Electronic International Interdisciplinary Research Journal (EIIRJ)

ISSN 2277-8721 UGC Approved Journal No 48833

# SEMANTIC LEVEL OF LANGUAGE OF CHILDREN WITH COCHLEAR IMPLANT AND NORMAL HEARING

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## Abstract

*The study entitled Semantic Level of Language of Children with Cochlear Implant and Normal Hearing was conducted with the purpose to find out the receptive and expressive semantic level of language of children with cochlear implant and normal hearing. Total 50 children in the age range of 5-7 years were conveniently selected from mainstream schools, special schools and therapy centers from Mumbai as a sample for study. Out of which 25 were cochlear implanted children and 25 children were having normal hearing. A standardized tool, Linguistic Profile Test (LPT) developed by AYJNIHH (1992) was administered to assess the receptive and expressive semantic level of language of children with cochlear implant and normal hearing. Descriptive survey design was used for study. The data analysed by using' test and R package. A significant difference was found between the receptive and expressive semantic level of language of children with cochlear implant and normal hearing. The result indicated that the children with cochlear implant have less receptive and expressive semantic level of language compare to normal hearing children. The study concluded that this could have happened because of less frequency of using cochlear implant, lack of post cochlear implant therapies, inappropriate listening environment from the family. However the fact cannot be denied that the children normally display a phenomenal growth in linguistic skills in their every year, with cochlear implant children need to get linguistic communicative environment.*

**Key Words:** *Semantic Level, Children with Cochlear Implant, Normal Hearing Children*

**Introduction:**

***"In spite of the fact that language as a socializing and informing force, it is at the same time the most potent factor for the growth of individuality"***

***Edward Sapir***

Language is an extraordinary gift of God. It is part of what makes man fully human. Language is the vocal communication of thoughts and ideas, a process by which meaning is conveyed or expressed from one to another. Children without language are limited in engaging in the most human of all skills- communicating with others. Therefore, they cannot indicate when they are ill, hunger, or thirsty, except by primitive gesture or sound (Cole, M.L, Cole T. J, 1989).

Children without language are not able to verbally share ideas or to express personal experience, events, or even feelings. But perhaps most devastating of all, they are not able to use language to decode other bodies of knowledge. Because many area of learning are language related, the child without language may have great difficulty in one or more cognitive area (Cole, M.L, Cole T. J, 1989). The early sequence of linguistic growth in hearing impaired children follows a delayed but a normal pattern further, only in later stage; these children are required to communicate with abstract concepts. This is where most of hearing impaired children finds their linguistic skills to be insufficient (Ross M, 1990). The hearing impairment is a most important factor which affects the language of children. Research study shows that improper auditory inputs leads to delayed and inadequate speech patterns. Schefer and Lynch (1981) found marked delay in acquisition of first word and two-word utterance. This apart, they found both similarities and differences between the patterns of acquisition of the deaf children compare with hearing children( Schefer and Lynch (1981).The current study intended to assess semantic level of children with cochlear implant. The terms semantics and cochlear implant are briefly introduced as below.

**Semantics:**

Semantics is the subfield that is devoted to the study of meaning, as inherent at the levels

of words, phrases, sentences, and larger units of discourse (termed texts or narratives). The study of semantics is also closely linked to the subjects of representation, reference and denotation. According to Angela Gentry (YNK) Semantics means the meaning and interpretation of words, signs, and sentence structure. Semantics largely determine our reading comprehension, how we understand others, and even what decisions we make as a result of our interpretations. Semantics can also refer to the branch of study within linguistics that deals with language and how we understand meaning. This has been a particularly interesting field for philosophers as they debate the essence of meaning, how we build meaning, how we share meaning with others, and how meaning changes over time.

**Cochlear Implant:**

A cochlear implant is an electronic medical device that replaces the function of the damaged inner ear. Unlike hearing aids, which make sounds louder, cochlear implants bypass the damaged hair cells of the inner ear (cochlea) to provide sound signals to the brain.Cochlear implant is a technically advanced device that helps the adult and children who have severe to profound hearing loss and who do not receive satisfactory benefit from hearing aid or tactile devices to understand speech. Cochlear implant are neural stimulators, which, when implanted into the cochlea of inner ear, bypass the function of the sensory receptors.

(Pulsifer et al. 2003) Evidence of basic perceptual gains following cochlear implantation is found in consistent improvements in hearing thresholds. However, improved thresholds for sound awareness represent only a preliminary measure of the intervening effect of a cochlear implant. A vast range of levels of hearing and communication ability are observed in children who receive cochlear implants, and the true impact is measured by more consequential outcomes than awareness of sound. Crystal 1997 comprised that the Cochlear implants can improve access to ambient language but is usually provided at ages after early development stages for the domains of language have begun. By age 4, most children have achieved sufficient mastery of the phonological, grammatical, and

pragmatic systems to be considered a native speakers or signers.

**Need of the Study**

There has been a rapid and continuous evolution within the field of cochlear implant technology. Particularly coding strategies as well as the surgical procedure to implant the electrode array into the cochlea (Krueger et al, 2008, Gifford, Olund, &Dejong, 2011). In the last decade cochlear implantation has become a standard procedure in the treatment of pre-lingual hearing impaired children (Baudonock, Van Lierde, D'haeseleer, &Dhooge, 2011). Although cochlear implant recipient were initially happy to receive even modest gains in speech recognition, the expectations are now much higher (Fitzpatrick, seguin, schramm, Chenier, & Armstrong, 2009, Cullington& Zeng, 2010; McDermott, 2011). Perold (2001) reported that parents had experienced disappointment in the period following the switch-on of their children's implants because they had unrealistic expectation of seeing immediate improvement in their children's communication abilities.

On review of related literature the researcher intended to conduct the study for following reasons.

- To assess the language of cochlear implant user children to know the usefulness /benefits of cochlear implantation and to see their language if at par with normal hearing children. The study is also be useful for children with cochlear implant and educators in planning and regrouping for classroom instructions and to bring in necessary modifications in method of instruction.
- It could be used to make the educators and parents aware of the need of cochlear implant for the hearing impaired child for exposing the normal hearing world at the earliest age.

Apart from the above uses, the study may serve as basis for several other studies in this area in future. It may also add to the fund of knowledge.

**Review of Literature:**

Kenett (2013) studied on the Semantic organization in children with cochlear implants:

computational analyses of verbal fluency.The purpose of the study to check cochlear implantation enables children with severe and profound hearing impairments to perceive the sensation of sound sufficiently to permit oral language acquisition. 27 children with cochlear Implant and 27 age and IQ-matched normal hearing children ages 7–10 were tested on a timed animal verbal fluency task. The responses were analyzed using correlation and network methodologies. The result of the study was that the children with cochlear Implant appeared to have a less-developed semantic network structure compared to age-matched normal hearing peers. Santos, et al. (2014) studied phonological and semantic verbal fluencyof hearing-impaired and normal-hearing people. The hearing-impaired subjects with low educational level evoked fewer words in semantic and phonologic verbal fluency tests in comparison to normal-hearing subjects.

**Aim of the Study:** The aim of the study was to study the semantic level of language of children with cochlear implant and normal hearing children

**Main objective of the study:**

To assess the receptive expressive semantic level of language of children with cochlear implant and normal hearing.

**Main Hypotheses of the study:**

**Ho.** There will be no significant difference in receptive&expressive semantic level of language of children with cochlear implant and normal hearing.

**Research Questions**

What is the receptive & expressive semantic level of language of children with cochlear implant and normal hearing?

**Variable of the study**:

| **Variable** | | |
|---|---|---|
| **Independent variable** | Children Group | Children with Cochlear Implant &Normal Hearing Children |
| **Dependent variable** | Language | Receptive &Expressive Semantic Level |

**Methodology:**

The descriptive survey design was selected and followed for carrying out the study.

A total of 50 children, 25 children with Cochlear Implant studying in special schools at primary level and taking therapy at therapy centres and 25 children with normal hearing studying in inclusive schools at primary levelin Mumbai were selected conveniently and grouped as Group - A Children with Cochlear Implant (CI) and Group -B Children with Normal Hearing (NH). All of them were selected from 5 to 7 years of age group. Group 'A' children who were using cochlear implant since 3 to 4 years and having no any other additional impairment were selected for study.

**Linguistic profile test (LPT)**a standardised tool was used for collection of the data. This test was developed by PratibhaKanarth, Head of Dept. of Speech and Pathology, AIISH, Mysore. Ministry of Social Justice and Empowerment (M.S.J.E), Govt. of India helped in developing of tool and the UNICEF was funded for this whole purpose. This task was undertaken as a joint collaborative project entitled "Development and Standardization of Language and Articulation Test in Indian Languages".

The statistical analysis of the data was carried out using SPSS 16.0 and R version 3.2.5(2016-04-14). Convenient sampling technique was used for data collection. The simple descriptive statistics and 't' test analysis were used to check significance of semantic level. Since the data was obtained using method of non-probability samples, the distribution for the test statisticswas obtained using 1999 permutation samples drawn from the data itself, to test the null hypothesis of equal means. For Permutation sampling from the data without replacement method was used and to get the confidence interval 2000 bootstrap samples and for bootstrap re-sampling was used.

**Result and Discussion**

**Table 1: Receptive&Expressive Semantic Score of groups A & B**

| Language | Groups | N | Mean | Std. Deviation | Std. Error | Min | Max | Percentiles | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 25 | 50 | 75 |
| Receptive | Group - A CI | 25 | 33.32 | 3.52 | 0.704 | 22 | 36 | 33 | 34 | 35 |
| | Group - B NH | 25 | 35.68 | 0.69 | 0.138 | 33 | 36 | 35.5 | 36 | 36 |
| Expressive | Group - A CI | 25 | 21.4 | 6.627 | 1.325 | 3 | 30 | 20 | 22 | 26 |
| | Group -B NH | 25 | 27.64 | 1.63 | 0.326 | 22 | 30 | 27 | 28 | 29 |

**Figure 1 : Receptive Semantic Level**

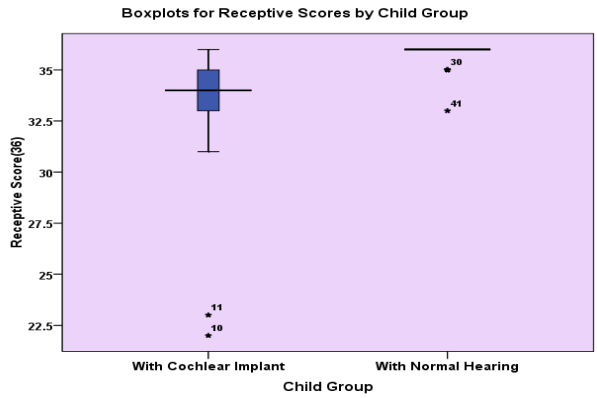
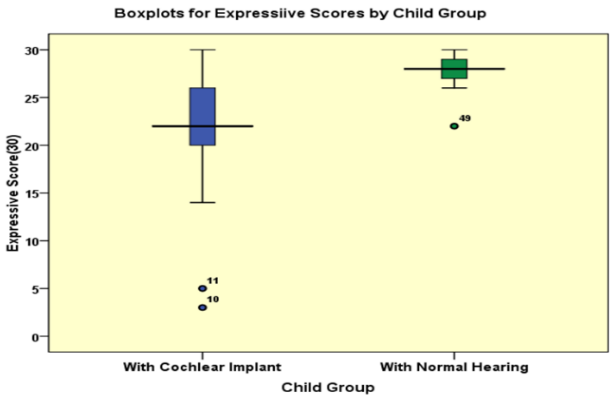



**Figure 2 : Expressive Semantic Level**




From the table 1, it is seen that the mean Receptive Score for the children with cochlear implant group Group–A CI (33.32) is lower than that of the children with normal hearing group Group-B NH. Though the difference in the 25$^{th}$ percentile (P25) of Group – A&B was found marginal (33 for Group A and 35.5 for Group B), the difference was major on both the groups in 50$^{th}$percentiles are 34 and 36 respectively andin 75$^{th}$ percentile it is 35 and 36 respectively for both the groups. These differences are visually presented in the box–plot diagram 1 and 2.

From the Box plot (figure 1) for receptive semantic score of (Group A&B) there are two extreme scores for children with Cochlear Implant group(Group A) at the lower end of the scale(case 10 with score 22 and case 11 with score 23). All other scores are 31 or more. As against this in the distribution of the Normal Hearing group 19 children are with score 36, five with score 35 and one with score 33. The scores 33 and 35 are extreme for the distribution of normal hearing group as revealed in Figure 1. The minimum and the three percentile scores are higher for the normal hearing than for the cochlear implant group. In summary, performance of normal hearing group is better than the cochlear implant group, on receptive language.

**Hypothesis Testing:**

The major objective of the study was to compare the receptive semantic level of language of children with cochlear implant (Group - A) and children with normal hearing (Group - B). Thus the null hypothesis was formulated based on the said

objective as follows.

**Ho1 :- "There *will be no significant difference in receptive and expressive semantic level of language of children with cochlear implant and normal hearing"***.

For testing the above hypothesis the following statistical analysis was applied. The scores obtained by the Groups – A&B on administration of the Linguistic Profile Test (LPT) were considered for analysis. The 't' test analysis for the receptive and expressive semantic scores is presented in Table 2.

**Table 2: 't'-test Analysis: Receptive&Expressive Score of Group A & B**

| Language | Samples | t | df | P-value (2-tailed) | Mean Difference | Std. Difference Error | 95% Confidence Interval of the Difference | | Result |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower | Upper | |
| Receptive | Basic | -3.289 | 25.843 | 0.003* | -2.36 | 0.717 | -3.835 | -0.885 | Significant |
| | Permutation (n=1999) | t<= 3.289 | - | 0.001* | - | - | - | - | |
| | Bootstrap(n=2000) | - | - | - | -2.36 | 0.706 | -3.88 | -1.12 | |
| Expressive | Basic | -4.572 | 26.893 | 0 | -6.24 | 1.365 | -9.041 | -3.439 | Significant |
| | Permutation (n=1999) | t<= -4.572 | - | 0.001 | - | - | - | - | |
| | Bootstrap(n=2000) | - | - | - | -6.24 | 1.365 | -8.88 | -3.76 | |

The analysis of the data was carried out using SPSS16.0 and R version 3.2.5 (2016-04-14).SPSS. The result of the't' test for equality of means presented in the table 2 shows a significant difference between the two distributions. On average, Normal hearing group

had greater Receptive Semantic Score (M = 35.68, SE = 0.138 see table-1), than Cochlear Implant group (M = 33.32, SE = 0.704see table-1). The mean difference (-2.36) was significant t (25.84) = -3.29, $p < .05$. The mean difference also represents a large effect r = 0.54. The permutation samples also confirmed significance of the t results ($p<0.05$). The bootstrap samples had 95%CI of -3.88 to -1.12.

On average, Normal hearing group had greater expressive Score (M = 27.64, SE =0.326 see table-1), than Cochlear Implant group (M = 21.4, SE =1.325see table-1). The mean difference (-6.24) was significant t (26.90) = -4.572, $p < .05$. The mean difference also represents a large effect r=0.661. The permutation samples also confirmed significance of the t results ($p<0.05$). The bootstrap samples had 95% CI of -8.88 to -3.76.

Thus the null hypothesis framed in this study was rejected and the result obtained was ***"There exists a significant difference in the receptive and expressive semantic level of language of children with cochlear implant and normal hearing"***.

**Finding of the Study:**The receptive and expressive semantic level of children with normal hearing (Group - B) was found better than that of the children with cochlear implant (Group - A). In general the present data supported the fact that the normal hearing group had greater receptive and expressive score than the cochlear implant group.

The children of cochlear implant users are not at par with normal hearing children in their receptive and exprecive semantic level of language.

**Discussion:**

The result of the present study is having similarities with the earlier study conducted by the Deena Wechsler-Kashi, youed N. Kenett.. It says that children with cochlear implant appeared to have a less developed semantic network structure compared to age matched normal hearing peers. Another study by Blarney, Detteman and Barker (1995) resulted that the variables of age of implantation, duration of profound deafness, communication mode, and speech perception skills failed to significantly predict rate of improvement. The result of present study could be because of family which restricted to avail post

implant therapies, level of parents education, frequency of use of cochlear implant in a week or in a day.

**Suggestions:** Early implantation at right age, Early intervention program/ Auditory Verbal Therapy, parents counseling, creation of appropriate listening environment can improve the situation.

**Recommendations:**

The major recommendations for further study include (i) The further study can be conducted on semantic and syntax level of language (ii) Semantic and syntax level of language of children using hearing aid and cochlear implant (iii) Area /population of study can be broadened. (iv)Impact of age of cochlear implantation on language development of a hearing impaired person could be studied.

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