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Correlation of category of auditory performance scale in both quiet and noisy environment with speech intelligibility rating performance in children who underwent unilateral cochlear implantation

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Abstract
Cochlear implantation is a device which is surgically implanted and makes the hearing and speech performance better in children. Category of Auditory Performance scale (CAP) & Speech Intelligibility Rating Scale (SIR) used to rate auditory outcomes & asses the intelligibility of speech from implanted children in everyday life both quiet and noisy environment. The aim of the study was to correlate CAP in both quiet and noisy environment with SIR performance in children who underwent unilateral cochlear implantation. In this study participants were prelingually hearing impaired children who had undergone unilateral cochlear implantation. A total of 30 children, 19 girls and 21 boys were included. Children with cochlear implant were assessed with CAP test and SIR. On the basis of their performances scores were given and calculated. Present study reveals that the correlation between CAP in quiet and noisy environment with Speech Intelligibility performance indicates that there is a good correlation in both the environment (quiet and noise) of children using unilateral implant. The study concluded that change in CAP score may directly influence SIR scores.

Keywords: Cochlear implant, categories of auditory performance, speech intelligibility rating

Introduction
Hearing loss is the most common sensory defect, affecting normal communication. Hearing loss an abnormal or reduced hearing caused by some disorders. Pre lingual deafness indicates hearing loss during infancy or a congenital deformity and loss. A child who has congenital hearing loss is exposed to the higher risk of the delayed growth of speech and language compared to the children who have been suffering from hearing loss after some language courses. Therefore, rapid diagnosis and assessment of the hearing and the ability to receive and understand the speech in the early ages of life, is of great importance and this has led that newborn hearing screening of infants be implemented at birth over the world. In fact, cochlear implant surgery has been quickly admitted as the standard therapy for treatment of profound hearing loss in children with profound bilateral loss.

Cochlear implantation (CI) is a device which is surgically implanted and makes the hearing and verbal performance better in children. Cochlear implant already has an established role as a treatment for profound hearing loss or congenitally deaf. Unilateral cochlear implantation denotes implant done in one ear. Unilateral cochlear implant also allows congenitally deaf to develop speech and language. Traditionally cochlear implants are provided unilaterally, leaving the opposite pathways deprived of input. Despite of this children who underwent unilateral implant are good in oral communication abilities with good listening skills. Case differences in speech learning, prolonged follow up after cochlear implantation and poor evaluation made it difficult to assess speech perception after cochlear implant in hearing impaired children. Since hearing is restored after the cochlear implantation, eventually speech is also expected to improve and individual are also able to adjust their speech characteristics in later period. So as to asses these auditory skills and speech performances there were lot of tests are available. The tests which assess the auditory skills and speech performance after implantation are Category of Auditory Performance scale (CAPS; Archbold, Lutman, and Marshall, 1995) and Speech Intelligibility Rating (SIR; M. C. Allen, Nikolopoulos, and O'Donoghue, 1998) [2].

Category of Auditory Performance scale (CAPS) used to rate auditory outcomes from paediatric cochlear implantation in everyday life both quiet and noisy environment. This test is use assess children and even for infants. CAP consists of eight different scores which ranges from deafness to good verbal output or communication. CAP evaluates the actual daily verbal and auditory skills in children and it can be used for showing the hearing improvement during follow up sessions. It is nonlinear hierarchical scale consist of eight categories. Categories of Auditory Performance measures supraliminal performance, which reflects everyday auditory performance in a more realistic way. The CAP comprises a hierarchical scale of auditory perceptive ability ranging from 0 ‘‘displays no awareness of environmental sounds’’ to 8 ‘‘can use the telephone with a familiar talker’’. Another aspect, cochlear implantation has been reported to be associated with improvement in perception and speech production. The Speech Intelligibility Rating Scale (SIR) is the scale which asses the intelligibility of speech how well the speech is comprehendible. In this we can rate the speech based on the clarity, comprehensibility in a given conditions and also classifies speech intelligibility into five categories. Higher rating indicates better performance. Speech Intelligibility Rating (SIR) was used to measure the speech intelligibility of the implanted children by quantifying their everyday spontaneous speech. It is a time-effective global outcome measure of speech intelligibility in real-life situations. SIR consists of five performance categories ranging from ‘‘pre recognizable words in spoken language’’ to ‘‘connected speech is intelligible to all listeners’’. There are studies that have shown after cochlear implantation speech perception improves, the rate at which intelligible spoken language develops and is less well documented.

Age at the implantation time has a significant effect on auditory and subsequent speech development. Govaertis *et al*. planned a trial in 2002 to evaluate the results of cochlear implantation according to the patient’s age. 20-30% of cochlear implantations that were performed after 4 years, 66% of those between 2-4 years and 90%of those before 2 years of age became al-most normal in auditory performance ac-cording to CAP scale after 3 years of follow up. Nikolo poulos *et al*. studied 133 deaf children before school age and showed acceptable results in those who were operated before eight years of age.

The aim of the study was to correlate categories of auditory performance in both quiet and noisy environment with speech intelligibility rating performance in children who underwent unilateral cochlear implantation.

Method

The current study was design to study prelingually hearing impaired children who had undergone unilateral cochlear implantation. Categories of Auditory Performance test (CAP) and the Speech Intelligibility Rating (SIR) respectively were used to assess all the children with unilateral cochlear implantation. All participants received their implants unilaterally at the age of 3 years.

Following are the

Inclusion criteria

- Children who were prelingually hearing impaired and underwent unilateral cochlear implantation were included in this study.
- Children with cochlear implant who have attended Speech and language therapy for minimum one year were included in this therapy.
- Children age range from 4-8 years was included in this study.
- Children who used hearing aids almost 6 months prior to the cochlear implantation

Exclusion criteria

- Children with multiple disabilities like cerebral palsy, attention deficit hyperactive disorder were excluded from the study.
- Participants with bilateral cochlear implantation were excluded
- Participants with Bimodal hearing were also excluded from the study.

A group of children with the age range of 4-8 years were included with a mean age of 5year 6months. A total of 30 children, 19 girls and 21 boys were included. Spearman correlation was used in this study to see the correlation between Categories of Auditory Performance in both quite environment and noisy environment with Speech Intelligibility Rating Test. The CAP and SIR assessments were conducted by speech therapists in the therapy sessions in clinical settings and also in noisy environment as a routine evaluation during the follow-up of 6 months to 1year after unilateral cochlear implantation. On the basis of their performances scores were given and calculated.

Table 1: Categories of Auditory Performance (CAP) (Criteria used to categorize children in the CAP scale)

Category	Criteria
9	Use of phone with unknown speaker in unpredictable context.
8	Follows group conversation in a reverberant room or where there is some interfering noise, such as a classroom or restaurant.
7	Use of telephone with known listener.
6	Understanding of conversation without lip-reading.
5	Understanding of common phrases without lip-reading
4	Discrimination of some speech sounds without lip-reading.
3	Identification of environment sounds
2	Response to speech sounds (e.g. “go”).
1	Awareness of environment sounds
0	No awareness of environment sounds

Table 2: Speech Intelligibility Rating Scale (SIR) criteria. (Criteria used to categorize children with unilateral implant)

Category	Speech Intelligibility Rating Criteria
5	Connected speech is intelligible to all listeners. Child is understood easily in everyday contexts.
4	Connected speech is intelligible to a listener who has a little
3	Experience of a deaf person's speech Connected speech is intelligible to a listener who concentrates and lip-reads.
2	Connected speech is unintelligible. Intelligible speech is developing in single words. When context and lip-reading cues are available.
1	Connected speech is unintelligible. Prerecognizable words in spoken language.

All children were assessed after surgery using CAP and SIR. To eliminate test bias, each child was rated by the same speech and language therapist who was blind to the child's situation and was not allowed to ask for information such as the duration of cochlear implant use and whether the child received speech therapy prior to scoring. The CAP and SIR scores of the groups at each time point were correlated using spearman correlation.

Result & Discussion

The study was aimed to see the correlation between Categories of Auditory Performance (CAPS) both in quiet and noisy environment with Speech Intelligibility performance (SIR). Study shows the unequal study sample, of 19 girls and 21 boys with the total number of 30 participants were included. Fig. 1. Represents the mean value of CAPS score in quite environment is 5.96 with the Standard deviation (SD) score of 2.48.

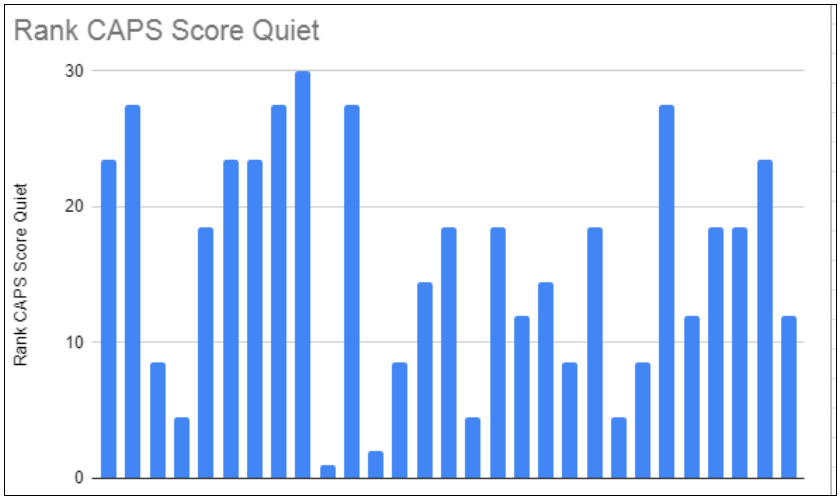

Fig 1: Mean of CAP Scale in quite environment.

The fig. 2. Represents the mean value Category of Auditory Performance in noisy environment is 4.3 and SD score is 2.39.

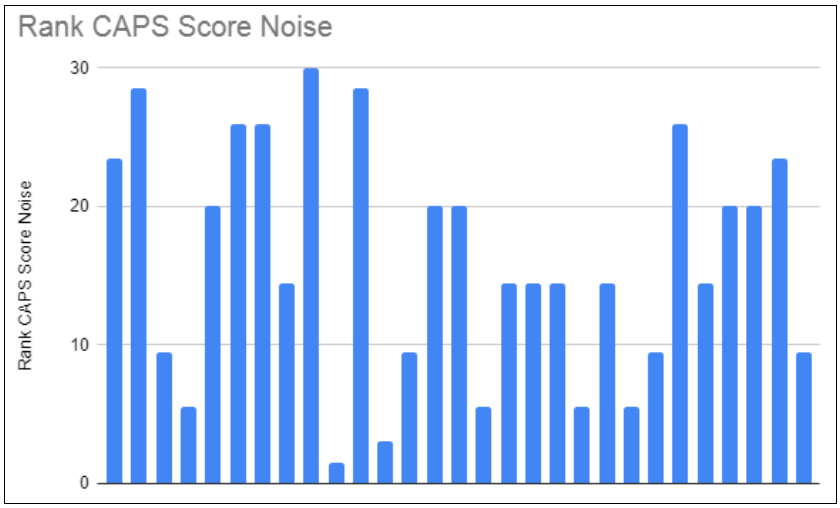

Fig 2: Mean of CAP Scale in noisy environment

The representation of Speech Intelligibility Rating Scale (SIR) mean value in fig. 3. Which indicates the mean value 2.56 and SD score of 1.25.

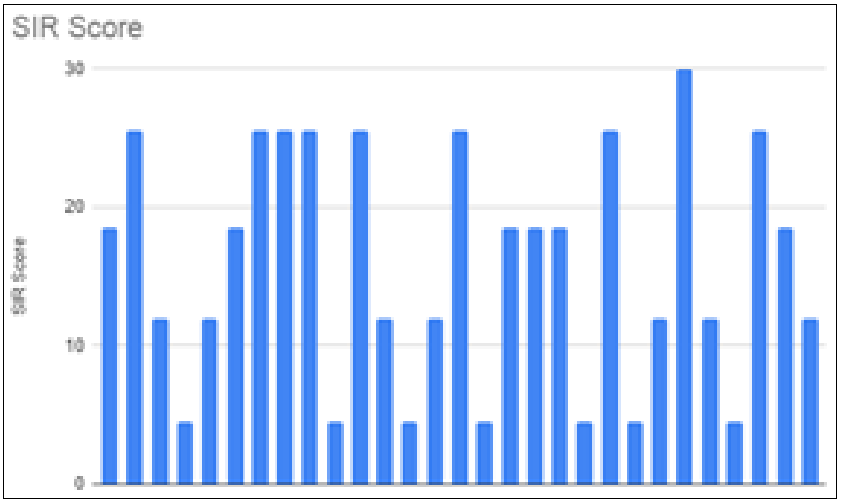

Fig 3: Mean of Speech Intelligibility Rating Scale (SIR)

By using the Spearman correlation method present study reveals that the correlation between Categories of Auditory Performance in quite environment with Speech Intelligibility performance is (0.8362) and where as in noisy environment with Speech Intelligibility performance is (0.770) which indicates that there is a good correlation in both the environment (quiet and noise) of children using unilateral implant. So if the speech language training protocol will be proper and early implantation will give good auditory perception and speech intelligibly.

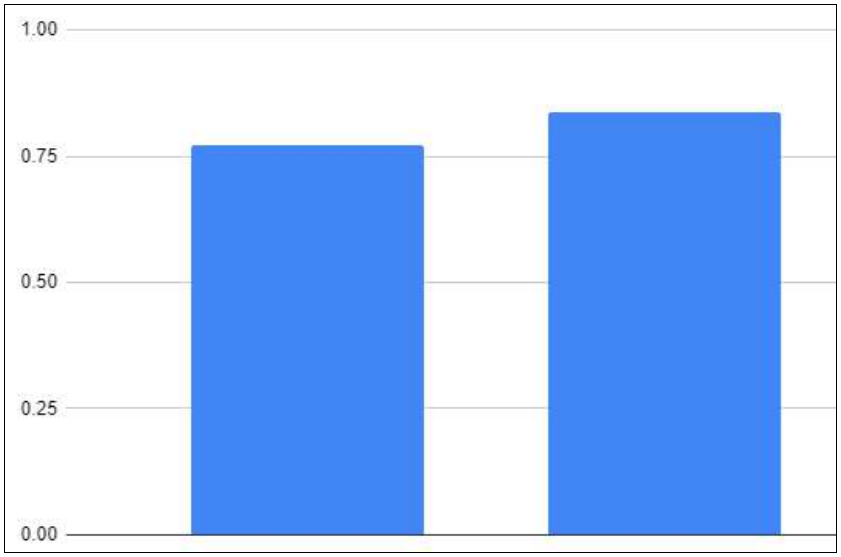

Fig 4: Correlation between Categories of Auditory Performance in quiet and noisy environment with Speech Intelligibility performance.

Conclusion

The conclusion drawn from the study indicates that the change in Categories of Auditory Performance score may directly influence Speech Intelligibility Rating score. Overall communication skills will also improve with good CAPS & SIR scores. Study also showed that prelingually hearing impaired children's ability to develop speech and language after unilateral cochlear implantation. For highest level of Category of Auditory Performance (CAP) and Speech Intelligibility Rating (SIR) scales postoperative aural rehabilitation along with speech and language therapy are required. However, intelligibility of speech remains a hope of many parents who submit their children to cochlear implantation. To help and counsel parents CAPS & SIR provides insights about auditory skills status & global outcome measure of speech production in real life situations. It is also concluded that children with hearing impairment should receive cochlear implant at young age will have better CAPS & SIR scores.

References

1. Agrawal Y, Platz EA, Niparko JK. Prevalence of hearing loss and differences by demographic characteristics among US adults, data from the national health and nutrition examination survey, 1999-2004. Archives of Internal Medicine. 2008;168:1522-1530.
2. Allen MC, Nikolopoulos TP, O'Donoghue GM. Speech intelligibility in children after cochlear implantation. American Journal of Otolaryngology. 1998;19:742-746.
3. Archbold S, Lutman ME, Marshall DH. Categories of Auditory Performance. Ann Otol Rhinol Laryngol Suppl. 1995;166:312-4.
4. Chadha NK, Papsin BC, Jiwani S, Gordon KA. Speech detection in noise and spatial unmasking in children with simultaneous versus sequential bilateral cochlear implants. Otology & Neurotology. 2011;32:1057-1064.
5. Dettman SJ, Pinder D, Briggs RJ, Dowell RC, Leigh JR. Communication development in children who receive the cochlear implant younger than 12 months:

risks versus benefits. Ear Hear. 2007;28:11S-1
6. Geers AE. Speech, language, and reading skills after early cochlear implantation. Arch Otolaryngol Head Neck Surg. 2004;130:634-638.
7. National Institute on Deafness and Other Communication Disorders. Cochlear implants. Bethesda, MD: Author, 2011.
8. National Institute for Health and Clinical Excellence. Hearing impairment-cochlear implants: 2nd appraisal consultation document. London: NICE, March 2008. http://www.nice.org.uk/guidance/index. jsp?action=article&o=39932 (accessed 16 December 2009).
9. Nikolopoulos TP, Archbold SM, O'Donoghue GM. The development of auditory perception in children following cochlear implantation. Int J Pediatr Otorhinolaryngol. 1999;5(49)Suppl 1:189-91.
10. Nopp P, Schleich P, D'Haese P. Sound localization in bilateral users of MED-EL COMBI 40/40+ cochlear implants. Ear and Hearing. 2004;25:205-214.
11. O'Donoghue GM, Nikolopoulos T, Archbold SM, Tait M: Congenitally deaf children following cochlear implantation. Acta Otorhinolaryngol Belg. 1998;52(2):111-4.
12. Sharma A, Dorman MF, Kral A. The influence of a sensitivity period on central auditory development in children with unilateral and bilateral cochlear implants. Hearing Research. 2005;203:134-143.
13. Snik AF, Makhdoum MJ, Vermeulen AM, Brokx JP, van den Broek P. The relation between age at the time of cochlear implantation and long-term speech perception abilities in congenitally deaf subjects. Int J Pediatr Otorhinolaryngol. 1997;41:121-131.