

Health Preserving Technologies in the Work with Children after Cochlear Implant Surgery in the Conditions of Inclusive Education

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Abstract

The article considers issues connected with the necessity to arrange special training conditions for children after cochlear implant surgery within inclusive education system. Special attention is paid to the opportunity of using health preserving technologies, in particular to the method of biofeedback in the process of forming oral speech skills of this category of children.

Keywords: children with hearing impairments, дети с нарушениями слуха, inclusive education, cochlear implant surgery, health preserving technologies, biofeedback method, diaphragm relaxed breathing.

INTRODUCTION

In Russian the year of 2016 was marked by practical transition of educational system from discussing the problem to the real implementation of inclusive education. Such a transition was based on the changes included into the Federal State Educational Standards of Elementary and Secondary General Education, as well as on the ratification of a number of other documents such as the Federal Standard of Pre-School Education (2013) and the Federal State Standard for Children with Disabilities in (2016). The necessity for social, cultural and educational inclusion of children with special educational needs was noted in the works of many Russian authors (M.A. Alekseev, S.V. Alyokhin, L.V. Godovnikov, E.N. Kutepov, N.N. Malofeev, N.M. Nazarov, M.M. Semago, N.Ya. Semago and others). The realization of goals, objectives and priority ideas of inclusive education determines the necessity for creating adequate conditions for children with disabilities in every educational establishment. Children with cochlear implants constitute a specific category since their individual needs require special psychological-pedagogical support.

The aim of the article: to study opportunities of using modern health preserving technologies, in particular biofeedback method in the work with children after cochlear implant surgery in the conditions of inclusive education.

Cochlear implant surgery as a means of rehabilitation of deaf children.

Cochlear implant surgery is a complex surgical procedure that involves placing an array of electrodes into the cochlea, which provide a sense of sound by means of electric stimulation the remaining hearing nerve. At the modern stage of science development cochlear implant surgery is one of the most efficient methods of rehabilitation due to the contemporary technology advances in the field of medicine (T.G. Gvelesiani, T.A. Tavartkiladze, J.S. Moog, J.K. Niparko, A.E. Geers and others).

According to I.V. Koroleva and others [1], children with hearing impairment and hearing loss have the

opportunity to fully communicate with others after cochlear implant surgery. However, in the post-surgery period the long-term rehabilitation stage is required. In this period procedures for adjusting a sound processing device and adaptation to a hearing aid play a significant role for a child. Surrounding adults must be aware of the importance of constant wearing a hearing aid. Only after that it is possible to start correctional work.

Leading Russian teachers of the deaf (S.A. Zykov, R.M. Boskis, L.P. Noskova, E.G. Rechitskaya and others) noted that the earlier special medical and educational measures to reduce consequences of hearing impairment were undertaken, the more successful child's development is. The creation of family's hearing environment, a hearing aid use at early age or cochlear implant surgery, as well as arranging special work on improving hearing perception and speech forming, determine successful child's development. Research proved that a group of children with hearing impairment can be extremely diverse both by the level of mental development and by the level of speech development which is conditioned by a combination of the following factors: extent of hearing impairment; time of hearing impairment emergence; pedagogical conditions, in which a child occurred after hearing impairment emergence; child's individual features and needs. The given peculiarities can impede the process of teaching and up-bringing a child with cochlear implant to a certain extent, thus, preventing the formation of relevant universal educational actions [1].

Pedagogical technologies in teaching children with cochlear implants.

E.V. Alyoshina [2] notes that the formation of universal educational activities in accordance with the Federal State Educational Standard contributes to personality development of children by means of cognitive development and intensifying intellectual activities. Such activities include the formation of moral norms, the ability to compare actions with the customary norms; while doing so it is very important to have the ability to orientate oneself in society, to accept social roles and to find connection between educational activity and its goals. The

result of the formation of regulatory actions of schoolchildren is manifested in the ability to plan and control one's own actions and to forecast the result of activities. In the process of the formation of universal educational actions the level of motivational preparedness for mastering subject knowledge and skills increases including the expansion of cognitive and communicative functions of children with disabilities. In this regard, the teachers of inclusive educational establishments face the problem of searching adequate pedagogical technologies that provide formation of universal educational actions in children with cochlear implants.

Health preserving technologies were proved to be effective in teaching children with disabilities. Their practical implementation provides graduates of educational establishments with the sufficient level of health by means of forming competencies necessary for efficient socialization. The ideas on creation of health preserving conditions were included into the most important government documents determining the priority of the education system development. "The Concept of Modernization of Russian Education System until 2020" envisages conditions for improving the quality of general education and for preserving and strengthening the health of schoolchildren in educational establishments [3]. Therefore, solving the problem of developing and implementing effective measures for preserving health and preventing diseases in the classroom and during extracurricular activities is a priority for educational establishments of all levels.

N.K. Smirnov [4] defined some pedagogical technologies as health preserving since they are aimed at teaching schoolchildren culture of health, developing personality traits that contribute to health preservation and strengthening, shaping the notion of health as a value and motivating to maintain a healthy lifestyle. It is worth noting that health preserving educational technologies can be considered as a systematic approach to teaching and upbringing based on teacher's desire not to damage the health of children.

The experience of educational support of children with auditory deprivation that are incorporated into comprehensive school system shows that they have difficulties in mastering the programme material within the academic process. Teachers of general education schools in which children are taught after cochlear implant surgery must be aware of their psychophysiological features of development [5].

Such children experience certain difficulties in interacting with the surrounding world. The speed of the development of such mental processes as attention, memory and thinking is not the same for different individuals. Schoolchildren with cochlear implants may have a slow rate of processing information, unique perception of the phenomena of the surrounding reality and delayed speech development. When forming oral speech skills of such pupils, it is important to pay attention to the development of language ability, the need for communication, the readiness to imitate the speaker's speech and the use of ready-made speech tools. This

direction of work is indispensable for the formation of all types of speech activity: speaking, reading, writing, listening, auditory and auditory-visual perception on a purely practical basis with the use of stimulating speech material in accordance with age peculiarities. According to the leading experts of Saint-Petersburg Research Institute of Ear, Throat, Nose and Speech (the Ministry of Health), the goal of habilitation of a child after cochlear implant surgery is to develop the ability to understand, speak and communicate by means of speech skills at a level close to the level of a child with normal hearing. The work on the habilitation of a child with a cochlear implant in the process of inclusive education should be one of the main links in the educational process [6].

The existing experience of Russian teacher's work with children after cochlear implant surgery shows that the following conditions are necessary to arrange adequate habilitation measures:

- favorable speech environment in an educational organization and at home;
- systematic training classes with specialists (speech therapist, defectologist, psychologist);
- the use of modern pedagogical technologies;
- the increase of the literacy of parents in developing hearing and speech skills of a child with cochlear implant.

The use of biofeedback technology in the rehabilitation process.

We believe that the use of biofeedback for educational needs as a means of health preservation technology enables to significantly accelerate the process of rehabilitation of children after cochlear implant surgery.

E. Jacobson, who at the early XX century created progressive muscle relaxation technique, is considered the first to use electromyographic biofeedback. In Russia the active study of the given method was started in the 1970's. In 1996 the Russian Association of Biofeedback was established that greatly contributes to improving the level of educational technologies of compensatory and health preserving impact.

L.A. Vanina [7] notes that *diaphragm relaxed breathing* is the basis of biofeedback method. This type of breathing is an inherent human ability; it is often lost due to negative ecology influence on the human organism, stress situations, long-term somatic diseases, etc. A specific feature of the diaphragmatic type of breathing is that the lungs receive a larger volume of air, at the same time a long smooth exhalation brings maximum benefit in the activity of the speech and motor organs. Such type of breathing is the most favourable for the functioning of the respiratory system, the coordinated activity of the articulation organs and the comfortable state of the whole organism.

The use of biofeedback method (functional biocontrol) in the work on forming diaphragm relaxed breathing as a basis for speech act functioning is relevant for correctional developmental support of pupils with auditory deprivation. This method can be used not only for correcting psycho-emotional condition and speech disorders of children but also for health improving effect. The application of biofeedback method in the process of teaching contributes to

forming the correct speech breathing that makes the basis of speaking itself.

The implementation of biofeedback method in the work with children enables to solve two main objectives.

First of all, it allows abandoning pathologic breathing, speech and behaviour stereotype.

Second, it enables to form a new stereotype of breathing, speech and behavior corresponding to individual norm or maximally close to it [2].

Normal speech is necessarily characterized by long but economical inhaling. This condition is often hard for deaf and hearing impaired children to follow since they have difficulties in controlling respiratory muscles. The work with scenarios of computer-based speech therapy programmes basing on biofeedback method contributes to solving the task of speech formation of children with cochlear implants.

Speech correction within biofeedback method is carried out in two stages:

- 1) developing diaphragm relaxed breathing type in children;
- 2) in the phase of even exhaling a child is taught new skills of phonation, articulation and speech basing on the already formed breathing stereotype.

As practices showed, the formation of long economical and even exhaling can be a certain difficulty for children with hearing impairment due to their undeveloped skills of controlling the work of respiratory muscles. At the same time rehabilitation classes in forming and correcting articulatory habits of children with cochlear implants with the use of biofeedback contribute to developing positive dynamics of speech and improve general functional condition of a child. Thus, a pupil develops skills of implementing diaphragm relaxed breathing to correct and develop speech, behavior and functional state in general, his speech activity increases and he starts using the skills, obtained in the process of biofeedback training, in everyday life.

The analytic-synthetic method of teaching children with cochlear implants pronunciation involves the unity of work on the whole unit – a phrase and on the word and its elements – syllables and sounds. In this case the most important tasks are aimed at the following:

- ♣ normalization of speech breathing and speech fusion associated with it,
- ♣ formation of skills to change voice pitch and power,
- ♣ correct pronunciation of sounds and their clusters separately, in syllables, word combinations, words and phrases,
- ♣ reproduction of speech material at a given tempo,
- ♣ perception, distinguishing and reproduction of various rhythms,
- ♣ ability to express one's emotions by different intonation means [8].

The application of biofeedback method contributes to solving these tasks, as well as to coordinating mouth and nose breathing with the active diaphragm involvement. These are soundless breathing exercises at first. There are a lot of variants (tables, exercises) to coordinate nasal

inhaling and exhaling. All of them are aimed at teaching a child to control his own inhaling and exhaling. All in all, they result into a natural breathing process that implies nose inhaling and mouth exhaling when speaking.

To control diaphragm movement is easier in a relaxed position. Training skills of diaphragmatic breathing continues up to the moment when a pupil learns to correctly use respiratory organs. Every child shows different improvement rate so this process must be controlled individually.

Exercises on the development of diaphragmatic breathing form the skill of phonatory breathing. Gradually soundless breathing exercises turn into the phonatory ones, i.e. exhaling children learn to pronounce certain sounds. For example, inhale through your nose and then pronounce calmly: *v-v-v-v* or *A-A-A-A*, releasing air through your mouth. Eventually phonatory exercises become more complicated. Within a single exhalation it is required to pronounce sound *s-s-s-s* with or without pauses. Another variant is to pronounce a combination of consonants within a single exhalation: *fs-*, *ks-*, *shs-* and others.

With the improving of the skill of phonatory breathing correct speech breathing is formed which in turn ensures normal voice formation. The work on the power and pitch of the voice begins with the pronouncing vowels and consonants within a long exhalation. At the same time there is a practice of pronouncing the elements of words which is the prerequisite for pure pronunciation of sounds. Speech material is gradually included into the exercises to improve speech breathing skills. Sound material must be pronounced within a long exhalation; it includes a number of syllables, word combinations, words pronounced with a change in rhythm and tempo, phrases and sentences.

The transition to more complex speech and psycho-emotional loads is carried out when a pupil trains in the mode of working with prose and verse text, for example, when using the scenario "Speech". Children under the control of external feedback signals and physiological indicators learn to read texts, retell them and to memorize poems observing respiratory pauses.

T.V. Akhutina [9] notes that during the work with biofeedback method it is necessary to take into account individual flexibility of central nervous system of every child. It is accounted for by the fact that not only positive motivation but also general functional organism conditions influence work capacity. Such conditions include age, characterological, nosological peculiarities, as well as vegetative, neuroendocrine and psychosomatic disorders. Therefore, the period of formation of a new dynamic stereotype, which is diaphragm relaxed breathing and adaptive self-regulation, with the use of biofeedback method is strictly individual for every child with hearing impairment.

To form speech breathing skills according to biofeedback method a child is offered to do the following.

1. Make a comfortable, deep enough inhale through the nose and an even, long exhale through the slightly opened lips (the correctness of this exercise on inhalation and exhalation is estimated by the

movement of the anterior wall of the abdomen and lower ribs).

2. Breathe comfortably, without effort. At this time various pictures appear on the screen. For example, a transparent column that is uniformly colored if the child correctly follows the instructions.

The rest time lasts 2-3 minutes, a pupil during first 4-6 classes breathes arbitrarily watching slides or cartoons and listening to music.

Subsequently, if the breathing exercises during working periods do not cause difficulties, the child is offered to continue breathing during the rest period while watching the slides, as well as during periods of work.

The experience of using biofeedback method in the work with children, who have cochlear implants, allows singling out the following opportunities of its application.

1. The opportunity of constant and unbiased control of physiological indicators.
2. The opportunity of targeted correction of speech skills and organism functional condition.
3. Providing a high level of motivation during the work process.
4. Active child's participation in the process of self-regulation.
5. Reducing time of the formation of skills due to objectivity, visibility and maximum inclusion of various analyzers of central nervous system.
6. Maintaining optimal homeostasis and balance of two branches in the autonomic nervous system of the body (sympathetic and parasympathetic).
7. The use of the optimal physiological (energy) state of the organism in the process of vital activity and speech.
8. Optimization of the rehabilitation process [1].

Noting the importance of the results of the computer biofeedback simulator that was used during practical training, it can be stated that it promotes synchronization of the work of the cardiovascular and respiratory systems. The registration of the heart rate is made using a special sensor, which is fixated on the chest of a child. In the period of work auditory and visual (on the screen) feedback signals are presented, with the help of which one can learn to properly control breathing process [10].

N.V. Bordovskaya [11] believes that the application of biofeedback method in the academic process contributes to forming various universal educational actions in children with cochlear implants. Person-oriented actions include the formation of skills to use speech patterns taking into account communicative situation, increase in the level of motivational preparedness for mastering oral speech, improvement of skills of productive cooperation with adults and peers and socio-cultural adaptation. Meta-subject actions comprise the formation of preparedness to plan, control and assess one's own activities, preparedness for logical acts such as comparison, analysis, synthesis and generalization. Subject actions involve the development of opportunities of auditory and auditory-visual speech perception and skills to use them in communication, hearing perception of speech material with the help of

cochlear implant to enable formation and correction of speech pronunciation aspect.

CONCLUSION

In modern society oral-aural adaptation and socialization of a child with cochlear implant in surrounding environment are closely related to child's health condition, up-to-date diagnostics and correction of his psycho-emotional and psycho-somatic state. In the process of training with biofeedback method on the basis of using relaxation techniques, diaphragmatic breathing, signals of external feedback and increasingly complicated speech loads a child with cochlear implant develops a correct healthy habit (dynamic stereotype) of respiration, phonation and speech conduct; thus, developing these skills contributes to successfulness of inclusion into educational process [1].

Therefore, the application of modern health preserving technologies, in particular the formation of diaphragm relaxed breathing with the use of biofeedback method and on its basis correct phonation in the work with children after cochlear implant surgery in the conditions of inclusive education enables to significantly reduce rehabilitation period and to form children's universal educational actions that make the foundation for speech communication and are aimed at social adaptation in the world of people with normal hearing.

CONFLICT OF INTEREST

The authors confirm that the data do not contain any conflict of interest.

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