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DEVELOPMENT AND STANDARDIZATION OF SCHOOL READINESS TEST IN BANGLA FOR NORMAL HEARING CHILDREN AND CHILDREN WITH HEARING IMPAIRMENT USING COCHLEAR IMPLANT

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ABSTRACT

The study is an attempt to design an instrument in Bangla to assess school readiness of the Normal Hearing and Cochlear Implanted children aged 4-6 years. A rigorous literature survey backed by expert opinion has formed the dimensions, components of the dimensions and questions in each component were again validated by experts. Reliability study was taken care to assess the suitability of the developed test to be used. Independent sample t-test was applied to investigate whether there is any significant difference in the performance scores of the Normal Hearing Children and Cochlear Implanted children. Result confirms that the development test is reliable and significant difference in performance score among Normal Hearing Children and Cochlear Implanted children in the age group of 4-6 years exists.

Keywords: School readiness, standardization, general development, emotional development, social development.

Introduction:

Education provides us with knowledge about the world. It paves the way for a good career. It helps build character. It leads to enlightenment. It lays the foundation of a stronger nation. Education makes a man complete. Kautilya, an Indian philosopher, royal adviser, and professor of economics and political science very rightly underlined the importance of education, some 2000 years ago. He has highlighted the fact that education enriches people's understanding of themselves. He has said that education is an investment in human capital, and it can have a great impact on a nation's growth and development. As per Census 2001 India has approximately 60 million children in the age group of 3 – 6 years. The 86th Amendment to the Constitution, making education for children in the 6 – 14 age groups, a fundamental right, does not cover children less than 6 years of age. Right to Education Act, 2009 specified free and compulsory education of children from 6 to 14 years of age. A child can only be admitted to Class I when he or she attains the age of 6, but what about 5-year-old students who earlier used to get admission in Class I? Now that the government has taken a decision, the rights of 5-year-old children will also be protected. The preschool period which includes the age group between 3 to 6 years are the period of readiness.

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School readiness has not been formally defined, however, young children are increasingly expected to perform at predetermined levels in various developmental domains when they admitted to school in class I. Developmental proficiency and basic knowledge for example, colors, alphabet, numbers, an understanding of the conventions of reading are assessed to determine readiness (Kessler, 1991). Forget-Dubois et al. (2007) defined school readiness as a "multidimensional construct that refers to the cognitive, communicational, behavioral, and emotional skills, as well as basic knowledge that facilitate the child's learning and adjustment at school entry." It includes both cognitive and non-cognitive factors, hard and soft skills, general knowledge and approaches to learning, academic and socio-emotional components (Janus and Duku, 2007). School readiness is an important social issue because, on average, research suggests a significant percentage of children in the United States are not ready to learn when they enter into school. According to a national survey of children's school readiness, teachers reported that 35% of children residing in the United States lacked the skills necessary to perform well academically upon school entrance (Boyer, 1991). Although the Indian studies are not available focusing on the percentage of children with limited readiness skills; it was reported that many children do not attend kindergarten or nursery classes before they find a seat in class I do not acquire the certain developmental domains. School readiness programs target, in most cases, 3-6 age group and are designed to provide all necessary care and education of children for their development through physical, cognitive, linguistic, social and emotional growth. On an average only 26% of the pre- primary age children in the region have access to school readiness programs.

Federal bills and laws also influence how school readiness is constructed. The School Readiness Bill included the following standards in their conceptualizations of school readiness: (1) language knowledge and skills, (2) early literacy, specifically pre-reading skills, (3) early basic mathematical concepts, (4) cognitive skills, (5) socioemotional development that "supports" school success, and (6) for second language learners, English acquisition. In the year 1998, for the first time, policy makers articulated that school readiness should be the primary goal for Head Start programs (Parker et al., 1999). When the child develops the required skills before entering school, every aspect becomes streamlined for him. To asses these skills such as analysis, association ,balance, discrimination, dominance, figure ground, fine motor movements, gross motor movements ,short term memory, laterality and directionality, body image , lateral midline, eye movements , position in space, synthesis , closure, sequence, form constancy, academic skill and language skill., a standardized test is necessary. There is lack of earlier work in India, so language specific test would be beneficial.

Deaf children have more auditory access than ever before. Reasons for the diversity in the outcomes for implants include age of implantation and length of experience with the implant, type of rehabilitation received, physiology of the auditory system, presence of associated disabilities, nature of the educational setting and communication mode employed by the child. Most children with implants improve their speech and language skills regardless of the type of language programme they are in and most children in oral or auditory programmes remain delayed in language skills after implantation relative to hearing children (Marschark and Spencer, 2003).According to Wu et al. (2013), the academic achievements of Mandarin-speaking children who receive Cochlear Implants from a young age and are integrated into mainstream elementary school system appear to fall within the normal range of their age-matched hearing counterparts after 5-11 years of use. This study strongly suggests the need for future ongoing support for these children in communication field. Cochlear Implant users use residual hearing maximally in such a way that the holistic success of early intervention planning of hearing impairment may be utilized as a whole. Thus there is a need to assess the school readiness of Cochlear Implanted Children with reference to normal hearing counterpart regarding development of curriculum in inclusive education system. In India , Centre for Early Childhood Education and Development (CECED) (Annual report 2011-2012) in partnership with Andhra Mahila Sabha (AMS), Hyderabad and the Regional Center National Institute of Public Cooperation and Child Development (NIPCCD), Guwahati conducted study on variations in content and processes across Early Childhood (ECE) Centres, public, private and voluntary and identified quality related elements that demonstrate significant impact on immediate basis in terms of school readiness and adaptive behavior and on medium term basis on primary school outcomes. When the child develops the required skills before entering school, every aspect becomes streamlined for him. To asses these skills such as analysis, association ,balance, discrimination, dominance, figure ground, fine motor movements, gross motor movements ,short term memory, laterality and directionality, body image , lateral midline, eye movements , position in space, synthesis , closure, sequence, form constancy, academic skill and language skill., a standardized test is necessary. A very little work has been done to assess academic related skills like reading, auditory comprehension, short term memory in Indian languages. A Reading Readiness Test in Kannada was developed by Devaki Devi in 1978. Therefore, there is a need of development and standardization of School Readiness Test in Bengali because of the dearth of language specific test to assess school readiness in Bengali.

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Aim of the Study:

The study aims at developing a Bengali School Readiness Test and standardization of the test.

Objectives of the study:

i. To develop school readiness test in Bengali.
ii. To establish validity of the test material.
iii. To measure test re-test reliability.

Hypothesis:

i. The developed School Readiness Test in Bangla will be standardized.
ii. The developed test will be reliable and internally consistent.
iii. There will be a significant difference in performance score in normal hearing child and children with hearing impairment.

RESEARCH DESIGN AND METHODOLOGY

The study wasdescriptive research. The method and the procedure adapted for the study are described here.
Sample: The study consisted two group of participants Group I was comprised of 30 hearing children aged from 4 – 6 years and Group II was comprised of 30 (4 - 6 years) children with bilateral severe to profound sensory neural hearing loss. The criteria for selection of the subjects were all the participants in this group-I was attending Kindergarten system regular school Bangla as their medium of instruction. No known history of any sensory impairment. No known psychosocial and behavioral problem. No known cognitive deficit. No known neurological involvement. Children with bilateral severe to profound sensory neural hearing loss using monaural or binaural cochlear implant (cochlear implant was done within maximum 3 years of birth. All the participants in group-II were attending preschool for the Hearing impaired children, Auditory Verbal Therapy centre or regular schools in various part of Kolkata and suburbs, Bangla as their medium of instruction, no known psychosocial and behavioral problem , no known cognitive deficit and no known neurological involvement.

Tools: The test was developed in Bangla considering 20 skills or domains. These include analysis, association, balance, discrimination, dominance, figure ground, fine motor movements, gross motor movements, short term memory, laterality and directionality, bodyimage, lateral midline, eye movements, position in space, synthesis, closure, sequence, form constancy, academic skills and language skills. The valid material as well as the activities was included for the test and the final test was developed based upon the 20 domains as discussed above. The timing for competition of the test on each participant was approximately 45 minutes. The materials as well as activities which were used for the test was validated by 2 speech pathologists, 2 psychologists, 1 special educators, 2 linguists as judges and itemized scores was taken out through which its validity was measured by rating through a three (3) point Likert Scale; where (2) zero was irrelevant, one (2) was partially relevant and two (3) was completely relevant. Cronbach's alpha result was 0.82, relevant and completely relevant questions were selected for the questionnaire. The researcher personally visited the schools; clinic to meet the class teachers as well as clinician and the test was administered on both the groups. Internal Consistency was measured by the homogeneity of twenty domains through co- relating each domain. Test – Re test reliability was checked by re-administering the same test on all participants after two weeks interval.

Statistical Analysis:

Statistical process was followed to find out the result from raw data. T- Test was applied for analyzing the data. It was completed using r" console software and Pearson's Correlation Coefficient Test was applied for measuring internal consistency and Test Re-Test reliability.

Results and Discussion

School readiness is increasingly being recognized as major need in education as it has far reaching consequences in a child's educational and later life. School readiness assessments have been criticized for a lack of multidimensional assessment approach (Mohamed, 2013).In contrast to previous studies, which are generally univariate in their approach, this research aimed at a multidimensional approach to assessing at risk factors in preschool learners in the age cohort (4-6 years).

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School Readiness Test in Bangla measures general development, social development, emotional development, analysis, association ,balance, discrimination, dominance, figure ground, fine motor movements, gross motor movements ,short term memory, laterality and directionality, body image , lateral midline, eye movements , position in space, synthesis , closure, sequence, form constancy, academic skills and language skills and Reading readiness skills.

Validity of the Test tool: Inter judge agreement was observed by using Cronbach's alpha value = 0.82.

Reliability**:**Pearson's Product Moment Correlation Coefficient has been used to find out the internal consistency and reliability of the questionnaire.

Table 1: Dimension wise correlation coefficient and significance value for Normal Children:

Dimensions	***p- Value***	***r***
Non Verbal Evaluation	**0**	**0.997477**
Numeracy	**0**	**1**
Verbal Evaluation/ Language Development	**0**	**0.985203**
Reading Readiness Evaluation	**0**	**0.98395**
Subtotal	**0**	**0.997794**

Table 1 revealed Pearson's Product Moment Correlation Coefficient of the high values of internal consistency and test re-test reliability of Normal Hearing Children as Non Verbal Evaluation (r = 0.9), Numeracy (r = 1), Verbal Evaluation of Language Development (r = 0.9), Reading Readiness Evaluation (r = 0.9), and Sub Total of all the Components (r = 0.9). Thus the four dimensions of the developed test has high values of Pearson's Product Moment Correlation Coefficient.

p = 0 reveals that there was significant correlation among Test and Re-test condition at 95% of confidence interval.

Hassan et al. (2014) in their study stated that Pearson's correlation was used to assess the association between the different parametric data. For all tests a probability (P) value less than 0.05 was considered significant.

Three groups were selected, according to Language test, Pure Tone Audiometry (PTA) and Auditory Brain Stem Response (ABR). Group I included fourteen children with severe and/or severe to profound SNHL aided with proper hearing aids. Group II consisted of fourteen children with CI (MED-EL and Nucleus) and group III included fourteen children with normal hearing. Receptive, Expressive and total language quotients were calculated using the Arabic Language test. Assessment of psycholinguistic abilities was done using the Arabic version of the Illinois Test of Psycholinguistic abilities.

Results of the Arabic language test indicated that CI children showed significant differences (<0.05) in all language parameters (Receptive, Expressive and total language age) in comparison to HI children. Control group showed highly significant differences (<0.01) in comparison to both CI and HI groups in all language parameters (Receptive, Expressive and total language age).

In the above mentioned study attention was directed toward auditory and visual short-term memories, which seems to be related to cognitive processing tasks and language development. Thus, all children of the three groups were selected to be free from any neurological, behavioral deficits and within average mentality. In the study children with cochlear implantation were significantly better in all language skills in comparison with HI children. However all language parameters were significantly lower in HI and CI groups in comparison to normal control group. This finding could be explained by the increased ability of the children with CI to comprehend speech and improve their speech intelligibility in addition to faster acquisition of speech production and language development. So, here in this study also it may be said that the reason behind low score of cochlear implanted children (shown in Table 3) in response to normal language development depends on intact sensory channels and early hearing impairment has its impact on language acquisition and competence which the Normal Hearing Children acquired due to their exposure to hearing environment since birth. As in India hearing screening during birth is so rare resulting the children with hearing impairment to be identified later, in that case they may lag behind their hearing peers.

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Table 2: Component wise correlation coefficient and significance value for Normal Hearing Children:

Component	*p- Value*	*r*
General Development	0	1
Emotional Development	0	1
Social Development	0	1
Analysis	NA	NA
Association	0	0.980762
Balance	0	0.985649
Discrimination	0.006265	0.769033
Figure Ground	0	0.979505
Fine motor movements	0	0.983818
Gross motor movements	0	1
Short term memory	0.000218	0.625678
Laterality and Directionality	0	0.994904
Body image	0	0.979558
Body image	0.000845	0.839246
Lateral midline	0	0.98585
Eye movements	0.021987	0.715375
Position in Space	0	1
Synthesis	0	0.988294
Closure	0	1
Sequence	0	0.989571
Form constancy	0	0.986594
Numeracy	0	1
Language development/Auditory STM	0.004556273	0.95412
Auditory Long term memory	0.008254659	0.921132
Auditory closure	0.004982292	0.748109
Auditory Sequence	0.001076133	0.836226
Auditory Association	0.000638029	0.8427
Auditory Figure Ground	0.020415979	0.684442
Reading Readiness test/Auditory Discrimination	0.003096313	0.949698
Rhyming words	0	0.986666
Memory	0	0.984651
Visual discrimination	0.000921001	0.801784
Visual Short Term memory	0.035448609	0.893238
Spatial test	0.003096313	0.950061

In Table 2 Pearson's Product Moment Correlation Coefficient component wise reveals that there is a significant positive correlation (as the correlation coefficient value is more than 0.6) for all the components. For the component of "Analysis", correlation and significance value are not applicable because the total score for "analysis" is equal for both Test and Re-Test. So in this component it was obtained that item score of Test and Re-Test were same. Thus it is beyond the measures of correlation at $r^2=0$.

Hassan et al. (2014) used Pearson's correlation to assess the association between the different parametric data. For all tests a probability (P) value less than 0.05 was considered significant.Results of auditory short-term memory subtests revealed significant differences (<0.05) in CI group in comparison to HI Group regarding all parameters of auditory short term memory (sound blending, auditory association, auditory closure and verbal expression). Also there were highly significant differences (<0.01) between control group and CI and HI groups in all auditory short term memory. On testing the visual short term memory, all children who are normal hearing and hearing impaired were assessed with tasks that did not demand speech, to avoid absence of answers due to language impairments.

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The results were comparable for HI and CI groups regarding all subtests of V-STM. However, all subtests of V-STM (Visual Sequential memory, Visual reception, Visual closure and Manual expression) were better in HI and CI groups in comparison to normal control group. So it can be assumed that when visual short term memory is used the performance of cochlear implanted children and normal hearing children may not vary.

Table 3: Dimension wise correlation coefficient and significance value for Cochlear Implanted Children:

Dimensions	*p. value*	*r*
Non verbal	**0**	**0.999438147**
Numeracy	**0**	**1**
Verbal Evaluation Language	**0**	**0.998974287**
Reading Readiness Evaluation	**0**	**0.998968663**
Sub Total	**0**	**0.999761251**

Table 3 indicated Pearson's Product Moment Correlation Coefficient of the high values of internal consistency and test re-test reliability of Cochlear Implanted Children as Non Verbal Component ($r = 0.9$), Numeracy ($r = 1$), Verbal Evaluation of Language Development ($r = 0.9$), Reading Readiness Evaluation ($r = 0.9$), and Sub Total of all the Components ($r = 0.9$). It indicates that there is a significant positive correlation (as r –value is close to 1) for all the four dimensions of the developed test. **p = 0** reveals that there was significant correlation among Test and Re-test condition at 95% of confidence interval.

Spencer et al. (2003) selected sixteen pediatric cochlear implant users' language and literacy skills were evaluated and then compared with a reference group of 16 age-matched, normal-hearing children. All 32 participants were educated in mainstream classes within the public school system in the Midwest. The “Sentence Formulation” and “Concepts and Directions” subtests of the Clinical Evaluation of Language Fundamentals-3 test were used to evaluate receptive and expressive language skills. Reading comprehension was evaluated with the “Paragraph Comprehension” subtest of the Woodcock Reading Mastery Test. Performance measures for the writing analyses included productivity, complexity and grammaticality measures. In the above mentioned study the results of the language performance measures (i.e., “Formulated Sentences” and “Concepts and Directions” subtests of the CELF-3) for each of the two groups are presented as, the mean standard score for the cochlear implant group on the “Formulated Sentence” subtest was 5.14 (SD = 2.38), while the mean standard score for the normal- hearing group was 10.25 (SD = 3.09); a t-test demonstrated that these means were significantly different [$t(27) = -5.02$, $p < .0001$]. The mean standard score for the cochlear implant group on the “Concepts and Directions” subtest was 7.17 (SD = 2.48) while the mean standard score for the normal-hearing group was 9.44 (SD = 3.32); these means were also significantly different [$t(28) = -2.06$, $p < .05$]. The standardized scores of the cochlear implant group placed on an equal-interval scale by converting them into z-scores based on the mean and standard deviation of the normal-hearing group. This reveals that for the expressive subtest, “Formulated Sentences,” the cochlear implant group scored 1.6 SD below the mean of the normal-hearing group (represented by an average score of 0). For the receptive subtest, “Concepts and Directions,” the performance of the cochlear implant group was .69 SD below the mean of the normal-hearing group.

Spencer et.al. (2003) applied Woodcock Reading Mastery Test (Woodcock, 1987) to observe whether there is any significant difference across normal and cochlear implant children in reading mastery. They observed a significant mean difference in reading performance across the normal hearing group and the cochlear implant group. The normal-hearing group obtained a mean standard score of 99.5 (SD = 14.09), whereas the cochlear implant group obtained a mean score of 90.13 (SD = 11.18). The mean difference was significant at .05 level. Although the cochlear implant group scored lower on the “Passage Comprehension” subtest than the normal-hearing group, the mean score of each group is within 10 points on the standard scale. In grade equivalency terms, the cochlear implant group obtained a mean grade equivalency of 3.3 (SD = .94), whereas the normal-hearing group obtained a mean grade equivalency of 3.8 (SD = .68). The minimum standard scores for the cochlear implant group and the normal-hearing group were 71 and 71, respectively. The maximum standard scores for the cochlear implant group and the normal-hearing group were 118 and 120, respectively. Therefore the range of standard scores for both groups was similar. The results of the above review of literature suggest that the language skills of pediatric cochlear implant users are related to and correlated with the development of literacy skills within these children. Consequently, the performance of the cochlear implant users, on various language and literacy measures, compared favorably to an age-matched group of children with normal hearing. There were significant differences in the ability of the cochlear implant users to correctly utilize grammatical structures such as conjunctions and correct verb forms when they were required to formulate written and oral sentences. Thus obliging with the review of literature it may be said that expressive language performance is more challenging to children with cochlear implants and it would be appropriate for their educational or remedial language programs to emphasize the use and development of these structures.

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Table: 4: Component wise correlation coefficient and significance value for Cochlear Implanted Children:

Components	*p-value*	*r*
General Development	**0**	**1**
Emotional Development	**0**	**1**
Social Development	**0**	**1**
Analysis	**0**	**1**
Association	**0**	**1**
Balance	**0**	**0.995406**
Discrimination	**0**	**0.997306**
Figure Ground	**0**	**1**
Fine motor movements	**0**	**0.996904**
Gross motor movements	**0**	**0.961021**
Short term memory	**0**	**1**
Laterality and Directionality	**0**	**0.997753**
Body image	**0**	**0.997494**
Body image	**0**	**1**
Lateral midline	**0**	**0.997245**
Eye movements	**0**	**0.966743**
Position in Space	**0**	**1**
Synthesis	**0**	**1**
Closure	**0**	**1**
Sequence	**0**	**1**
Form constancy	**0**	**1**
Numeracy	**0**	**1**
Language development/Auditory STM	**0**	**1**
Auditory Long term memory	**0**	**1**
Auditory closure	**0**	**1**
Auditory Sequence	**0**	**0.988186**
Auditory Association	**0**	**1**
Auditory Figure Ground	**0**	**0.987272**
Reading Readiness test/Auditory Discrimination	**0**	**1**
Rhyming words	**NA**	**NA**
Memory	**0**	**1**
Visual discrimination	**0**	**1**
Visual Short Term memory	**0**	**0.968579**
Spatial test	**0**	**1**

Table 4 highlights Pearson's Product Moment Correlation Coefficient for all the components of the developed test. Correlation coefficient reveals that there is a significant positive correlation (**r**>0.96 for all the components). It is evident in the above table that for the entire component a significant positive correlation exists between Test and Re-test. For the component of "Rhyming words", correlation and significance value are not applicable because the total score for “Rhyming words” is equal for both Test and Re-Test. So in this component it was obtained that item score of Test and Re-Test were same. Thus it is beyond the measures of correlation at $r^2=0$.

In a study conducted by Huber and Kipman (2012), Children with CI scored significantly worse on the Comprehension, Vocabulary, and Number Sequences (NS) tests. They also performed worse on the Salzburger Lese–Screening (SLS); however, the difference is not significant. In all other tests, performance did not differ significantly between theCI group and normal-hearing group. Results of the MANOVAs show the same results: Children with CI differ significantly from normal-hearing children on the Comprehension (F= 4.30, P= .045), Vocabulary (F=26.40, P= .000), and Number Sequences (F= 6.05, P=.017) tests. Hence, it may be said that Cochlear Implanted Children may have deficits in those auditory and cognitive abilities that have been shown to be fundamental to language learning, such as working-memory capacity and phonological awareness. The advent of cochlear implants (CI) has brought with it the goal of spoken language performance on par with that of normal hearing (NH) listeners. This goal is not met purely on technology, requiring further behavioral intervention, and CI recipients are found to lag behind their NH peers. Several factors have been identified to account for this lag, with age of implantation appearing to account for most of the variance. The comparison of means and significance level between Normal Hearing Children and Cochlear Implanted Children on all the dimensions of the test (Non Verbal Evaluation, Numeracy, Verbal Evaluation, and Reading Readiness Evaluation) is given below in Table No. 5.

Table 5.Dimension wise comparison of mean and significance level for Normal Hearing Children and Cochlear Implanted Children:

Dimensions	*p. value*	*t. statistics*	*Normal hearing children (mean)*	*Cochlear implanted children(mean)*
Non-verbal Evaluation	**0.03**	**8.966297**	**236.333333**	**159.1724**
Numeracy	**0.03**	**6.958885**	**16.2333333**	**10.13793**
Verbal Evaluation/ Language development	**0.O5**	**21.63906**	**41.1666667**	**6.827586**
Reading Readiness Evaluation	**0.001**	**12.1336**	**18.4666667**	**6.793103**
Sub Total	**0.001**	**12.05484**	**312.1**	**182.9655**

Table 5 reveals that there is a significant difference of mean of performance score at 95% confidence interval among Normal Hearing Children and Cochlear Implanted Children on the entire dimension. In table 5 it could be seen that there is significant difference in the Language development dimension between Normal Hearing Children and Cochlear Implanted Children. In this respect a study stated that there is a wide variation in individual outcomes following cochlear implantation, or using hearing aids. Some Cochlear Implant recipients or Hearing aids users never develop useable speech and oral language skills. The causes of this enormous variation in outcomes are only partly understood at the present time (Hassan et al, 2014). The cause of this phenomenon may be assumed that Hearing Impaired individuals have poor auditory short-term memory (A-STM) in comparison to normal hearing individuals. Also, Hearing impaired individuals have visual short-term memory (V-STM) better than normal hearing individuals. Cochlear Implanted children have decreased auditory verbal-STM which may be due to associated language impairment. So, multisensory training is needed both in therapy sessions and classrooms with more focus on visual stimuli. In a study conducted by Punch and Hyde (2011), reported by more than two thirds of parents that their children were able to participate easily in a regular class, and slightly more than one third of teachers reported this. Between 50% and 60% of teachers disagreed that children were achieving high standards in reading, writing, and math ordered achieving at the expected level for their age, whereasbetween18%and 23%ofparentsindicated disagreement on these items. Almost 70% of children in the teacher reports fell below the class median in academic performance. The component wise comparisons of mean for the two groups are given in the Table 6 below.

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Table 6: Component wise comparison of mean and significance for Normal Hearing Children and Cochlear Implanted Children:

Components	*p. value*	*t. statistics*	*Normal Hearing Children(mean)*	*Cochlear implanted Children (mean)*
General Development	0.590899514	5.981467849	9.466666667	7.827586207
Emotional Development	0.069752393	1.848596413	13.66666667	12.82758621
Social Development	0.567940085	0.574456094	9.1	8.931034483
Analysis	0.004613819	3.079176006	15	12.86206897
Association	0.019370643	2.427994729	7.066666667	5.379310345
Balance	0.000152452	4.138639429	9.266666667	7.620689655
Discrimination	0.006935725	2.848683965	8.366666667	6.931034483
Figure Ground	0.938735185	0.07720428	9.066666667	9.034482759
Fine motor movements	0.298425864	1.05150648	9.7	9.172413793
Gross motor movements	0.024481291	2.310883198	17.6	16.72413793
Short term memory	0.000135751	8.655463304	9.766666667	4.310344828
Laterality and Directionality	0.009172127	10.01735592	38.66666667	7.24137931
Body image	0.242954702	1.180533102	6.5	4.862068966
Body image	0.055368338	8.42510652	13.73333333	10.06896552
Lateral midline	0.022507034	8.360204107	13.63333333	8.448275862
Eye movements	0.066705675	4.302228022	9.566666667	7.724137931
Position in Space	0.00058126	7.311744651	9.6	6.379310345
Synthesis	0.144210846	1.480916826	3.133333333	2.275862069
Closure	0.002751415	6.096899774	9.633333333	6
Sequence	0.0004	6.997606323	9.4	2.724137931
Form constancy	0.007749	4.864521221	4.4	0.827586207
Numeracy	0.001912137	6.958885291	16.23333333	10.13793103
Language development/Auditory STM	0.001076021	6.746308783	5.1	0.517241379
Auditory Long term memory	0.000141921	7.84663114	7.333333333	0.344827586
Auditory closure	0.00716642	24.51026082	7.866666667	0.310344828
Auditory Sequence	0.008964482	10.14969487	8.266666667	4.551724138
Auditory Association	0.000217564	24.48759937	8.933333333	0.068965517
Auditory Figure Ground	0.001573598	12.81921144	4.3	0.896551724
Reading Readiness test/Auditory Discrimination	0.019037486	10.89765199	2.733333333	0.068965517
Rhyming words	0.001445597	3.520188867	1.033333333	0
Memory	0.00131311	6.290737284	7.433333333	3.793103448
Visual discrimination	0.000333521	4.000321783	3.8	2.275862069
Visual Short Term memory	0.000197	7.593445571	1.766666667	0.517241379
Spatial test	0.001853592	12.77850395	1.733333333	0.13793103

Table 6 indicates the mean and significance level for the Normal Hearing Children and Cochlear Implanted Children for all the components under dimensions Non Verbal Evaluation, Numeracy, Verbal Language Development, Reading Readiness Evaluation and the Subtotal of the dimensions. Though, all the dimensions highlighted significant difference, there are some components in which there is no significant difference of mean of performance score between the Normal Hearing Children and Cochlear Implanted Children. These components are "Emotional development", "General development", "Social development", "Figure- ground", "Fine motor development", "Body image(1)" and "Synthesis" ($p > 0.05$). All these components belong from Non Verbal Evaluation dimension. Thus it conveys that there is a significant difference among all the dimensions of school readiness test for Normal Hearing Children and Cochlear Implanted Children in an overall basis as showed in Table 5. Hence, the formed hypothesis that there will be a significant difference of mean of performance scores for Normal Hearing Children and Cochlear Implanted Children holds true and the hypothesis may be accepted.

In an Australian study teachers reported their perceptions of children's functional outcomes in a range of communication, academic, social, independence, and identity areas. Reported achievements in literacy, numeracy, and social development were below class levels of Normal Hearing Children.

The reasons illustrated as behind this outcome may be the difficulties for schools and families in regional and remote areas and seemed particularly aware of the additional demands and stresses on families in these areas. These findings reflect those from our surveys and interviews with parent, which strongly show the difficulties regional and rural families experienced. Although agencies such as implant clinics, audiology services, and early intervention centers make ongoing efforts to improve prompt access to ongoing services for families in regional and remote parts of Australia, it is clearly essential that these efforts are continued and expanded (Punch and Hyde, 2010).

In this respect it could be related to present study outcomes where the cochlear implant children in concurrence with those reported by previous studies indicating that children with cochlear implants continue to lag behind their hearing peers in academic achievement.

The literature reports significant academic gains for children with cochlear implants compared to profoundly deaf children without implants but generally suggests that implanted children continue to fall behind their hearing peers (Marschark et al., 2007). For instance, Thoutenhoofd (2005) found a performance gap in academic attainment between students with cochlear implants and all Scottish schoolchildren, based on the Scottish National Test data; however, the gap was smaller than the gap for profoundly deaf children without implants. In mathematics, the cochlear implanted children were comparable to students with a moderate hearing loss, whereas in reading and writing they were comparable to children with a moderate to severe loss. In their follow-up study of U.S. students who had received a cochlear implant between the ages of 2 and 5 years, Geers and her colleagues found that the majority of students did not have age-appropriate reading levels when aged 15–18 years, although most surpassed the levels commonly reported for deaf teenagers (Geers, Tobey, Moog, and Brenner, 2008). Certain factors, in particular younger age at implantation, are generally associated with higher literacy and academic levels (Archbold et al, 2008; Connor and Zwolan, 2004).

A study compared cognitive performance of 40 children with cochlear implants (of the initial 65 eligible for this study) with performance of normal-hearing children. Furthermore, it was analyzed the relations between hearing, medical/Audiological, and social/educational background variables and cognitive performance, as well as relations between academic skills and cognitive performance. Finally, it was assessed to what extent various background variables explain cognitive performance. Children with Cochlear Implant performed at an average level, compared with the 40 matched normal-hearing children, in inductive reasoning (''nonverbal IQ''), auditory Short Term Memory, visual Short Term Memory, and selective visual attention. They performed worse in commonsense knowledge, vocabulary, and deductive reasoning (mathematical logical reasoning). Auditory Short Term Memory, commonsense knowledge, and deductive reasoning correlated with reading and arithmetic achievement. Cognitive performance of children with Cochlear Implant was strongly connected to hearing variables such as age of fitting the hearing aids, age at first and second implantation, duration of first implant use, bilateral implantation, and social background variables. Early hearing, provided by hearing aids and CI, pro motes the early development of oral language in deaf children, and in this case, the first language acquisition may be very similar to that of normal-hearing children. Because normal-hearing children use strategies of inductive reasoning to learn general linguistic rules (e.g., flexion rules for the conjugation of verbs), inductive reasoning is trained simultaneously to language acquisition, which may also be the case for early hearing children with Cochlear Implant (Huber and Kipman, 2012). In this study a major resemblance of the performance of Cochlear Implanted Children with Normal Hearing Children has been seen that the Normal Hearing Children outperformed in comparison with the children with cochlear implant. The reason could be due to the lack of experience in the hearing world.

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Conclusion

The aim of the study is an attempt to develop a Bengali School readiness test in Bangla and standardize it. Hence, it can be concluded that the developed test is a reliable one for measuring school that the developed test is a reliable one for measuring school readiness of 4- 6 years Cochlear Implanted Children and Normal Hearing Children. This study also concludes that there is a significant difference in performance score among the Normal Hearing Children and Cochlear Implanted Children on all the dimensions (Non Verbal Evaluation, Numeracy, Verbal Evaluation- Language Development, and Reading Readiness Test) of the developed test. Cochlear Implanted Children scored significantly lower than the Normal Hearing Children on all the dimensions of the test. Thus the developed test can be useful in detecting the strong and weak areas of both Normal Hearing Children and Cochlear Implanted Children. The test if administered to children by various preschools and kindergartens or pre-primary schools before school entry, then it may boost to treat the risk factors and the child need not suffer the consequences of being lag behind from rest of the peers. Equally, this developed school readiness test can be administered over the Cochlear Implanted Children to track their developmental areas and further intervention measures could be provided according to the lacking skills because ultimately they have to be mainstreamed, and to get streamlined with rest of the world the children have to be equally competent with their peers and society. In this respect detecting and measuring school readiness is the utmost need and this developed school readiness test will benefit for the reason.

Reference

1. Archbold, S., Harris, M., Odonoghue, G., Nikolopoulos, T., White, A., and Lloydrichmond, H. (2008) 'Reading Abilities After Cochlear Implantation: The Effect Of Age At Implantation On Outcomes At 5 And 7 Years After Implantation', *International Journal of Pediatric Otorhinolaryngology*, vol.*72, no.*10, pp. 1471-1478.
2. Boyer, E. L. (1991) *Ready to learn: A mandate for the nation,* Princeton, NJ: Carnegie Foundation for the Advancement of Teaching.
3. Centre for Early Childhood Education and Development (CECED). (2011- 12).Annual Report (2013) Assessed from http://ceced.net/images/3464_AUD_CECED%20Annual%20Report_2012_SHARP%20(FINAL).pdf .
4. Connor, C. M. (2004) 'Examining Multiple Sources of Influence on the Reading Comprehension Skills of Children Who Use Cochlear Implants', *Journal of Speech, Language, and Hearing Research*, vol.*47, no.*3, pp. 509-526.
5. Forget-Dubois, N., Lemelin, J., Boivin, M., Dionne, G., Séguin, J. R., Vitaro, F., and Tremblay, R.E. (2007) 'Predicting early school achievement with the EDI: A longitudinal population-based study', *Early Education and Development*, vol.18, no.3, pp. 405-426.
6. Geers, A., Tobey, E., Moog, J., and Brenner, C. (2008) 'Long-term outcomes of cochlear implantation in the preschool years: From elementary grades to high school', *International Journal of Audiology*, vol.*47*, *no.*s2, pp. S21-S30.
7. Hassan, H. E., Eldin, S. T., and Kasaby, R. M. (2014) 'Psycholinguistic abilities in cochlear implant and hearing impaired children', *Egyptian Journal of Ear, Nose, Throat and Allied Sciences*, vol.*14*, pp. 29-35.
8. Huber, M., and Kipman, U. (2012) 'Cognitive Skills and Academic Achievement of Deaf Children with Cochlear Implants', *Otolaryngology -- Head and Neck Surgery*, vol.*147,no.*4, pp. 763-772.
9. Janus, M. and Duku, E. (2007) 'The school entry gap: Socioeconomic, family, and health factors associated with children’s school readiness to learn', *Early Education and Development*, vol.18, no.3, pp. 375-404.
10. Kessler, S.A. (1991) 'Alternative perspective on early childhood education', *Early Childhood Research Quarterly*, vol. 6, pp. 183-197.
11. Marschark, M., and Spencer, P. E. (2003) *Oxford handbook of deaf studies, language, and education*, Oxford: Oxford University Press.
12. Marschark, M., Rhoten, C., and Fabich, M. (2007) 'Effects of Cochlear Implants on Children's Reading and Academic Achievement', *Journal of Deaf Studies and Deaf Education*, vol.*12*, *no.*3, pp. 269-282.
13. Mohamed, S.A. (2013) The Development of a School Readiness Screening Instrument for Grade 00 (Pre Grade R) Learners, [online], Available:http://etd.uovs.ac.za/ETD-db//theses/available/etd-07172013-161029/unrestricted/MohamedSA.pdf [26Dec2013].
14. Parker, F.L., Boak, A.Y., Griffin, K.W., Ripple, C., and Peay, L. (1999) 'Parent-child relationship, home learning environment, and school readiness', *School Psychology Review*, vol.28, pp. 413-425.
15. Punch, R., and Hyde, M. (2010) 'Children With Cochlear Implants In Australia: Educational Settings, Supports, And Outcomes', *Journal of Deaf Studies and Deaf Education*, vol.*15, no.*4, pp. 405-421.
16. Spencer, L.J., Barker, B.A., and Tomblin, J.B. (2003) 'Exploring the language and literacy outcomes of pediatric cochlear implant users,' Ear Hear, Vol.24, no.3, pp.236-247.
17. Thoutenhoofd, E. (2005) 'Cochlear Implanted Pupils in Scottish Schools: 4-Year School Attainment Data (2000-2004)', Journal *of Deaf Studies and Deaf Education*, vol.*11*, *no.*2, pp. 171-188.
18. Woodcock, S. (1987) Woodcock Reading Mastery Tests—Revised. American Guidance Service; Circle Pines, MN.
19. Wu, C., Liu, T., Liao, P., Chen, C., Chang, B., and Lin, B. (2013) 'Academic achievements and classroom performance in Mandarin-speaking prelingually deafened school children with cochlear implants', *International Journal of Pediatric Otorhinolaryngology*, vol.*77, no.*9, pp. 1474-1480.