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Mainstream School Performance of Children with Hearing Impairment Using Cochlear Implant: A Preliminary Report from a Teacher's Perspective

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Abstract

Cochlear implantation in children with hearing impairment (HI) have demonstrated significant outcomes in the areas of spoken language development and education. However, it has been reported that children with cochlear implant (CI) have variable performance in regular educational settings. Therefore, the aim of study is to understand the issues related to classroom performance in children with cochlear implant from a teacher's point of view. Children with cochlear implant placed in mainstream education were recruited for the study. The class teacher filled out a questionnaire that was developed which included 14 domains that was identified based on previous literature. The results indicated significant lacunae in the areas of communication, listening, and social interaction, use of appropriate compensatory strategies, test taking skills, reading, and writing. Children with CI exhibited considerable deficits in mainstream education. However, the study highlighted the potential areas that required professional support to cope with mainstream education. The results of the study can also help to enhance teacher education and thereby facilitate better learning opportunities for children with CI.

Keywords: Mainstream education, Cochlear implants, Rehabilitation, Inclusion, Communication

Introduction

Cochlear implantation has become a recognized treatment option for individuals with severe to profound hearing loss (Niparko et al., 2010). The outcomes of cochlear implant (CI) device are well recognized in the areas of speech perception, speech production, verbal language, reading, social interaction, quality of life and mainstream education (Wu et al., 2013). Children implanted at an early age are trained to acquire necessary skills of speech recognition and language development. Hence, early implantation enables children with hearing loss to be integrated in mainstream education as their hearing peers (Damen et al., 2007). Significant positive academic outcomes have been reported by parents of children using CI in mainstream education (Chundu et al., 2014). The implementation of the National Educational Policy in 1986 and the Persons with Disabilities Act, 1995 has facilitated children with CI to be enrolled in

mainstream schools. However, the placement of these children in mainstream education still remains a challenge in India.

The children with hearing impairment encounter various difficulties to cope in the regular educational system. They commonly experience speech and language deficits and show signs of lower academic achievement and have poor psychosocial development than their normal hearing peers (Punch & Hyde, 2010; Wu et al., 2013). These difficulties affect their overall performance in mainstream education. Previous studies have identified that children with CI face communication and listening difficulties (Archbold et al., 2002; Bouton et al., 2012; Leigh et al., 2013). The cognitive skills and social behaviors are also affected compared to the other hearing peers in the class (De Giacomo et al., 2013; Kluwin, 2002). Classroom noise levels also create annoyance to the child with hearing impairment in mainstream education (Crandell & Smaldino, 2000; Stinson, 1999). All this has a significant impact on the overall quality of life in children with hearing impairment (Damen et al., 2007; Hintermair, 2011; Kyle & Harris, 2006). Children with hearing loss had significantly delay in reading and other literacy related areas (Moog & Geers, 2003; Prakash, 2012).

In a developing country like India, the primary educator is the teacher who oversees the class. The class teacher is the one who spends most of the time in class along with the children and they are expected to be aware of the overall academic performance. Hence, it is imperative to recognize the teachers as informants to report the mainstream performance of a child with CI. Therefore, the current study attempts to report the challenges to accommodate children with CI in a mainstream curriculum in India from functional information obtained from the teacher.

Method

The study was a cross-sectional study design, and it was carried out in two phases. The study was approved by institutional ethics committee of Sri Ramachandra University. (Reference: CSP/16/JAN/45/66).

Phase 1

For the current study, a non- standardized questionnaire was developed with the underlying principles and domains of the Screening Instrument for Targeting Educational Risk (SIFTER) developed by Anderson (Anderson et al., 2005) as a base reference. The purpose of the questionnaire was to serve as a guideline to assist the teacher to record the observations of the child with CI in the classroom. The questionnaire developed was culturally relevant to accommodate the Indian educational system. The questionnaire included the following domains:

1. Listening behaviors in classroom
2. Classroom acoustics
3. Device performance

4. Attention
5. Communication
6. Social behaviors
7. Repair strategies/compensatory strategies
8. Independent working habits
9. Class participation
10. Test-taking skills
11. Written language
12. Parental support
13. Overall academic considerations
14. Overall average in class

The questionnaire was validated for content by two audiologists, a special educator in the field of CI rehabilitation (minimum five years of experience) and a mainstream teacher. Appropriate changes were incorporated based on the suggestion provided by the professionals. The scoring was determined using frequency Likert scale. As the questionnaire was designed to obtain the opinion of class teacher the Likert scale was used. (Table 1)

Phase 2

Procedure

The participants of the study were children with severe to profound congenital hearing impairment (n=20) who have received cochlear implant at Sri Ramachandra Medical Centre, Chennai. The participants were children between the age ranges of 5 to 10 years with a unilateral CI with a minimum of two years of experience in mainstream school were recruited for the study. The age of implantation of the children was below five years. Children with any other additional issues were excluded from the study.

Appropriate consent from parents and permission from the schools were obtained. The teachers primarily belonged to the government schools in district villages in the state of Tamilnadu. Children who were recruited for the study were distributed across the state in different geographical locations of the state. All the teachers who participated in the study have a teacher training diploma and had a work experience of minimum of three years in mainstream school teaching. Consent from the teacher was also obtained to record the observations in class using the questionnaire. The teachers participated in the study were trained educators for primary school teaching. In Tamilnadu, and others states in India the class teacher transacts all the subjects in the Primary school. Only the class teachers were targeted to fill out the questionnaires as they will be aware of the child's performance in the classroom and they directly handle the child. The questionnaire was handed over to the class teachers in the mainstream schools where the children

using CI were enrolled by the parents. The investigator explained to the teacher over the phone regarding filling the questionnaire. The questionnaire was filled out by each class teacher based on the performance of the child in classroom. The follow up to return the filled in questionnaires was carried out via phone.

The questionnaire was constructed in a way that it consisted three statements in each domain within each domain there was a key statement. The scoring was based on the key statement that was the most vulnerable. The key statement was the one that directly addressed the issue in that domain and the response to that statement decided the performance in that domain. Each statement was rated good, fair, poor based on the observation of the class teacher. If the child scores low on the key statements, it reflects that the domain needs attention or it is affected. The interpretation of rating scale depicted in Table 2.

Statistical methods

To evaluate the performance of children with CI, percentage analysis was carried out for each domain to report the level of performance. Fisher's exact test was used for statistical significance. The analysis was performed using Statistical Package for the Social Sciences software version 22.0 (IBM, India).

Table 3: Percentage analysis of the domains

S No	Domains	Good	Fair	Poor
1.	Listening behaviours	40%	55%	5%
2.	Classroom acoustics	50%	25%	25%
3.	Device performance	35%	30%	35%
4.	Attention	20%	30%	50%
5.	Communication	30%	30%	40%
6.	Social behaviours	45%	35%	20%
7.	Repair strategies/ compensatory strategies	20%	30%	50%
8.	Independent working habits	35%	35%	30%
9.	Class participation	80%	5%	15%
10.	Test taking skills	35%	25%	40%
11.	Written language	30%	60%	10%
12.	Parental support	75%	25%	-
13.	Overall academic considerations	30%	10%	60%
14.	Overall average	15%	15%	70%

Results

The teachers filled out the questionnaire and the results indicated significant observation in the domains. The first domain was listening behaviors, about 60% (55 % - Fair, 5 %- Poor) of the children had poor and fair abilities in listening. With reference to the domain of classroom acoustics, the teacher observed that more than half (50%) of the children had no annoyance issues in classroom and rest of the children were observed to have moderate to severe level of annoyance in the classroom. It was noted that 50% of the children had no issues in classroom and the remaining 50% had moderate to severe level of annoyance. Only 35% of the children were rated to have good device performance. The study revealed that 50% of the children with CI had poor attention during class. In the domain of communication, the teachers reported that more than half (Poor: 40%, Fair: 30%) of the children were fair to poor oral communicators. Only a 30% of the children who were implanted before the age of 3 years were good oral communicators.

The results indicated that the use of repair / compensatory strategies was limited among children with CI. Only 20% of them had the knowledge to use the strategies whenever there was a communication breakdown. The teachers reported that 75% of the parents of the children with CI were highly supportive of their children and the school administration.

In the present study a greater number of children reported to have fair (35%) to poor (20%) social interaction which can be suggestive of probing into psychosocial aspects and address the same. It was interesting to note that 80% of the children were reported to have good class participation by the teacher. The literacy components include writing and reading; it was interesting to note that majority of the children had fair (60%) writing abilities. The average class ranking of the child with CI revealed that out of the 20 who participated in the study, 14 were ranking below average in their academics.

Fisher's exact test was used to establish the significance between two variables, the age of implantation with school performance and cochlear implant experience with the school performance of the children with CI the results indicated there was no statistical significance ($p > 0.005$) when the school performance was not affected by the age of implantation and cochlear implant experience.

However, despite several gaps in learning, children with CI enjoyed participating in class activities. The overall performance of children with CI in the current study indicated that most of the children required additional professional help in most of the areas that influence education. Specifically, in the areas of communication, listening, social interaction, use of appropriate compensatory strategies, test taking skills, reading, and writing.

Discussion

The present study explored the performance of children with CI in the mainstream education by their class teachers who were the primary observant of their performance in school. The results of the study suggest that the performance of the children was highly variable as rated by the class teacher. It must be noted that, there is individual variability in terms of school performance and learning styles among the children with CI is based on their educational support system.

Mainstream performance is influenced by many factors that facilitate learning, amongst which listening in classroom is one of the most important pre-requisites for learning. It was noted in the current study 50% of the children exhibited only fair listening Abilities despite using the cochlear implant devise. Listening again can be affected by many factors as to room acoustics, Signal to noise ratio, mapping etc. However, in average Indian classrooms that have a large student teacher ratio does not allow the teacher to facilitate listening specifically for one child with the device in the classroom. The reason for poor listening can be attributed to the limitation in time whereby the teachers are unable to facilitate listening while the lessons are being taught (Archbold et al., 2002; Leigh et al., 2013).

The acoustics in a classroom is an important factor for a child with HI that facilitates listening. Classrooms that are acoustically treated or even located in a silent area can considerably reduce noise. However, Indian classrooms are not acoustically conducive for children with CI. The background noise levels of Indian classrooms have exceeded the recommended ANSI standards (50dBA) ranging from 58 to 68.2 dBA (Sundaravadhanan et al., 2017). Hence, it is evident that Indian classrooms do not have the most ideal conditions for listening. Therefore, this is a challenge for children with CI to make use of the CI device and listen to their full potential. Also, the level of classroom noise might vary and depending on the time and the region of location (Crandell & Smaldino, 2000). This indicated that the rating of the teacher might be based on the observation during any one point during the day. However, the rating by the teacher can be an overall observation made during the entire day.

The teachers reported that the children did not use any coping strategy whenever they had a communication breakdown. Apparently, most children in the current study were unaware of the breakdown in communication and strategies to assist for the same (Tye-Murray, 2012). The psychosocial aspects of children with CI have also been highlighted recently. It is observed in the study population that more than half of the children were rated to have poor social interaction in class. The limitation in oral communication may be one of the reasons that can indirectly affect their social skills.

Writing ability is one of the major components of literacy skills essential for mainstream education. However, most children were reported to have fair to poor writing skills. These findings were in consonance with the results of previous studies (Spencer et al., 2003). Children with HI displayed deviant forms of language in writing and also are unable to represent spoken language in written forms (Mayer & Wells, 1996). Out of the 20 children with CI, teachers reported only six children had competent verbal communication abilities and all of them were implanted before the age of 3 years (Archbold et al., 2002; Damen et al., 2007). Hence, the age of implantation will not be considered for better performance in mainstream (Spencer et al., 2003). The teachers reported that 80% of the children to be good participators in the class activities. Looking at the overall performance, 60% of the children performed poorly in the mainstream setting. This can be suggestive that a majority of the population post implantation required additional support to cope with the requirements of mainstream education.

The overall academic average was poor in most of the children, indicating below average in class ranking. The participants of the present study are enrolled in schools managed by state government. The teachers and parents in schools have limited knowledge of CI and educational accommodations for the same. Only awareness and professional training can increase awareness among mainstream educators. Also, from a parental perspective, Indian parents expect to enroll their children with CI in mainstream education irrespective of the child's capability to cope in educational system (Gladys Prathiba, 2020). Also, these groups of parents do not have the financial capacity to seek professional help in addition to the regular school expenditure. It was noted that none of the children who participated in the study were attending any additional therapy/support to cope with mainstream schooling. Therefore, the results from the present study indicate that the overall academic performance is below average for more 75% of the children who participated in the study.

Conclusion

The initiation of the state government has made CI more accessible to people in the rural areas. Therefore, more children with HI will receive CI and potentially join mainstream education. The direct clinical implication of the study is for the rehabilitation team involved in the process is to identify the gaps and facilitate mainstream education for children with CI. It also provides an insight to create awareness and make appropriate accommodations in a regular classroom. Given the educational systems in India, a larger representation of the sample would have provided finer details regarding the performance of children in CI in all spheres. Rehabilitation professional and teachers involved in process must take the essential steps to monitor the progress of the child in collaboration with the educators and parents to achieve optimal progress in mainstream.

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References

Anderson, I., Martin, J., Costa, A., Jamieson, L., Bailey, E., Plant, G., & Pitterl, M. (2005). Validation of the Common Objects Token (COT) Test for Children With Cochlear Implants. *Deafness & Education International*, *7*(3), 154–170. https://doi.org/10.1179/146431505790560347

Archbold, S. M., Nikolopoulos, T. P., Lutman, M. E., & O'Donoghue, G. M. (2002). The educational settings of profoundly deaf children with cochlear implants compared with age-matched peers with hearing aids: Implications for management. *International Journal of Audiology*, *41*(3), 157–161. https://doi.org/10.3109/14992020209077179

Bouton, S., Colé, P., & Serniclaes, W. (2012). The influence of lexical knowledge on phoneme discrimination in deaf children with cochlear implants. *Speech Communication*, *54*(2), 189–198. https://doi.org/10.1016/j.specom.2011.08.002

Chundu, S., Jeyaraman, J., Mandke, K., & Manchaiah, V. (2014). Benefits and Shortcomings of Cochlear Implantation in Children: Parental Reports from India. *International Journal of Speech & Language Pathology and Audiology*, *2*(3), 125–131. https://synergypublishers.com/jms/index.php/ijslpa/article/view/657

Crandell, C. C., & Smaldino, J. J. (2000). Classroom acoustics for children with normal hearing and with hearing impairment. *Language, Speech, and Hearing Services in Schools*, *31*(4), 362–370. https://doi.org/10.1044/0161-1461.3104.362

Damen, G. W. J. A., Langereis, M. C., Snik, A. F. M., Chute, P. M., & Mylanus, E. A. M. (2007). Classroom Performance and Language Development of CI Students Placed in Mainstream Elementary School. *Otology & Neurotology*, *28*(4), 463–472. https://doi.org/10.1097/MAO.0b013e318033efee

De Giacomo, A., Craig, F., D'Elia, A., Giagnotti, F., Matera, E., & Quaranta, N. (2013). Children with cochlear implants: Cognitive skills, adaptive behaviors, social and emotional skills. *International Journal of Pediatric Otorhinolaryngology*, *77*(12), 1975–1979. https://doi.org/10.1016/j.ijporl.2013.09.015

Gladys Prathiba, D. (2020). Benefits of Cochlear Implants in Children with Hearing impairment : Parental Perspectives from Tertiary Care Hospitals in Tamilnadu. In *Indian Journal of Public Health Research & Development* (Vol. 11, Issue 6). https://doi.org/10.37506/IJPHRD.V11I6.10596

Hintermair, M. (2011). Health-related quality of life and classroom participation of deaf and hard-of-hearing students in general schools. *Journal of Deaf Studies and Deaf Education*, *16*(2), 254–271. https://doi.org/10.1093/deafed/enq045

Kluwin, T. N. (2002). Social Processes and Outcomes of In-School Contact Between Deaf and Hearing Peers. *Journal of Deaf Studies and Deaf Education*, *7*(3), 200–213. https://doi.org/10.1093/deafed/7.3.200

Kyle, F. E., & Harris, M. (2006). Concurrent correlates and predictors of reading and spelling achievement in deaf and hearing school children. *Journal of Deaf Studies and Deaf Education*, *11*(3), 273–288. https://doi.org/10.1093/deafed/enj037

Leigh, J., Dettman, S., Dowell, R., & Briggs, R. (2013). Communication development in children who receive a cochlear implant by 12 months of age. *Otology and Neurotology*, *34*(3), 443–450. https://doi.org/10.1097/MAO.0b013e3182814d2c

Mayer, C., & Wells, G. (1996). Can the Linguistic Interdependence Theory Support A Bilingual-

Bicultural Model of Literacy Education for Deaf Students? *Journal of Deaf Studies and Deaf Education*, *1*(2), 93–107. https://doi.org/10.1093/oxfordjournals.deafed.a014290

Moog, J. S., & Geers, A. E. (2003). Epilogue: Major findings, conclusions and implications for deaf education. In *Ear and Hearing* (Vol. 24, Issue 1 SUPPL.). Lippincott Williams and Wilkins. https://doi.org/10.1097/01.aud.0000052759.62354.9f

Niparko, J. K., Tobey, E. A., Thal, D. J., Eisenberg, L. S., Wang, N. Y., Quittner, A. L., & Fink, N. E. (2010). Spoken language development in children following cochlear implantation. *JAMA - Journal of the American Medical Association*, *303*(15), 1498–1506. https://doi.org/10.1001/jama.2010.451

Prakash, S. S. (2012). Inclusion of children with hearing impairment in schools: A survey on teachers' attitudes. *Asia Pacific Disability Rehabilitation Journal*, *23*(3), 90–111. https://doi.org/10.5463/DCID.v23i3.117

Punch, R., & Hyde, M. (2010). Children with cochlear implants in Australia: Educational settings, supports, and outcomes. *Journal of Deaf Studies and Deaf Education*, *15*(4), 405–421. https://doi.org/10.1093/deafed/enq019

Spencer, L. J., Barker, B. A., & Tomblin, J. B. (2003). Exploring the language and literacy outcomes of pediatric cochlear implant users. *Ear and Hearing*, *24*(3), 236–247. https://doi.org/10.1097/01.AUD.0000069231.72244.94

Stinson, M. (1999). Empirical paper. Participation of deaf and hard-of-hearing students in classes with hearing students. *Journal of Deaf Studies and Deaf Education*, *4*(3), 191–202. https://doi.org/10.1093/deafed/4.3.191

Sundaravadhanan, G., Selvarajan, H. G., & McPherson, B. (2017). Classroom listening conditions in Indian primary schools: A survey of four schools. *Noise & Health*, *19*(86), 31.

Tye-Murray, N. (2012). Foundations of aural rehabilitation: Children, adults, and their family members. In *Deafness & Education International* (Vol. 14, Issue 3). 10.1179/1464315412Z.00000000018%5Cnhttp://ezproxy.umsl.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2012-25681-006&site=ehost-live&scope=site

Wu, C. M., Liu, T. C., Wang, N. M., & Chao, W. C. (2013). Speech perception and communication ability over the telephone by Mandarin-speaking children with cochlear implants. *International Journal of Pediatric Otorhinolaryngology*, *77*(8), 1295–1302. https://doi.org/10.1016/j.ijporl.2013.05.015

TABLES

Table 1: Scoring of the questionnaire

S.NO	Frequency of occurrence	Rating
1.	Very frequently	5
2.	Frequently	4
3.	Occasionally	3
4.	Rarely	2
5.	Never	1

Table 2: Interpretation of the rating

S.NO	Frequency of occurrence	Rating	Interpretation
1.	Very frequently	5	Good
2.	Frequently	4	
3.	Occasionally	3	Fair
4.	Rarely	2	Poor
5.	Never	1	

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