

# Performance of Bengali Speaking Children with Hearing Aid on Peach Scale

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**Abstract:** Parental questionnaires offer more rapid insight on the quality of hearing technology usage by children. It provides information concerning the functional performances and achievements of children who have been fitted with hearing equipment. The intent of this study was to translate and adapt the PEACH questionnaire into Bengali and assess its efficacy in identifying variations in the functional hearing performance of Bengali children fitted with a Hearing Aid (HA) at an earlier and later stage in the course of their lives. The Bengali PEACH questionnaire was administered on parents/ caregivers of 40 Bengali speaking children aged 3 to 6 years old who were fitted with HA before 2 years of age (Group 1) and after 2 years of age (group 2) with 20 parents in each group. The findings of the study reveals that those children who were fitted with HA before the age of 2 years performed better in quiet, noisy and overall situations than the children who were fitted with HA after 2 years of age. In addition, the questionnaire was proven to possess high test retest reliability in all scenarios. Hence, The Bengali PEACH questionnaire is a reliable and efficient tool for measuring and tracking functional hearing performance and communication skills in children with HA or Cochlear implant (CI) in their daily lives.

**Keywords:** Bengali PEACH questionnaire, Hearing loss, Functional hearing performance.

## 1. Introduction

Early onset of sensorineural hearing Loss (SNHL) compromises communication skills, academic performance, psychosocial behavior, and emotional development. It also impose burdens on the affected child, the child's family and society. Even children with unilateral SNHL may experience problems with speech recognition in noise, educational difficulties, and psychosocial development. (Bess et al., 2006, p.483). Childhood hearing loss also creates economic burden for the family. (Northern &Downs, 2002, p.28). The other intangible costs affecting the child and family may include family tension, family disruption, breakdowns in family communication, and social isolation. The physiological origins of SNHL include loss of inner hair cell function (IHC), outer hair cell function (OHC), reduced electrical potential within the cochlea, and changes to the mechanical properties of the cochlea. For SNHL, there are various deficiencies to be addressed. Some sounds are completely inaudible. Other sounds can be heard because a portion of their spectra is audible, but they may not be accurately identified since other portions of their spectra (often the high - frequency region) are inaudible. A child with SNHL has a narrower range of levels between the weakest sound that can be heard and the most intense sound that can be endured than an individual with normal hearing. Children with HL have a reduced capacity to hear a signal that follows or is followed by another signal. Children with HL are also less able to distinguish between sounds based on where they originate. Because of the reduced resolution (frequency, temporal, and spatial), this implies that noise, or even other parts of the speech spectrum, will mask speech more than an individual with normal hearing would. (Dillon, 2012, p.1). Amplification is considered to be one of the most important interventions for children with HL. An important intervention to help the hearing - handicapped children is the Hearing Aid (HA) and or Cochlear Implant (CI). To compensate for the difficulties faced by children with SNHL,

HAs have to amplify weak sounds more than they amplify intense sounds. The importance of parental involvement in the habilitation process of their children with HL is absolutely crucial to the child's success usage of amplification devices. (Northern &Downs, 2002, p.338). Studies have shown the significant role that parents have in facilitating communication, promoting interaction and fostering language development in children with HL. Achieving consistent use of hearing technology in young children is a common issue, particularly when HL is of mild degree. (Fitzpatrick et al., 2019). Parents play a major role in facilitating their children's use of hearing devices and supporting their language development. Research evidence suggests that one way to compensate for delays in identification and rehabilitation for children with HL is to involve the family in the early intervention process. Outcome evaluation is a crucial stage in the pediatric HA fitting process. After the fitting of HAs, it is of paramount importance to know about the amplification provided by the HAs. Young children with HL cannot provide information about the amplification they are experiencing from their HA. However parents and educators can provide useful information about the effect of amplification in real conditions. Therefore, clinicians and researchers depend on parent reports to determine the functional performance in these populations to assess spontaneous responses to sounds in everyday life. Questionnaires are more appropriately administered in the native language of the family. However, it is necessary to note that some administration barriers may arise when caregivers are not literate enough (Johnson & Danhauer, 2002). The most commonly administered parental report scales are, LittleEARS Auditory Questionnaire (LEAQ, Mecklenburg, 1996), The Auditory Behavior in Everyday Life (ABEL, Purdy et al, 2002), Meaningful Auditory Integration Scale (MAIS, Robbins et al., 1998), Infant Toddler Meaningful Auditory Integration Scale [IT - MAIS] (Zimmerman&Phillips, 1997) and Parents' Evaluation of Aural/Oral Performance of Children [PEACH] (Ching &

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Hill, 2007). The PEACH is a questionnaire designed to record how the child is hearing and communicating with others when using his/her HAs and/or CI. Parents are asked to observe their child's listening behavior in everyday life and give a rating in relation to a range of hearing and the situations where they communicate with others. The scores in the PEACH questionnaire can be used to build a picture of the child's functional performance in everyday life situations. The results can be used by the audiologist to customize audiological intervention to address the specific difficulties experienced by the child. Several studies have been conducted in western countries to assess the effectiveness of PEACH on children with HL using HA or CI.

Eroglu et al. (2021) aimed to adapt the PEACH questionnaire to Turkish children and also to analyze, and verify the validity and the reliability of the questionnaire in 120 children with HL (57 HA users; 63 CI users) between 3 and 12 years of age. The results suggested that PEACH Scores were increased in parallel to their age, HA, and usage of CI. They also noted that children with bilaterally fitted CI performed better than children who were fitted with CI unilaterally. The study concluded that the Turkish PEACH questionnaire could be recommended as a convenient tool for children with hearing aid and cochlear implant to monitor functional, auditory, and communication skills.

Levy et al. (2016) translated, adapted and validated the PEACH questionnaire to Brazilian Portuguese and was administered to 13 parents or guardians of children with moderate to severe HL. The results showed that The PEACH questionnaire is very important in speech therapy of children with HL, as well as scoring the frequency of their responses to sound stimuli in everyday silent or noisy environment implies the effective participation of the mother and/or family members in the daily observations, helping professionals to validate the benefits of HA/CI.

Brännström et al. (2014) translated the PEACH questionnaire into its Swedish version and validated it by collecting the responses of 27 families with children within an age range of six to 50 months in order to determine the psychometric properties of the translation and identify the relationship between age and the reported outcome. The results revealed that the responses provided by parents from the Swedish translation display similar psychometric features to those previously reported, as well as a similar link between the overall score on the scale and age to those discovered in earlier studies.

Quar et al. (2012) adapted the PEACH questionnaire into the Malay language and the parents of 74 children with normal hearing ranging in age from three months to thirteen years were asked to monitor their children's auditory/oral behavior in everyday situations. Results suggested that Malay PEACH was proved applicable to assess the functional aural/oral performance of Malaysian children with HL.

Kumar et al. (2013) aimed to compare the functional language performance of Tamil - speaking children who received CI before 2 years of age (Early implanted group) and between 3 and 4 years (Late implant group) using

PEACH scale. Thirty primary parents/caregivers of Tamil children with severe to profound SNHL fitted with CI were grouped according to age at cochlear implantation. Earlier implanted group was implanted before 24 months and later implanted group was implanted between 36 - 48 months of age. The PEACH scale was translated and adapted into Tamil language and administered on participants. The results showed that the early implant group obtained higher PEACH score than the late implant group. High test - retest reliability was obtained from six participants when the adapted scale was administered twice. The results suggested that PEACH scale is considered as a reliable measure for evaluating the effectiveness of amplification for children in real life situations.

To summarize, there were a few or limited studies on PEACH in Bengali language. Hence the present study aims at comparing the effect of age at intervention of Bengali speaking children fitted with hearing aids on everyday functional language performance in different situations and communication skills using PEACH adapted into Bengali language. Bengali language (Bangla) is an Indo - Aryan language native to the Bengal region of South Asia spoken by more than 210 million people as a first or second language and one of the languages officially recognized in the constitution of India and used primarily in the states of West Bengal, Assam, and Tripura and sizable immigrant communities in the United Kingdom, the United States, and the Middle East.

## 2. Method

The adapted Bengali PEACH questionnaire was given to the care givers/parents to evaluate the listening skills of children with HL and how it affects their functional hearing performance and communication skills in their daily life. PEACH (Ching & Hill, 2007) questionnaire was translated and adapted into Bengali language and validated by 5 audiologists who were fluent in both English and Bengali language.

### Subject selection

Forty Parents /primary care givers of children having moderate - moderately severe SNHL fitted with HA in the age range of 3 - 6 years were selected for the study from Kolkata, West Bengal. Children were subdivided into two groups according to the age at which hearing aid was fitted. Group I - 20 children who were fitted with HA before 2 years of age and Group II - 20 children who were fitted with HA after 2 years of age. They were undergoing speech therapy since 1 - 2 years. Children who were having other sensory impairment, neurological and cognitive impairment were excluded from the study.

### Tool and Procedure used

Bengali PEACH questionnaire by adapting PEACH (Ching & Hill, 2007) in English following the guidelines provided by Ching and Hill (2007) and distributed to parents of children with HL to fill it. The initial part of PEACH questionnaire includes pre - rating checklist which includes 3 questions to assess if child is wearing amplification properly & if the child is wearing it, if the child is healthy. Only if the answers of the all of the three questions are 'yes',

the parent/ caregivers were asked to fill rest of the questionnaire.

The second part of PEACH questionnaire comprises of 13 questions to evaluate children’s usage of amplification devices (HA/CI) and discomfort in loudness, children’s response in quiet and noisy situations, children’s response to vehicles, children’s ability to use telephone and children’s response to sounds other than human voices.

**Scoring**

Quiet (A) - Questions 3+4+7+8+11+12 (A/24) X 100

Noise (B) - Questions 5+6+9+10+13 (B/20) X 100

Overall (C) - (A+B) (C/44) X 100

PEACH scoring includes Quiet (A) score, Noise (B) score and Overall (A+B) PEACH score expressed in percentage (%). the questions/items were rated on a 4 point Likert scale where 0 = Never (0%), 1=Seldom (1 - 25%), 2= Sometimes (26 - 50%), 3= Often (51 - 75%) and 4= Always (75 - 100%). Questions from 3 till 13 is taken for the scoring.

**Test retest reliability**

Once the administration of the Bengali PEACH questionnaire was completed, 8 parents of Group I children and 4 parents of Group II children participated again by answering the same questionnaire after a gap of 4 weeks to assess the test retest reliability of Bengali PEACH questionnaire

**3. Results and Discussion**

**Table 1:** Mean sub scale scores in Quiet, Noise and Overall of Group I (Children before 2 years of age) and Group II (children after 2 years of age)

(n = 40)	Frequency	%
Early fitting	20	50
Late fitting	20	50

Table 1 reveals that Group I children have higher mean sub scale scores in Quiet, Noise and Overall than Group II children.

**Table 2:** Comparison of quiet, noise, and overall between Group I (children fitted with hearing aids before 2 years of age) and Group II (children fitted with hearing aids after 2 years of age)

		Mean	S. D.	"t"	p value	Significance
Quiet	Early fitting	18.8	2.0	8.94	< 0.001	Sig.
	Late fitting	12.4	2.5			
Noise	Early fitting	14.4	2.0	9.20	< 0.001	Sig.
	Late fitting	8.3	2.2			
Overall	Early fitting	33.2	3.7	9.63	< 0.001	Sig.
	Late fitting	20.6	4.5			

("t" = Independent sample "t" test)

The Independent sample "t" test was used to compare Bengali Peach scores in quiet, noise, and overall between the groups of children. The results suggested that was a significant difference in the performance of two groups of children in quiet, noise, and overall. The results suggested that group I have better performance in quiet, noise and overall than Group II children.

**Test retest reliability -**

**Table 3:** Comparison (Test to re test) of quiet, noise, and overall between groups

		Test				Re test					
		Mean	S. D.	"t"	p value	Significance	Mean	S. D.	"t"	p value	Significance
Quiet	Early fitting	20.4	1.6	5.82	< 0.001	Sig.	21.4	2.1	5.65	< 0.001	Sig.
	Late fitting	11.8	3.7				14.8	1.5			
Noise	Early fitting	15.6	1.6	8.77	< 0.001	Sig.	16.4	1.5	8.82	< 0.001	Sig.
	Late fitting	6.5	1.9				8.3	1.5			
Overall	Early fitting	36.0	3.1	7.78	< 0.001	Sig.	37.8	3.4	7.41	< 0.001	Sig.
	Late fitting	18.3	4.9				23.5	2.4			

("t" = Paired "t" test)

The Independent sample "t" test was used to compare the test to re test data of quiet, noise, and overall between groups. There was a difference (p < 0.05) in quiet, noise, and overall between the groups during test as well as re test. Table 3 shows that there is significant difference in quiet, Noise and Overall scores of Group I and Group II children after a gap of 4 weeks observed by parents.

Bengali PEACH questionnaire was administered twice on 8 Parents of Group I children and 4 parents of Group II children after a gap of 4 weeks to evaluate test retest reliability of responses in children. The Pearson correlation coefficient was used to find the test re test reliability of quiet, noise, and overall. The obtained correlation coefficients were found to be significant (p < 0.05) and hence quiet, noise, and overall were reliable. Also, the measurements were consistent (95% CI for ICCC do not include "Zero") from test to re test.

**Table 4:** Reliability analysis

	Test re test reliability		Intra class correlation coefficient (ICCC)		Significance
	"r"	p value	ICCC	95% CI	
Quiet	0.866	< 0.001*	0.912	0.69 to 0.98*	Sig.
Noise	0.991	< 0.001*	0.992	0.97 to 0.99*	Sig.
Overall	0.944	< 0.001*	0.960	0.86 to 0.99*	Sig.

("r" = Pearson correlation coefficient)

**4. Discussion**

The present study aimed to adapt PEACH questionnaire in Bengali language to assess the listening skills of children with HL and how it affects their functional hearing

performance and communication skills in their daily life. The questionnaire was given to 40 parents of children with moderate - moderately severe HL fitted with HA in the age range of 3 - 6 years. Children were divided into two groups based on the age at which HA was fitted (Group I - children who were using HA before 2 years of age and Group II - children who were fitted with HA after 2 years of age) and entered for speech therapy. The questionnaire was given to parents and they were asked to read it carefully, mark the response and rate it as per 4 point rating scale. The results revealed that children who were fitted with HA before the age of 2 years performed better, hence better/higher scores in quiet, Noise and Overall situations than children who were fitted with HA after the age of 2 years in Bengali PEACH questionnaire. High Test retest reliability of the questionnaire was found, when it was assessed again on 8 parents after a gap of 4 weeks. The results of the present study is in accordance with the previous studies in other western languages like Turkish language (Eroglu, 2021); Swedish language (Brännström et al., 2014); Malay language (Quar, 2012), Brazilian - Portuguese language (Levy & Rodrigues, 2016) and also Tamil language (Kumar et al., 2013).

## 5. Conclusion

Parental questionnaires have been found useful in assessing the outcomes achieved by children after being fitted with an amplification device such as a HA or CI. It can be concluded that the Bengali PEACH questionnaire is a reliable tool to assess and monitor functional hearing performance and communication skills of children with HA or CI in their daily life.

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