



Efficacy of An Aural Rehabilitation Intervention with Adult Cochlear Implant Users

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ABSTRACT

Cochlear implants are small electronic devices that allow people to hear sounds. A cochlear implant can help a person with very little or no natural hearing ability. The number of people who use cochlear implant keeps growing. More than 3,24,200 people across the world use cochlear implants. 40 percent of children who are born profoundly deaf now receive a cochlear implant, which is a 25 percent increase from 5 years ago according to a survey conducted in 2014. The main idea of this paper is to evaluate up to what extent intervention of aural rehabilitation (AR) can improve outcomes for adult cochlear implant users. The AR protocols will include auditory training, communication strategies training and informational counselling. The proposed paper will examine whether an aural rehabilitation program consisting of auditory training (combining top-down/synthetic and bottom-up/analytic approaches) in the above-mentioned criteria can significantly improve the speech recognition abilities and psychosocial outcomes of post linguallly deafened adult cochlear implant users.

Keywords : Cochlear Implant, Aural Rehabilitation, Auditory Training, Rehabilitation Program, Speech Recognition Ability

I. INTRODUCTION

AR is the process of identifying and diagnosing a hearing loss, providing different types of therapies to clients who are hard of hearing, and implementing

different amplification devices to aid the clients hearing abilities.

AR can reduce one's perception of hearing difficulties, improve one's perception of quality of life, help one to become more effective user of hearing technology and communication strategies, and improve one's personal adjustments to living with

hearing loss. Aural rehabilitation evaluates the effectiveness of training to improve outcomes to adult cochlear implant users. Aural rehabilitation falls within the scope of practice of both audiologists and SLP's.

The aural rehabilitation process is comprised of several components including

1. Hearing aid fitting and orientation
2. Counselling
3. Auditory visual training
4. Conversational strategies
5. Environmental training
6. Consumer organisations

Under a project by Rehabilitation Engineering Research Centre on hearing enhancement a total of thirty adult cochlear implant users were randomly assigned to either the AR intervention protocol or the control group. Each group met for a six-week program for one and half hours each week. Multiple outcome measures were completed preintervention and again immediately following treatment and again at two month and six months post treatment. Measures included speech recognition performance on recorded topic related sentences (CasperSent) and a series of self-assessment measures of psychosocial function including personal adjustment participation or withdrawal from activities and quality of life.

II. COCHLEAR IMPLANTS AND COMMUNICATION FUNCTIONS

A cochlear implant is suitable for people with a severe to profound hearing loss, who do not benefit from standard hearing aids. Cochlear implants are generally most successful for people who had a relatively short length of deafness.

- Increasing numbers of adults receiving CIs and many are achieving high levels of speech perception. However, a proportion of adults still struggle in daily life and seek greater communication competency.
- CI does not resolve all communication issues. Residual issues can negatively impact psychosocial function and quality of life.

Some individuals demonstrate limited outcomes, as shown by poor speech recognition and/or evidence of significant hearing handicap. Others have good speech recognition, but not sufficient to meet the communication demands of their daily life.

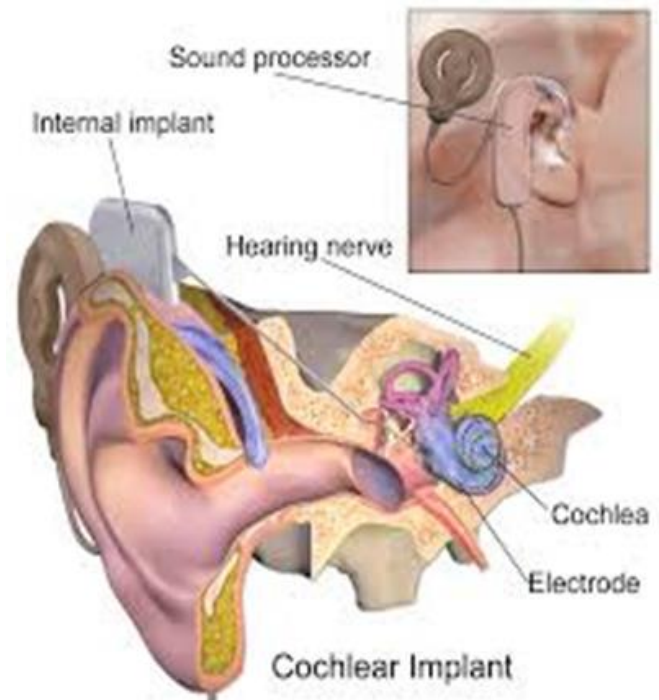


Fig 1 : A typical modern cochlear implant system that converts sound to electric impulses delivered to the auditory nerve.

III. AURAL REHABILITATION PROTOCOLS

A. Auditory training

Auditory training is an intervention method used in rehabilitative audiology that aims to help individuals with hearing loss use their residual hearing maximally. It emphasizes the development of listening skills to improve the recognition and interpretation of speech sounds despite limited hearing ability. The auditory training will exercise the auditory abilities in the attempt to minimize the functional deficits presented by the individual. It consists of listening tasks, in which the patient will perform the functions of auditory detection, auditory discrimination auditory recognition and auditory understanding.

One of the principles of the auditory training is to develop the central nervous system neuroplasticity in

order to generate changes in morphology and in auditory performance after the training auditory stimulation allowing the patient to give a new significance to resignify to each sound that he hears.

➤ **Auditory training outcomes:**

- Renewed interest in auditory training to improve speech recognition
- Role of auditory experience, especially focused auditory training, may be key to maximize functional outcomes in CI Users.
- Systematic review of evidence-based practice in Audiology, and more recently, cite evidence in support of benefits of auditory training, but recommend that future studies include a control group in order to establish the efficacy of training.

B. Communication strategies training

Your hearing device will help you hear better in some situations, but for better results using a range of communication skills will help you make the most of your hearing and your hearing device. There are other things you can do to give yourself the best chance of hearing and understanding well. These are commonly known as “communication tactics”. The best thing about these tactics is that they are useful for everyone, whether or not they have a hearing loss or use a hearing device.

The three main techniques under communication strategies training include Sentence identification, vowel and consonants contrasts, KTH speech tracking.

➤ **KTH speech tracking:**

KTH speech tracking is an easy to use approach in which a story is read by the clinician a line at a time, requiring the client to repeat it back verbatim. The first step in the KTH speech tracking procedure is to set a number of parameters for the session. The receiver's name and the testing condition are entered, along with the number of repeats of a blocked word and the duration (in minutes) of the tracking session. These include an elapsed time window and a record of all words which are presented via the LED display. Once these parameters have been set, the tracking session can begin.

C. Informational counselling

Informational counseling is the imparting of information to families about a broad range of topics throughout childhood, including, but not limited to, the following:

1. Audiogram interpretation
2. Amplification/technology options
3. Educational options
4. Communication options
5. Advocacy and public health and educational policies

Informational counselling focuses on providing education to the person with hearing loss or related disorders and their family/significant others about the disorder, associated symptoms, prevention and wellness, and the rationale for specific treatment intervention

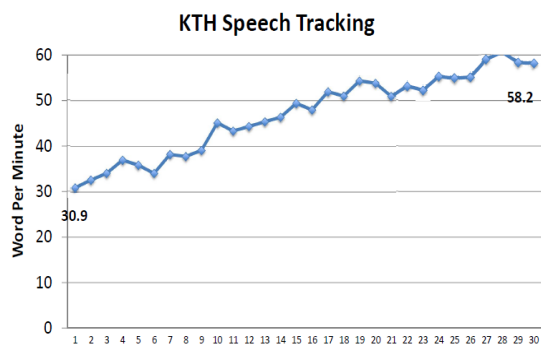


Fig 2 : AR group: Speech tracking for 30 5minute trials over six sessions(N=8).

IV. CONCLUSION

Referring to the figures above we can conclude that the participants had an improved word per minute count under the KTH speech tracking, numbered to increase from 30.9 words to 58.2 words per minute. Also, speech recognition in percent increased from a 55.1 (pre-treatment) to a whopping 73.7 (post two month) in the CasperSent. The main improvement in percent post training showed an increase of 18.1 to 18.6 increases but further declined to 13.3 post six months.

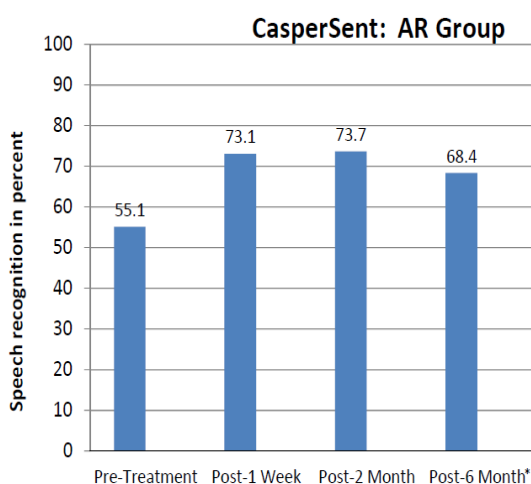


Fig 3 : Sentence recognition pre and post intervention(N=8) *post 6 months(N=6).

The summary of preliminary of speech recognition measures and psychosocial measures grouped for CT and AR is explained below

a) CT Group

- Participants showed no improvement in sentence recognition following training.
- Minimal improvement was seen on the Client Orientated Scale of Improvement (COSI).
- Minimal improvement basic speech domains, but none in psychosocial function.
- No reduction in self-perceived hearing handicap.

b) AR Group

- All participants showed improved speech recognition post-training (from 6.5% to 28.3%). Mean improvement post-training was
 - 18.1% at one-week post-training
 - 18.6% at two months post
 - 13.3% at six months post
- Improvement seen in personal goals (COSI).
- Improvement seen in social participation, self-assessed communication, and psychosocial function.

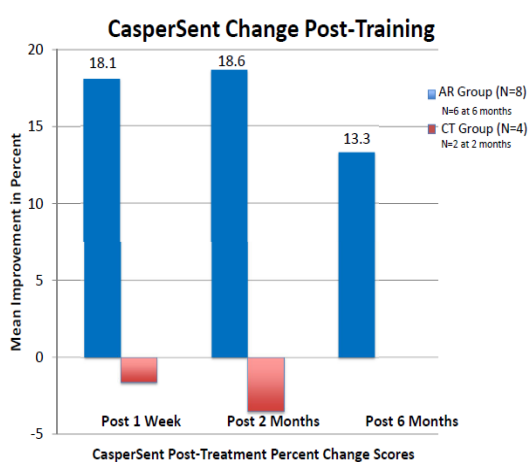


Fig 4 : CasperSent post treatment percent change scores.

- Reduction of self-perceived hearing handicap.
 - Primarily we can confirm that AR intervention contributed to increased speech recognition and to self-perceived improvement in psychosocial function. This preliminary data suggests that short-term AR can maximize outcomes for adult CI users.
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