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Effectiveness of Auditory Verbal Therapy in Children with Cochlear Implantation and Hearing Aid Users

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A B S T R A C T

Background: Hearing impairment is a complete absence or partial decrease in the ability to detect or understand sounds. It can range from a mild hearing loss to total deafness. Hearing impairment hinders the speech and language development of children severely. Hearing impaired children can use hearing aid or have cochlear implants for restoration of their hearing. Auditory verbal therapy (AVT) develops the oral communication in Hearing Impaired Children (HIC) with cochlear implants (CI) and also with children using hearing aids.

Objectives: To find out the effectiveness of auditory verbal therapy in children with cochlear implants and hearing aid users

Methodology: A quasi-experimental research was conducted to explore the effects of one to one speech and language therapy sessions using AVT for the speech and language development of the children using the hearing aids and children with cochlear implants during June 2013 to December 2013. Children with cochlear implants and children with moderate hearing loss, using digital hearing aid were included in this study. These Children did not have any other disability. A sample of 10 children was selected through purposive sampling technique. 5 children with cochlear implants and 5 using the hearing aids were selected. AVT was used to enhance the listening skills and oral communication. A pre-therapy and post-therapy assessment with a standardized language test (Test for reception of grammar) was used. 12 one to one speech and language therapy sessions were taken each session which lasted for 45 minutes. SPSS 16 was use of date analysis.

Results: Three participants in each group are between the age of 4 to7 years and 2 in each group are between 8 to 9 years old. Results of this Study show that most of the participants have passed pretest 0 or 1 and 2 level of TROG. Whether they are cochlear implanted or using hearing aid but after AVT they have passed level 3 and 4 of TROG. Significant P values of pre-and posttest have found.

Conclusion: Auditory verbal therapy is equally effective for both children with cochlear implants and children using the hearing aid with moderate degree hearing loss.

Introduction

According to Individuals with Disabilities Education Act (IDEA 1997) any negative effect on a child's performance in school or decrease in ability to learn due to permanent hearing loss or decrease in hearing is called as hearing impairment. Deafness is not included under the hearing impairment category according to IDEA; a complete inability to hear is called deafness. National Association of the Deaf uses the word hard of hearing rather than hearing impairment. Hard of hearing means that the person has some ability to hear and the person can use this ability to communicate with others, and he has the ability to communicate easily with others with that level of hearing. A person having mild to moderate degree of hearing loss is called hard of hearing. [1]

There are different types of hearing loss, Mild hearing loss (-10 to 15 dB) means that the person has trouble in hearing soft or distant speech, while the person with moderate hearing loss (41 to 55 dB) will have trouble in hearing speech sounds while having a normal conversation. On the other hand person with severe hearing loss (71 to 90 dB) will face trouble in hearing loud as well as speech sounds and a person having a profound hearing loss (90+) will face trouble in hearing environmental sounds too.[2] Any type of damage within the outer and middle ear which can cause reduction of loudness to the inner ear is called conductive hearing loss, on the other hand any damage to the inner ear resulting in permanent deafness is called sensory neural hearing loss which is also called nerve deafness.[3] When both components are involved it is mixed hearing loss.[4] There are many causes of hearing loss which include both environmental and congenital conditions. One third to one half of the causes detected is due to environmental factors. Most common cause is cytomegalic Virus, congenital rubella syndrome, pharmacologic ototoxicity, neo-natal asphyxia, and prematurity, while regarding genetic causes the most frequent are mutation in GJB2, which may cause 30 to 50% of profound non-syndrome hearing loss among people. Other common genetic conditions include syndrome conditions such as Pender's syndrome and Waardenberg's syndrome.[5, 6, 7]

Hearing aids can help in case of mild to moderate degree hearing loss either conductive or sensory neural. Most of the hearing aids have components which include a microphone, sound amplifier, receiver and batteries. Hearing aids may differ in design, technology and special features. There are many types of hearing aids like ones used behind the ear, in the ear, in the canal. Hearing aids can be analog or digital. Analog hearing aids are less common and manually operated. Digital hearing aids have computer chips and allow for more processing of sound during amplification process. Due to which it improves the performance of hearing impaired person in different situation it also has greater flexibility in hearing aids programming and also have multiple program memories.[8] For the improvement of the hearing of individuals with profound sensory neural hearing loss a prosthetic device; a cochlear implant is used. In the portion of mastoid of temporal bone an implant package is surgically placed. From this implant package an electrode array is inserted in to the cochlea. The remaining parts of device are worn externally which include microphone, speech processer, cable and transmitting coil. The microphone collects the sound and sends it to the speech processer. The speech processer converts the sound signal into an electronic code which is sent to transmitting coil along a cable. This transmitting coil sends it to the implant package which is connected with the cochlea. It provides electrical stimulation to the spiral ganglion and dendrite, and then electrical impulses travel along the auditory nerve then auditory pathways to the brain.[9] The characteristics of cochlear implant also depend not only on the components of device but also on the way the device is fitted. Fitting is referred to "programming" or "mapping". Programming is a set of instructions used to stimulate the electrodes.[10]

Auditory verbal therapy is an applied science. An auditory verbal therapy is objectively measurable and the goals of improving the area of audition, language, speech and cognition are set, which are achieved in individual sessions where parents act as partners in the therapy.[11, 12] It is widely used to enhance listening, language and speech of individuals with hearing loss.

The current study explored the effectiveness of speech and language therapy sessions with AVT techniques for developing language skills in children with moderate hearing loss (digital hearing aid users) and with severe to profound hearing loss now having cochlear implantation.Language learning requires a communicative environment; this study will elaborate the comparative effectiveness of AVT for these groups. The comparative effectiveness of AVT will eventually affect the efficacy of speech and language services. It will also improve the service delivery and therapeutic programs while working with hearing impairment.

Methodology

The study is Quasi Experimental and comparative in nature. Children between the ages of 5-9 years having pre-lingual moderate degree hearing loss bilaterally (Group A), using digital hearing aids bilaterally were selected for this study during June 2013 to December 2013. The data was collected from Government College for Teachers of Deaf, Gulberg Lahore. These children

were using hearing aids for last 7-9 Months without receiving any speech therapy; the Group B included the children of the same age group with cochlear implants, with or bilaterally without any previous speech and language therapy session. Purposive non-probability sampling technique was used to select the sample. Each group included 5 participants.

10 individual sessions for each child using AVT technique were administered for 45 minutes. Sessions were conducted twice weekly involving the parents during session. Sessions included various activities to enhance auditory stimulation, listening skills, reception of language and oral communication.

For pre-and post-evaluation of speech and language development of the children a standardized test; TROG was applied. Test for Reception of Grammar is used to measure the reception of language exhibited by child. SPSS 16 was used for data analysis.

Results

The results of the study are summarized in table below. Table depicts pre-therapy and post-therapy results of Group A and Group B on TROG. A, B, C blocks of TROG are for age range 4-8 years and D, E blocks for 8-9 years. Number of participants with pass and fail demarcation are for each Group is given according to respective TROG block. P-value for results is also calculated. There is marked difference in outcome after intervention with AVT technique.

Discussion

This study reported that Auditory Verbal Therapy (AVT) is a useful intervention for a wide range of children with hearing impairment. This hearing range include children with moderate hearing loss to profoundly severe hearing loss using the assistance of digital hearing aid and cochlear implants respectively. It is known that AVT is a very useful intervention for hard of hearing to enhance their listening skills thus improving the reception of language structures. The study showed that AVT techniques enhanced the skills of language reception in the selected sample.

Efficacy of Auditory verbal therapy is beyond doubt but there is lack of rigorous research evidence for it.[12, 13] Most of the longitudinal studies compare the results of language skills after AVT for hearing impaired children with those of typically hearing children. Longitudinal studies including the control group of comparable language level with experimental group are needed to justify these results.

A study conducted by Dornan provided the evidence that AVT is an appropriate intervention for children with cochlear implant.[14] It showed that speech perception improved markedly with moderate to high levels after 50 months from start of study. This study reported speech perception outcomes for the AVT group from the 38 months to the 50 months posttests and also compared outcomes for the AVT group for receptive vocabulary, receptive, expressive and total language, along with speech over 50 months with similar results of the matched hearing group. This study also compared reading, self-esteem and mathematics outcomes between the AVT and the hearing groups over the last 12 months of the study. It was concluded that AVT group's promising earlier outcomes of typical rate of progress for total language and speech skills to those of hearing controls has been

Table 1: Pre-Therapy Results and Post Therapy Results for Group A (with cochlear implantation) Group B (with hearing aid use).

	Group A (with cochlear implantation)				Group B (with hearing aid user)				p-values
	Pre Therapy Results		Post Therapy Results		Pre Therapy results		Post Therapy results		
	Fail	Pass	Fail	pass	Fail	Pass	Fail	Pass	
A (n=10)	05	0	01	04	05	0	03	02	0.074
B (n=10)	04	01	01	04	05	0	0	05	--
C (n=10)	05	0	04	01	04	01	02	03	0.025
D(n=10)	04	01	04	01	04	01	03	02	0.025
E(n=10)	05	0	04	01	03	02	01	04	0.275

maintained over the 50 months.[14] Current longitudinal study's scope covers reception of language and it is agreeable with this study.

In our study TROG estimated the reception of grammar pre-therapy and post-therapy. Participants depicted improvement in reception of structure of grammar e.g. nouns, verbs, tenses, pronouns. According to another study AVT has also been related to improvement of speech perception and speech production performance.[15] However, in another study the receptive vocabulary results for the AVT group are superior to those found in the literature, which have reported levels of receptive vocabulary for children with hearing loss lower than children with typical hearing.[16, 17, 18]

Similarly, another study reported that environmental sound recognition is not easy for children with cochlear implants.[19] Environmental sound recognition in these children can be successfully achieved by natural exposure if an auditory stimulus is scaffold in daily life likewise sounds of speech stimuli are also emphasized in routine aural and oral rehabilitation programs.

Overall, this study demonstrated the effects of AVT for both cochlear implant and hearing aid users. An exploratory study has shown that speech and language therapy help in development of listening and spoken language.[20] These results of this study highlighted the need for children with hearing loss using hearing aid or cochlear implant, to have ongoing rehabilitation.

Conclusion

Auditory verbal therapy is equally effective for both children with cochlear implants and children using the hearing aid with moderate degree hearing loss. AVT is very useful for habilitation of hearing and listening in individuals with hearing loss. The benefits of AVT can be summarized as ensuring the immediate fitting of hearing technology, utilizing focused audio logical management.

Thus, it is recommended to ensure services speech and language therapists for these children. It will promote academic, social and emotional competency along with auditory and linguistic skills.

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