

COCHLEAR IMPLANT AS AN IMPORTANT FACTOR OF THE DEVELOPMENT OF PROSODIC FEATURES IN PRELINGUALLY DEAF CHILDREN UNDER 2 YEARS OF AGE

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Abstract

Background: Profound prelingual hearing impairment has a substantial influence on child's development, particularly on its linguistic communication ability. In language communication the prosodic features play a basic role because they are responsible for proper speech reception. The prosodic aspect of speech is disturbed in people with hearing disability and is involved with communication deficit. Cochlear implantation has become a method that reinforces appropriate language development in children with prelingual deafness. The majority of young cochlear users can develop substantial language skills. However, whether these children develop as well the communication skills, such as the prosodic aspects of the language, remains an open question.

Material and methods: A group of 28 prelingually hearing-disabled children, all at about one year of age, either implanted or equipped with hearing aids, was investigated. The research was based on the comparison between recorded language statements, particularly its prosodic aspects, in both children's groups. The collected data were evaluated by the listening method with the aid of the prosodic scale 0–5.

Results: The development of the prosodic features in children using implants is significantly better than in these using hearing aids.

Conclusions: Preliminary results demonstrate an important role of the cochlear implant in the development of the prosodic features. It is very likely that the use of cochlear implants will equalize the language communication of hearing impaired children to that of hearing children.

Key words: prelingual deafness • language communication • prosodic features • cochlear implant

Background

One of the most important needs of a human being is the need to communicate with other individuals. Language plays a leading role in communication. This idea was formulated by H. G. Gadamer who underlined a great role of language for human communication [1]: *“The language is the real centre of human existence provided that it is considered within its proper domain, namely coexistence, communication of human beings.”*

The language system has a strict organization. It consists of the phonological, morphological and syntactic levels connected with following categories: sound, grammar, structure of sentence and related issues.

This study is focused on the phonological level. That level contains segmental and suprasegmental (prosodic) layers. The segmental layer describes the phonemes. The prosodic layer consists of musical factors, basically the rhythm, the accent and the melody [2]. The prosodic features play the fundamental role in language communication because they disclose the emotions and intentions of a speaker and

are, therefore, responsible for proper perception of the spoken language. There are some skills needed for proper language acquisition. These competences are connected with the structure of human language (linguistic competence) and also with language-communication tools applied in different situations (communication competence). The communication competence requires some rules to be applied: the social, situation, and pragmatic rules. The pragmatic rule, which is the most important of them in the communication aspect, is strictly related to the prosodic layer of a language.

A language statement is communicative if it fulfills the conditions of illocution and perlocution, i.e., the meaning and the “effect” of a linguistic fact [3] and, additionally, possesses validity claims [4], namely truth, sincerity and rightness, which are strictly connected with the prosodic layer of the language. Therefore, in a language statement, it is not only important **what** is being said (the segmental layer), but also **how** it is said (the prosodic layer).

The natural language is acquired through listening. For this reason, children with prelingual deafness have limited

possibility to develop and utilize the phonic substance of the language, particularly of its prosodic layer. Apart from this, there are several consequences of hearing disability: the “communication deficit” [5], speech disorders, particularly connected with suprasegmental features like inharmonious changes of the voice intensity, abnormal melody, disorders of the rhythm, rate and accent and, as a consequence, emotional difficulties and reduced social skills. Presently, the cochlear implantation has become a method that reinforces appropriate language development, particularly in children with the prelingual deafness. As a result, the majority of the young cochlear implant users can develop substantial language skills. According to the literature, the benefits of using implants are following: proper speech development at all levels, improvement of hearing perception, positive changes in personal and social behavior. However, these reports do not consider the prosodic aspect of the language being acquired and focus on the evaluation of hearing and language functions. For this reason, the research on the development of prosodic features can present an important premise of estimating the effects of using cochlear implants on the language communication in deaf children.

Material and methods

To estimate the influence cochlear implantation on the development of suprasegmental (and also segmental) speech features. I have carried out a preliminary study on two groups of children, both comprised of patients of the Medical University of Gdansk or the Specialistic Diagnostic and Rehabilitation Clinic of Polish Deaf Association PZG in Gdansk, qualified based on the hearing screening results. Both groups included only the prelingually deaf children, all about 1 year old. The first group included 15 children

with cochlear implants, while the other contained of 13 children using the hearing aids. The language statements produced by children from both groups were recorded.

Next, the recorded language statements were evaluated by the listening method with the aid of the prosodic scale 0-5, in both groups of children.

1. For the implanted children **before operation** (about 12 month of life) and about 6 months after operation (about 18 month of life).
2. For children with hearing aids at about 12th month of life and at about 18th month of life.

For each group (implanted children and children with hearing aids), two analyzes were carried out:

1. All children (within given group) together.
2. Children from non-deaf families which were accepted by their families and other children (from deaf families or not accepted by their families) separately.

Results

The results of measurements of the suprasegmental features in two groups of children before and after the test period are presented in Figure 1. It can be seen that there is a dramatic increase of suprasegmental features of the speech produced by implanted children, irrespective of the fact whether they are accepted or not accepted by their families. On the contrary, there is no notable suprasegmental feature development in the speech produced by children using the hearing aids.

I also found that both implantation and using hearing aids result in a remarkable development of segmental features

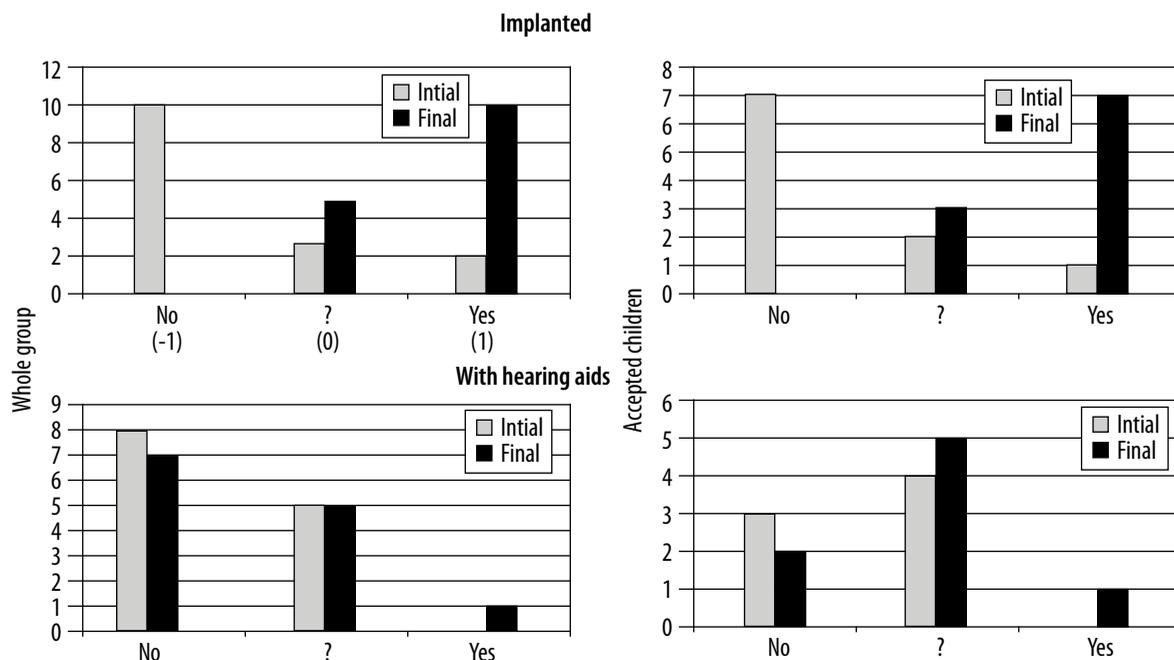


Figure 1. Comparison of the production of suprasegmental features in children before (grey bars) and after (black bars) implantation and control group of children with hearing aids in the same time period. The symbols on abscissae indicate lack of features (No or -1), presence of features (Yes or 1) and unclusive result (?), respectively. The heights of the bars are the numbers of children corresponding to the indicators on the abscissae.

(data not shown). However, implantation results in the more noticeable development of the more composite segmental features than a single sound, which is in agreement with the literature.

Discussion

It is necessary to remember that cochlear implant presents one of the factors influencing the development of the prosodic features of speech. The others are connected with the intellectual and emotional skills, family conditions and the educational process understood as the development of the hearing and language functions. The implant, however, remains an important element in this process, establishing the possibility of crossing the barrier between the worlds of silence and sounds, and, from the social perspective, between the acceptance and exclusion.

Conclusions

The results obtained in this study confirm the important role of cochlear implant for the development of the prosodic features of a language. To the best of authors knowledge, this is the first study in which the role of cochlear implants in the

development of suprasegmental features of speech was investigated in infants. Significant differences of the examined features between the groups of implanted and hearing aid-using children underline a great role of cochlear implants for the development of language communication in prelingually deaf children. Consequently, using the cochlear implants in a very early period of hearing impaired children's life is likely to equalize the their language communication to that of the hearing children. Perhaps, using the implants in the infancy stage, when the child is most susceptible to various communication features was the reason for the success of this project.

It should be noted that the results obtained in this study ought to be verified based on research carried out on the larger groups of children and with the rigorous statistical tests to verify the hypotheses. These experiments will be a part of my further studies.

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