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READING FLUENCY IN CHILDREN USING COCHLEAR IMPLANTS AND HEARING AIDS: A STANDARD GROUP COMPARISON

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ABSTRACT

Fluency is an important reading skill as it provides the critical bridge between word identification and comprehension. Absence of reading fluency has a negative impact on reading success. Various researches have reported that hearing impaired children have poor reading fluency. There is a lack of literature in comparing performance in reading fluency among normal hearing peers, children using hearing aids and children using cochlear implants. The present study aimed to compare the reading fluency among children with normal hearing, hearing aid users and cochlear implantees. Three groups of subjects participated in the study. Group I had 7 children using cochlear implant, Group II had 7children who use hearing aids, and group III had 7 normal hearing children. Results indicated significant difference in reading fluency between normal children and children using hearing aids as well as cochlear implantees. However, no significant difference was seen between hearing aid users and cochlear implantees in reading fluency. It can be concluded that, both children using hearing aids and cochlear implants lack in terms of reading fluency.

Keywords: Hearing impairment, Prosody, Reading accuracy, Reading rate

Introduction

Reading fluency is the ability to read text accurately, automatically, and with proper expression while constructing meaning (Pikulski & Chard, 2005; Gunning, 2010). A fluent reader can maintain this performance for long periods of time, can retain the skill after long periods of no practice, and can generalize across texts. A fluent reader is also not easily distracted and reads in an effortless, flowing manner. There are three key elements for fluent reading i.e. reading accuracy, appropriate rate and prosody (Hudson, Mercer, & Lane, 2000). Word-reading accuracy refers to the ability to identify or decode words correctly. There must be a strong understanding of the alphabetic principle, to blend sounds together (Ehri& McCormick, 1998), and a large knowledge of high-frequency words are required for word-reading accuracy. Poor word-reading accuracy has obvious negative influences on reading comprehension and fluency. A reader who reads words incorrectly is unlikely to understand the author's intended message, and inaccurate word reading can lead to misinterpretations of the text.

Reading rate comprises both word-level automaticity and the speed with which a reader moves through connected text. Automaticity is quick and effortless identification of words in or out of context (Ehri& McCormick, 1998; Kuhn & Stahl, 2000). The automaticity with which a reader can decode or recognize words is almost as important as word-reading accuracy. Automaticity frees up cognitive resources that can be devoted to text comprehension (LaBerge& Samuels, 1974). Rate of speech can be calculated in terms of reading speed—either the number of words read correctly per minute or the length of time it takes for a reader to complete a passage. Poor readers are often characterized by slow, laborious reading of connected text.

Prosody is a linguistic term to describe the rhythmic and tonal aspects of speech: the "music" of oral language. Prosodic features are variations in pitch intonation, stress patterns (syllable prominence), and duration (length of time) that contribute to expressive reading of a text (Allington, 1983; Dowhower, 1991; Schreiber, 1980, 1991). These elements signal question, surprise, exclamation, and other meanings beyond the semantics of the words being spoken. When these features are present and appropriate in oral reading, the reader is reading prosodically, or "with expression." A fundamental task of fluent reading is to supply the prosodic features in a text, although they are not graphically represented (Schreiber, 1980). He suggested that fluent readers use the morphemic, syntactic, semantic, and pragmatic cues to organize the text into meaningful phrases and read with

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correct prosody. Struggling readers are often characterized as reading in a monotone without expression or with inappropriate phrasing. Prosody is an important area of focus for fluency instruction because prosody and reading comprehension seem to have a reciprocal relationship.

There is high correlations between reading fluency and comprehension with typical hearing readers (O'Connor, Bell, Harty, Larkin, Sackor, Zigmond, N. 2002; Rupley, Willson, & Nichols, 1998; Therrien, 2004). The National Research Council (Snow, Burns, & Griffin, 1998) recommended that reading fluency must be assessed regularly in the classroom and effective instruction be provided when dysfluent reading is detected. Despite the importance of reading fluency and the need for direct teaching (National Institute of Child Health and Human Development [NICHD], 2000), it is often neglected in reading instructional programs (Allington, 1983; Kame'enui& Simmons, 2001). According to Hudson, Lane, and Pullen (2005), a student who is unable to accurately decode words will be unable to understand a given text. For typically hearing children, research reveals that an absence of reading fluency instruction can have a negative impact on their reading success.

It is well known fact that most of the children who are hearing impaired have poor reading skills. Traxler (2000) states that the average 17 year-old deaf high school student reads on a 4th grade level. Children with hearing impairment are at a disadvantage compared to their hearing peers because they cannot implicitly learn the relationship between letters and sounds without direct instruction and access to sound. In addition, children with hearing impairment have limited vocabulary when compared to hearing children. Furthermore, researchers have found that many children with hearing impairment have inadequate speech and language skills when compared to typical hearing peers (Robertson, Wray, Wilkes, Dow, &Geers, 2004). There are many factors that can negatively influence successful reading acquisition for children who are hard of hearing. However, the advent of cochlear implants has left a noticeable mark on hearing impaired children's ability to achieve reading success. Geers (2003) conducted a comparable study on the word reading and comprehension level of children with cochlear implants. The study comprised of 181 children between the ages of 8 and 9.11 years who were implant users for from 4 to 6 years. The result indicated that, more than half of the children assessed scored within the average range for hearing children.

Need for the study

Fluency serves as a bridge between word recognition and comprehension. Individuals who are able to read effortlessly and accurately have more capacity to attend to the meaning and, as a result, better understand what they read. Many studies have carried out in comparing the reading fluency between normal children and children with hearing impairment (e.g., Qi & Mitchell, 2007;Spencer &Marschark, 2010). Although some research has documented about reading fluency in children with hearing impairment and children using cochlear implants, the literature is lacking studies on comparison of performance in reading fluency among normal hearing peers, children using hearing aids and children using cochlear implants. Hence the present study compared the reading fluency of children who use cochlear implant with children who use hearing aids and normal hearing children.

Aim: To compare the reading fluency among cochlear implantees, hearing aid users and normal hearing individuals.

Method

Subjects

The study comprised of three groups of subjects with Kannada language as their mother tongue. Group I had 7 male children using cochlear implant (CI), Group II had 7 male children who were fitted with hearing aids, and Group III had 7male children with normal hearing sensitivity. All the subjects were in the age range of 8- 10 years. All the Subjects in Group I and II had bilateral congenital severe to profound sensorineural hearing loss diagnosed by an audiologist. Subjects in Group I were fitted with hearing aids at the age of 3 to 4 years and were reported to have not benefitted with hearing aids and they have undergone cochlear implantation at the age of 6-7 years. Subjects in Group II were fitted with hearing aids bilaterally at the age 3 to 4 years. All the children in group I and II are attending normal school and undergoing auditory training programme and speech language therapy.

Procedure

The experimenters considered three critical aspect of fluent reading: word-reading accuracy, rate and prosody (Bursuck&Damer, 2011)

Material: Kannada reading passage "thollamathuaadu"

The standardized Kannada reading passage "tholla mathu aadu" was given to each participant. The participants were instructed to read the passage. A digital recorder was used to record the reading sample. Word reading accuracy calculations were made by finding the ratio of the total number of words recognized correctly by the experimenter over the total number of words in the passage. The reading rate was estimated, using the calculation of the number of words uttered by the total duration of the passage. The checklist developed by Hudson et al., (2005) was used to assess the prosody. The checklist contained questions focusing on vocal emphasis, voice tone, appropriate inflection, use of punctuation, prepositional phrases, pauses, subject verb division etc. The oral reading of the all the subjects were given to five different speech language pathologists (SLP's). The SLP's were instructed to listen to the reading sample carefully and asked to rate the questions in the checklist using a three point rating

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scale, where 0 indicated not present, 1 indicated sometimes present and 2 indicated always present. Average rating of five SLP's on each question of the checklist on each subject was estimated and was subjected to statistical analysis.

Results

Descriptive statistics was obtained for the word reading accuracy of children using CI, hearing aids and normal hearing subjects. Children using CI, hearing aids and normal hearing children obtained a mean score of 48.69, 51.24 and 90.70 with the standard deviation of 26.33, 24.12 and 8.42 respectively. Figure 1 represents the mean word reading accuracy in three groups.

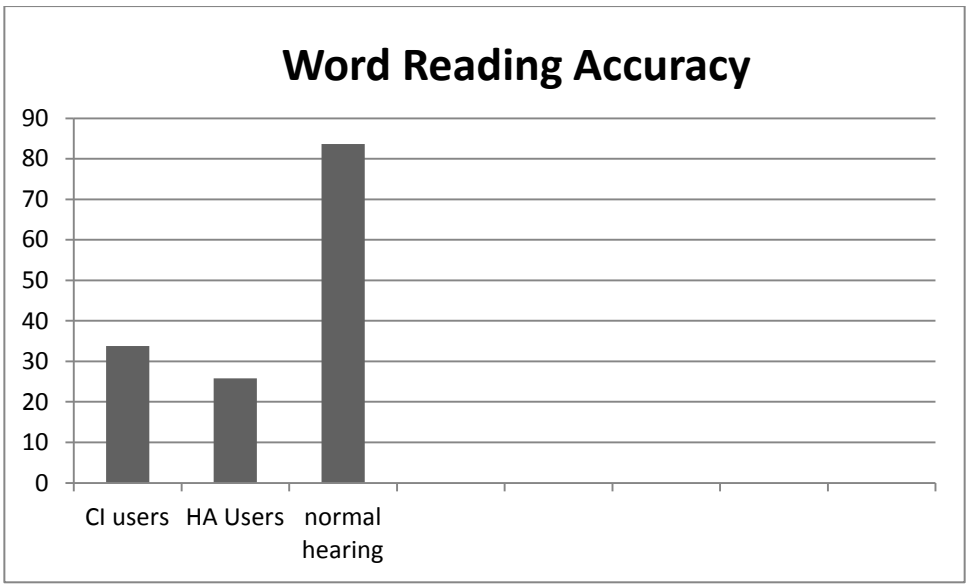

Figure 1: Mean word reading accuracy of cochlear implantees, hearing aid users and normal hearing children

One way ANOVA was carried out to compare the mean word reading accuracy across the three groups where the groups were taken as the independent variable and scores of word reading accuracy was taken as the dependent variable. The results indicated a significant difference in word reading accuracy across groups($p<0.05$). Bonferroni post-hoc test revealed a significant difference in word reading accuracy between normal children and children using CI and also between normal children and children using hearing aids. However, no significant difference was obtained between children using CI and Hearing aid users.

Similarly mean rate of speech was also determined for all the three groups. Normal children obtained highest rate of speech i.e. 83.65 (SD = 21.75), followed by children using CI i.e. 33.77 (SD = 14.29), and the children using hearing aids obtained the lowest mean score i.e. 25.80 (SD = 8.72). Figure 2 represents the mean rate of speech in three groups.

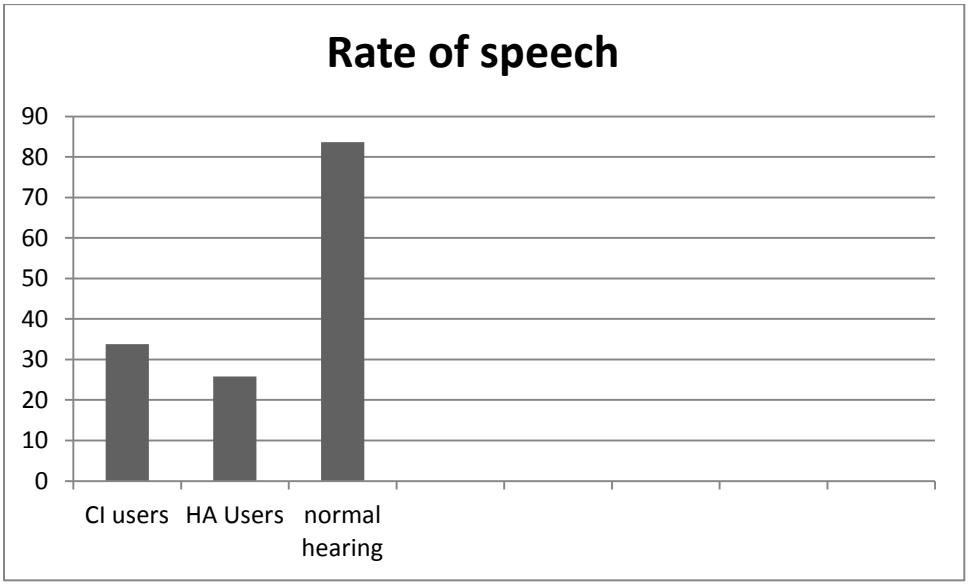

Figure 2: Mean rate of speech of cochlear implantees, hearing aid users and normal hearing children.

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To compare the mean across groups one way ANOVA was carried out and the results revealed significant difference across the group. Results of Bonferroni post-hoc test revealed a significant difference in rate of speech between normal children and children using cochlear implants, normal children and hearing aid users. No significant difference was obtained between children using CI and hearing aid users.

One way ANOVA was carried out to compare the average rating of five SLP's across groups on each question of the checklist, where groups were taken as independent variable and 8 different questions were taken as dependent variable. Results revealed significant difference across groups in all the 8 different questions. Further, Bonferroni post-hoc test indicated no significant difference between children using cochlear implants and hearing aids in 6 different questions except for two. Children using using CI obtained a higher rating compared to children using hearing aids on questions that assessed the use of appropriate vocal tone. The results also revealed significantly better score for normal children in all the variables when compared to the other two groups.

Discussion

The aim of the present study was to compare the reading fluency among normal children, children using hearing aids and cochlear implantees. It was clear from the results that compared to normal children, children using hearing aids and cochlear implantees obtained significantly poorer scores in word reading accuracy, rate of speech and prosody. This indicates that children with hearing impairment are poor in the reading fluency. The results also indicated that when compared to children using hearing aids, the cochlear implantees were better in reading rate and prosodic aspects of reading fluency, however it was not statistically significant. The reason for this could be the less years of exposure to sound through cochlear implant. Merely receiving a cochlear implant is not in and of itself a guarantee of reading success. The age at which one receives the implant is potentially an important factor. Although not all studies have found an age at implant effect (Geers, 2003), some have. For example, Archbold, Harris, O'Donoghue, Nikolopoulos, White, and Richmond (2008) assessed 105 deaf students, approximately ages 11 to 14 years, who were implanted before the age of 7 years. These students' reading abilities were assessed in the areas of vocabulary, sequencing, and sentence comprehension. This research showed that children who were implanted before a certain age (3.5 years) had a reading age commensurate with their chronological age.

The results of the present study can be supported by other studies for e.g. Kim et al., (2010) reported that, children using cochlear implants performed poor in reading fluency when compared to normal hearing peers. Various studies have been carried out on reading fluency in children with hearing loss. Traxler (2000) states that the average 17 year-old deaf high school student reads on a 4th grade level. Moores, (1987) reported that reading achievement levels for deaf children were far below than those of hearing children. Present study also revealed children with hearing loss performed poorer in three important aspects of reading fluency i.e. word reading accuracy, rate of speech and prosody. From the results of the present study and also from the literature support, it can be stated that children with hearing impairment have inadequate reading abilities. There is a high positive correlation between reading fluency and comprehension. The teachers of children with hearing impairment must pay attention to fluency in the classroom as part of the many things that hard of hearing children must acquire in order to be successful readers.

Conclusion

Reading fluency of children who use cochlear implant and hearing aids was found to be significantly lower when compared to normal hearing children. The possible reason can be the effect of hearing loss on the early language development. SLP must focus on improving the reading fluency in children with hearing loss, because studies have indicated that individuals who are fluent readers are able to process text effortlessly, which frees up working memory resources to focus on higher level reading processes such as word and phrase recognition, accessing prior knowledge, analyzing syntax, and checking for comprehension.

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