlear implants depends on the age of implantation, the duration of rehabilitation, and activities aimed at developing phonemic hearing. Early implanted children have higher pronunciation accuracy, but this process requires long-term speech therapy. For example, Geers et al. found in their study that early implanted children had pronunciation accuracy approaching 80% by the age of 5. Defects in sound pronunciation affect the child's social integration and self-confidence. Therefore, the development of phonemic hearing is considered the main way to improve sound pronunciation.

Special speech therapy methods are used to develop phonemic hearing. The most effective methods and their scientific basis are presented below:

Sound differentiation exercises: Play-based exercises are used to teach children to differentiate between different phonemes. For example, questions such as “Which word does this sound belong to?” or “Are the two sounds the same?” draw the child’s attention to the difference between sounds. This method has been proven effective in developing phonemic hearing in research (Rvachew & Grawburg, 2006).

Audiovisual stimulation: By associating sounds with visual images, such as letters or pictures, a child’s perception and memory of sounds can be strengthened. For example, associating the sound b with the word “child” and a picture helps the child remember the sound.

Speech rhythm and intonation exercises: Teaching

children the rhythmic structure and intonation of words improves sound pronunciation. By reading poems, singing songs or telling stories, a natural flow of speech is formed. This method helps the child to master speech naturally.

Involving parents: Exercises carried out at home together with parents play an important role in the development of phonemic hearing. For example, parents can help the child repeat words or perform exercises on differentiating sounds for 10-15 minutes every day.

Technological support: Modern computer programs and mobile applications are used to develop phonemic hearing. For example, interactive games that help distinguish sounds increase the child's interest and improve the effectiveness of the lessons. Modern methods include "interactive floor", "Logomer". Logomer is a software didactic complex for speech therapists. The complex presents the main topics of speech therapy correction exercises. The purpose of the program is to form the rules of correct pronunciation of sounds and words. When these methods are used regularly, sound pronunciation in children improves significantly. Speech therapists and rehabilitation specialists should use an individual approach depending on the child's age, hearing experience, and cognitive abilities. Recent studies on children with cochlear implants confirm the long-term benefits of cochlear implants in developing phonemic hearing in children. For example, a study by Indian scientists et al. found that after 5 years of rehabilitation, sound pronunciation in children with early implants approached that of children with normal hearing. A study by American scientist A.E. Geers et al. showed that exercises aimed at developing phonemic hearing increase the child's speech accuracy by 30-40%. The development of phonemic hearing depends on individual factors, such as the child's cognitive abilities, family environment, and the quality of the rehabilitation program. For example, active parental participation accelerates the improvement of sound pronunciation by 20%. However, the development of phonemic hearing in children with cochlear implants is slower than in children with natural hearing, which requires long-term support. The following are practical recommendations: Starting speech therapy immediately after implantation. Using play and interactive methods to develop phonemic hearing. Involving parents in the education and rehabilitation process. Regular monitoring of the child's speech development and drawing up an individual plan. Using modern technologies (for example, speech development applications).

The effectiveness of these technologies is achieved through an individual approach to children, an interesting and interactive organization of training, as well as cooperation with parents and tasks for them to perform at home. In conclusion, the development of phonemic hearing in children with cochlear implants is important in the formation of sound pronunciation. This process not only increases the accuracy of speech, but also contributes to the child's social integration, academic success and self-confidence. Scientific literature and research results show that early implantation and regular rehabilitation programs significantly improve sound pronunciation. Development in children will be even better if future research is focused on the following areas. Testing new generations of cochlear implant technology. Studying the neurophysiological foundations of the development of phonemic hearing. Optimization of individual rehabilitation programs. Development of methods for developing phonemic hearing using artificial intelligence and virtual reality. These studies will serve to make the speech development of children with cochlear implants more effective.

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