

COMPUTER INTERVENTION MODULE FOR CHILDREN WITH HEARING IMPAIRMENT

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I. INTRODUCTION

It is a well-known fact that any two persons with disability are not alike in their skills and deficits similarly any two languages are also not alike in their characteristics. In this context teaching children with special needs particularly those who have hearing impairment is quite a challenge considering the fact that children in India are exposed to bi/multilingual and multi cultural society.

Consequent to the development of technology the present scenario is to develop technology aided resources. This helps children with special needs to compensate for the deficits that they accrue owing to disability. The most basic and essential aspects generally considered is to help children develop / learn vocabulary for communication. In a bi / multilingual context such as India, majority of children with hearing impairment learn the second and third and other languages after picking up the home (native) language. As a consequence the children lose out on the critical period for language acquisition.

In view of the above factors, the aim of the present study is to get the child with hearing impairment to function as far as possible like typically developing hearing child. This approach only works with selected children who have enough residual hearing to comprehend some speech sounds, who are identified very early and whose parents can offer intense support for child's education. The bilingual-bicultural educational approach is modeled after programs for English language learners. The philosophy of these programs is that children should develop communicative competency in two languages through a solid base of instruction in their first language (Baker & Baker, 1997).

Since the severity of the hearing loss is not a determining factor, one must find other factors that identify the infants and young children most likely to be language-impaired (Conway. Alan G. Kamhi-1995). The language development in children with hearing impairment is generally slower and less complete compared to typically developing children who are learning their language naturally. Some words may be learnt but an overall and general understanding of the language is more often undiscovered. In order to facilitate speeded learning the study was designed to develop touch screen based

Tablet with Android application tool for children with hearing impairment in the age range of 8 to 10 years.

II. METHOD

10 typically developing participant (Group-I) from regular schools and 9 participants with Hearing impairment (Group-II) who are main streamed for education were selected. All the children were from Kannada speaking families and enrolled in English medium. The participants are assessed for their language and listening skills before initiating tech-based module. Each participant was asked to use the Mobile/Tablet in the presence of the investigator and the class teacher. Ten Lexical categories were selected from spoken language corpus (Mahalakshmi & Prema Rao,2012) and was loaded onto Mobile with Java platform Android 2.4 version application. Participants were given instruction in English and asked to choose an appropriate answer for the questions that were provided with the visual and audio clues. 9 participants with severe hearing impairment were included in the study. All the 9 participants were identified for disability around the age of two years and were fitted with binaural BTE hearing aids. The participants were enrolled in specialized preschool at AIISH, Mysore.

III. PROCEDURE

Pre training score (Baseline scores) of word knowledge, time taken to complete the module and the number of trials were noted. The performance of the participants in identifying correlating the pictures with words, listening, pronouncing words in English and Kannada was judged by the investigator and class teacher and scored for each trial. A happy face for all the correct answer and a sad face for all the incorrect answer were given as a feedback. Scoring and time taken are also displayed on the screen so that the trainer will get to know the start and stop time on a particular trial. A post-training lexical knowledge was also assessed. 90-95% criteria (score of 9 on a 10 point scale rating) was fixed to decide about children having learnt the lexicon. Pre-training and Post-training scores were compared for Group-I and Group-II. A comparative graph is plotted with reference to the number of trials versus performance on the task.

The results of the study offer a platform for research on a simple Augmentative Alternative Communication module that could be developed for the children with hearing impairment. Use of lexicon in English is a preliminary step to introduce the second language which is widely employed in the schools. This module emphasizes the ease of such training for children with special needs with technology support. Teachers are able to teach with ease as it involves audio, visual and interactive learning on a Mobile/Tablet. This Android application on a mobile or on a Tablet will encourage and provide a new dimension for bilingual children with disabilities. This is a user friendly environment for learning and a stepping stone towards an Augmentative Alternative Communication context.

This paper on Computer intervention module for Children with Hearing Impairment is not impractical but a need for children with hearing impairment and the statistical analysis show that there is no significant difference in the performance, of typically normal children and children with hearing impairment. This is achieved by the Mobile/Tablet with Java platform Android 2.4 version application software tool which displays the time taken, total score and gives a feedback for every correct or wrong answers once selected. This will help the class teacher to know whether the child was able to recollect and correlate the pictures on words that are thought. If not then can be trained using training module and note how he/she has improved over the trials which will help gauging him/her on learning abilities of two languages.

This paper is in developing a latest technology like the Android application tool for children with hearing impairment in two languages. Mobile/Tablet not only exposes the child to advance technology (touch screen) but also enables introducing learning on an interactive platform. Visual feedback on the screen of Mobile/Tablet gives feed back to the participant to learn words in English appropriately. Hence the participant will be able to scale his/her performance. The different stages of developing the frame work include the following.

1. Preparing the training module
2. Assessment on the module
3. Tabulating the scores, noting down the number of trials and time taken for each assessment
4. Plotting performance graphs between Normal and Hearing impaired participants, along with number of trials and time taken to complete the module

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The predominance of oralism began to wane in many European countries in the 1970s as across other continents since:- research studies began to indicate poor achievement levels of children with hearing impairment when only oralism was the approach. A seminal study by Conrad (1979), found that Deaf pupils left school with median reading ages of nine, with poor speech intelligibility and with lip-reading skills no better than those of the hearing population, despite their training in this area (quoted in Gregory, 1996). This dissatisfaction with oralism led to the introduction of what became known as 'total communication' methods and, later, followed by bilingual education.

Bilingualism is a complex term that is influenced by multiple factors, such as the age of acquisition of the second language, continued exposure to the first language, relative skill in each language, and the circumstances under which each language is learned in "Assessment of reading acquisition in bilinguals" (Gottardo & Grant, 2008). Bilingual research has shown that fluency in a first language is a strong

predictor of second language skill and that competence in a second language is a function of proficiency in a first language (Sharon Baker, ed.d. VI2 Integration of Research and Education January 2011). Regardless of this complexity, for the purposes of this paper, a simple definition of bilingualism is defined as 'knowing' two languages''(Valdez & Figueora, 1994, as cited in Gottardo & Grant, 2012) has been adopted.

A child can become bilingual by simultaneous acquisition or successive acquisition of the second language. A child under the age of 3 who is exposed to two languages usually experiences simultaneous acquisition. Successive acquisition of bilingualism happens when a child is exposed to the second language at an older age after learning the first language (National Center for Research on Cultural Diversity and Second Language Learning, 1995). Several experimental studies show that bilingual children learn new vocabulary in their second language (L2) more rapidly when it is initially presented in their first language (L1), (Perozzi & Sanchez, 1992). Corpus of vocabulary provides accurate information about language knowledge becomes a part of the drive to use technology to enhance language learning. Corpora can provide a data driven learning environment in the language teaching paradigm. A learner's corpora is as source of material to determine the goals for teaching language. Examples are provided in real time to the participant as a source of audio visual information(for example teaching lexical items of category of Automobile, Furniture, Fruits, Animals, etc. as been done by ELI-VM (English language Institute; university of Michigan) for testing and verification division to develop and validate various examinations for the certification of proficiency in English .On similar lines the present study employed the lexical categories listed in post doctoral research report (Mahalakshmi Prasad & Prema Rao, 2012).

In this approach, words of the first Language (L1 Native language Kannada) and the language of instruction in school (L2, English) are individually trained. Neurolinguistic findings suggest that if a child learns any language by the age of three then he/she will have the cognitive understanding to learn more languages. Often, Native Language (for example, Kannada) is treated as the first language of the participant with hearing impairment and is also used as the language of instruction in Karnataka. Participant with Hearing impairment can therefore learn English based on their knowledge of first language. This is a holistic approach that persons with disabilities have the right to be educated in the way that they choose and that organizations of people with disabilities should be involved in the design and implementation of programmes (stated by Salamanca Statement (1994)). The Disabilities Act 1995, reserves 3% seats for children with special needs in all Government educational institutions and other

educational institutions receiving aid from the Government as per Clause 39. It mandates that every child with a disability should have access to free education till the age of 18 years. Its endeavor is to promote integration of students with disabilities into regular schools as well as the setting up of special schools and to equip them with vocational training facilities (Clause 26).The Act also promotes research for the purpose of designing and developing new assistive devices, teaching aids, special teaching materials, etc, and it promotes teachers training programmers specializing in disabilities so that requisite trained manpower is available for special schools and integrated schools for children with disabilities. Denial of language results in poor educational levels leaving persons with language impairment ill-equipped to follow a trade or a business.

In view of the recent advances in teaching paradigm with the help of technology, the policy for inclusive education, and the empirical evidence suggesting facilitation of L2 learning with the help of L1 knowledge, the present study was designed to develop a technology enabled module to teach words in bilingual mode for children with hearing impairment. The study aimed at field testing of the module as well as comparison of performance of participants with hearing impairment in learning lexicon in L1 and

IV. METHODOLOGY

4.1 Selection of participants:

Nine participant with age range of 8-10 years with enrolled in a special pre-school in an urban area were selected for the study (Group II).A set of ten typically developing children matched for age and languages were also selected from a regular school for the comparison (Group I). All the participants were native speakers of Kannada language studying in Kannada medium(L1) and English language taught as (L2) second language in their curriculum. All the 9 participants GroupII were identified for disability around the age of two years and were fitted with binaural BTE hearing aids. The participants were assessed for their language and listening skills before initiating tech-based for training lexicon. The participant was asked to use the Mobile/Tablet in the presence of the class teacher. Ten Lexical categories were selected from spoken language corpus (Mahalakshmi & Prema Rao,2012) that were programmed on Mobile/Tablet with Java platform Android 2.4 version application. Pre training score (Baseline scores) number of trials and the time taken in each trial to complete the module with 90-95% accuracy in identifying, correlating the pictures with words, listening, pronouncing words in English and Kannada as rated by the investigator and the class teacher was noted. A happy face and tick mark with a comment is displayed for the right answer and a cross

mark for every wrong answer. Scoring and time taken is also displayed on the screen so that the class teacher will get to know the start and stop time on a particular assessment.

Performance of the participants GROUP-I (Typically developing children) was compared with that of GROUP-II (with hearing impaired).

4.2 Learning using Mobile/Tablet (Touch screen) with Application tool:

The various phases involved in developing the Tech-based bilingual lexicon training module are as follows:

- Developing an Android application that suit the purpose on Java platform
- Audio and Video reinforcement for training Module.
- Visual feedback on scoring pattern.
- Comparing the scores of each trial on the module.
- Plotting performance graph.
- Noting the data like Baseline scores, number of trails and time taken by each participant on the module.

4.3 Current method adapted:

- The teaching pre-reading pre-writing is done as per the checklists to assess different domains in preschool children with communication disorders (0-6) Titled "Development of an intervention module for preschool children with communication disorders (Swapna, Jayaram., Prema & Geetha,2010).
- The School Readiness Test (Asha Yathiraj et al., 2009) for the preschoolers is done and validated for higher classes.
- Students are enrolled into mainstream schools adapted by A.I.I.S.H Mysore to ensure children with disabilities (Hearing Impairment) after their preschool program are taken care off.
- These participants know to speak, read and write Native language (Kannada-L1) and also speak, read as well as write English (L2) as a medium of instruction.
- Children after getting enrolled will undergo training in both languages(Main stream)where half day (9am-1pm)will be spent at the regular school and next half day(1.30-4.30pm) will be trained at AIISH on same syllabus so that they get used to new topics and subjects.
- A.I.I.S.H has also take initiative to train the main stream teachers in handling and orienting on teaching, learning skills for children with special needs. Pre-school teachers will keep the tab of the improvement in children by noting their assessment scores at the school.

V. RESULTS

The data obtained on Group I and Group II participants on baseline measures and in learning bilingual lexicon was computed for the number of trials taken and the duration in each trial to achieve 90-95% accuracy in lexical learning. Table 1 shows the Mean and SD of the two groups. It was observed that there was no difference in the baseline performance in both the groups with Group I (8.4) and Group II (9.8). However, the mean score for the time taken was, in fact, shorter (46.66 seconds for 9 participants) for Group II (Hearing impaired) compared to Group I (59 seconds for 10 participants) for the entire set of lexical corpora.

Table-1
Group Statistics

groups		N	Mean	Std. Deviation	Std. Error Mean
Baseline Score	Normal	10	8.400	2.7568	.8718
	HI	9	9.889	.3333	.1111
Time	Normal	10	59.000	17.8450	5.6431
	HI	9	46.667	29.6268	9.8756

Figure-1 and Figure-2 .show the performance depicted for the two groups.

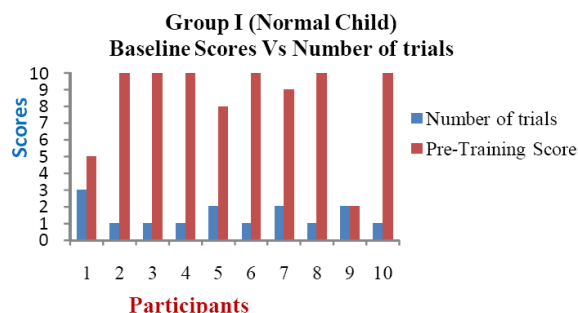


Figure-1

Number of trials is shown in the Figure-2.

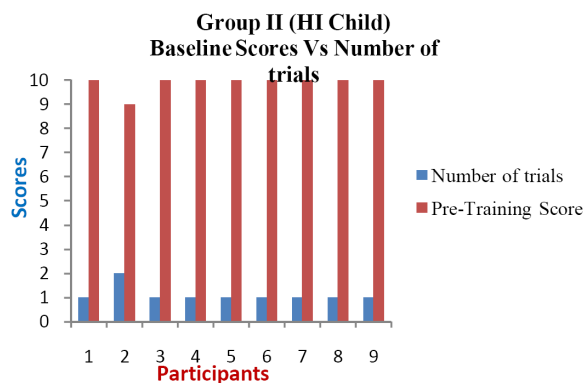


Figure-2

Figure 3 shows the time taken by the Group I and Group II during baseline measure. The Figure shows that Group I (typically developing children) took

longer time compared to Group II (hearing impaired) to correctly recognize the entire lexicon categories on Mobile/Tablet

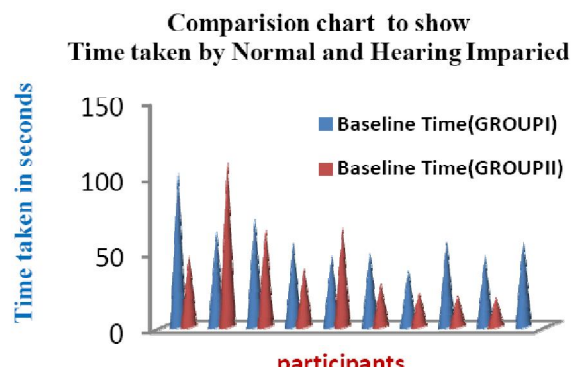


Figure-3

Figure 4 shows the number of trials taken by Group I and Group II which suggests that participant in Group I took more number of trials compared to those in Group II

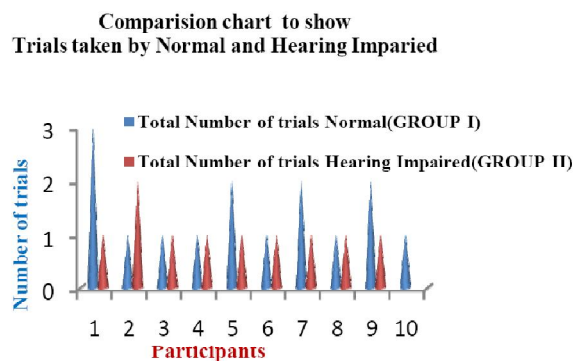


Figure-4

VI. DISCUSSION OF THE RESULTS OF THE STUDY

The results of the study are very encouraging from the perspective of adopting technology for teaching bilingual words for children with hearing impairment. While it was observed that the two groups of children selected for the study were approximating each other in their baseline measures (Table 1), the speed, number of trails and accuracy of learning was found to be higher in children with hearing impairment. The results are in consensus with earlier studies that report that children with hearing impairment learn L2 similar to that of typically developing children. The results of the study are, however, not in agreement with Perozzi & Sanchez (1992) who reported that children with hearing impairment show slower and less complete learning compared to the children who are learning their language naturally. The results of the study offer a platform for research on a simple Augmentative Alternative Communication module that could be developed for the children with hearing impairment. Clinical/educational implication of this module is that it may be used for children with

special needs with technology support. Teachers are able to teach easily as it involves audio, visual and interactive learning on a Mobile/Tablet. This Tech-based tool provides bilingual population with disabilities a user friendly mode in Augmentative Alternative Communication context. This translation in teaching learning process is between 8-10 years and is at word level. The properties of translated words using Android 2.4 platform from native language (Kannada) to English has been studied and compared with usual traditional method of class room teaching, this new technology with touch screen has made teaching the words of native first language (Kannada) speakers to easily pick on the English words.

VII. THE INTERVENTION AREAS IDENTIFIED ARE AS UNDER

1. Teacher environment — It should be pupil-centric and not teacher-centric
2. Reading skills improved
3. Assessment of children with hearing impairment
4. Teacher training improvement
5. More in-depth study to be conducted
6. More accountability
7. The need for a proper perspective
8. Development of need based infrastructure for intervention including technology support

CONCLUSION

To learn more than one language is the right of every child with hearing impairment and with the advancement of technology one can help this learning process simple, effective. This study also emphasizes that bilingualism is a need for children with hearing impairment and the statistical analysis show that there is no significant difference in the performance, rather the hearing impaired participants (Group-II) outperformed the task when compared to normal participant (Group-I). The study supports that bilingualism should be encouraged at earlier age with tech support for effective learning processes.

The clinical bottom line is that children who are deaf and hard of hearing are capable of becoming bilingual to the best of their ability when provided with adequate exposure and opportunities to support both languages. Practitioners need to provide families with a full range of options, including spoken language bilingualism because bilingualism allows DHH children equal access to important opportunities and allows for community membership.

IMPLICATION

1. Not only training children with their language of comfort, will be exposed to universal language with Mobile applications

2. Create awareness towards the latest technologies available
3. Improves reading in English will also help them to explore more information
4. Better opportunities in future when more participants enter into main stream of education
5. Parents hopes towards future will branch out in different directions
6. Easily understandable material helps the child to learn English quickly
e.g.: A-Apple/written in Kannada script
Saybu/Native word-applu

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