Adaptation of "Adult Aural Rehabilitation Guide" in Marathi and its Utility in Evaluation of Postlingual Adult Cochlear Implanted Recipients

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Abstract

Introduction: There is a need for a systematic assessment and training module in Marathi to ascertain the auditory performance of adult cochlear implantation (CI) recipients and to provide a standard regimen for treatment. The present study aimed to adapt the adult aural rehabilitation guide (AARG) in Marathi and to evaluate the performance of adult CI recipients using this tool; and to study the effect of chronological age, duration of the unaided hearing, postimplant duration (PID), and presence/absence of training on the auditory performance of adult CI recipients. **Methods:** Analytic and synthetic sections from the AARG were adapted in Marathi based on the acoustic-phonetic properties of Marathi. Two separate manuals – assessment manual and training manual – were developed. The assessment tool was administered on 26 adult postlingual CI recipients who were native speakers of Marathi. Training manual was used in two participants for a step-by-step aural rehabilitation program of eight sessions. **Results:** Most participants achieved scores above 20 for the analytic section, but <20 in synthetic section, out of a maximum score of 29. The difficulty was greater for open-set tasks, for sentences with uncommon words, and for longer sentences. Recipients could not use auditory commands for information transfer, seeking information, and in role-play. There was no correlation of auditory performance with chronological age, duration of unaided hearing, and PID of participants. The scores obtained were correlated to the presence/absence of previous rehabilitation. **Conclusion:** This study could successfully bring out a systematic assessment protocol in Marathi for postlingual CI recipients, and developed a systematic training module for their rehabilitation.

Keywords: Aural rehabilitation, cochlear implant, postlingual

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Introduction

Cochlear implantation (CI) in adults was approved by the Food and Drug Administration as early as 1985, and in most of the developed countries, adults with postlingual hearing loss have been the frequently implanted group.[1] However, the majority of recipients in India are in the pediatric age group. This could be because adults with postlingual hearing loss do not get the financial assistance from central government programs such as ADIP scheme, state government support or support from nongovernment organizations.[2] Provision of such help to pediatric clientele has facilitated CI programs in younger children. Many tools are available to assess the current level of auditory functioning (CLAF) in children such as the early speech perception test,[3] Meaningful Auditory Integration Scale,[4] Teacher's Evaluation of Aural/Oral Performance in Children,[5] and AVT checklist.[6] However, there is a dearth of tools for evaluating the CLAF in adults with postlingual hearing loss. Few tests such as CI-assisted audiogram, Ling's six sound test,[7] word/sentence recognition tests, and phonetically balanced word lists are available to monitor their performance. There is a need for a systematic assessment and training module-containing exercises arranged in a hierarchy to meet the different skill levels of CI recipients. Such a module

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can be used immediately postswitch on to ascertain the CLAF of the recipient, to plan goals systematically, and to provide a standard regimen for treatment.

Cochlear Limited (Australia) published "Adult Aural Rehabilitation Guide (AARG)" to provide a step-by-step guide to adult aural rehabilitation. This includes three components as follows: analytic, synthetic, and communication. Analytic section concerns with recognition of distinctive linguistic features of speech. The synthetic section involves the perception of speech in day-to-day communication. Communication section focuses on developing listening skills to initiate and maintain successful conversation. Although very useful, this resource needs adaptation and validation in Indian languages.

Marathi is the 4th frequently used language in India, being used by 4.94% of the Indian population.[8] It is the official language of the state of Maharashtra and co-official language of union territories of Daman and Diu and Dadra and Nagar Haveli. It is spoken in Maharashtra and parts of neighboring states of Gujarat, Madhya Pradesh, Goa, Karnataka, Chhattisgarh, Telangana, and Andhra Pradesh. However, there is no assessment tool available in Marathi to monitor the auditory performance of adults with postlingual hearing loss; thus, the need for the present study was felt.

Further, the auditory performance of postlingual CI recipients is highly variable. Factors such as duration of deafness, age at implantation, etiology of hearing loss, and experience with hearing aids have been cited as factors affecting performance.[9,10] To the best of the researchers' knowledge, there has been no Indian study investigating the factors affecting auditory performance in adult recipients. An understanding of these factors may help to delineate predictors of positive outcomes post-implantation, thereby guiding implantation decisions and facilitating clinicians to counsel prospective recipients about expected and realistic outcomes.

The present study aimed: (a) to adapt the AARG in Marathi; (b) to evaluate auditory performance of postlingual adult CI recipients using the adapted tool; (c) to study effect of factors such as chronological age, duration of unaided hearing, postimplant duration (PID), and presence/absence of training on auditory performance of postlingual adult CI recipients.

Materials and Methods

The study involved three phases – (1) Adaptation of AARG in Marathi, (2) its validation, and (3) the assessment of adult postlingual CI recipients using the adapted tool. The site of the study was a hospital in south Mumbai. For the third phase of the study, data were collected additionally at three to four private clinics in Maharashtra. The study was approved by the Ethics committee of academic and research projects of the hospital.

Phase I: Adaptation

Analytic and synthetic sections from the AARG were adapted in Marathi in this study. In analytic section, the exercises were arranged in the following levels-pattern perception, word stress, vowel and consonant recognition, high-low frequency identification, identification of over-learned speech at phrase level, and text following. Under each level, the exercises were arranged in a hierarchy from easy to difficult. In synthetic section, the exercises comprised levels ranging from continuous discourse tracking, sentence completion exercise using cloze task, identification of picture in auditory-only condition, enhancing speech perception in conversation, contextual/situational cues assisting speech perception, activities to enhance transfer of information, variations on open-set tasks, predictability of sentence, seeking information through role play, perception of open-set sentences without contextual cues, comprehension tasks, two-scripted conversation and games, and interactive activities. Here again, under each head, the material was arranged in a hierarchy from easy to difficult.

The task involved was not a simple translation of the exemplars, but necessitated the construction of exemplars in Marathi that assessed the same auditory skill as in the English resource but was based on the acoustic-phonetic properties of the Marathi language. The words used in the exemplars were those that are commonly used in Marathi and were rated on their familiarity by three native speakers of Marathi. Words that were considered as unfamiliar by any two out of three speakers were excluded. For the construction of exemplars at phrase or sentence level, the inherent differences between English and Marathi were taken into consideration. For example, differences in sentence formation (subject-object-verb in Marathi), presence of gender-sensitive, number-markers and case-markers in Marathi, were considered during adaptation.

Phase II: Validation

The adapted material was given to two audiologists and speech-language pathologists who were native speakers of Marathi with twenty years' experience in the field of adult aural rehabilitation. Items deemed inappropriate by experts were excluded or modified. Exemplars that were not culturally relevant were replaced by respective relevant ones.

Further, the adapted and validated material was divided into two separate manuals-an assessment manual and training manual. The training manual comprised the same number of exemplars as that in the English one. The sequence of exercises was the same as that in the English version. One-third of the total exemplars in each exercise were randomly selected and included in the assessment manual for both the sections. The assessment manual was used to assess the CLAF of the recipient.

Phase III: Administration

The assessment tool was administered on 26 adult postlingual CI recipients who were native speakers of Marathi. Participants were in the age range of 20–70 years (mean: 46.35 years). Their duration of the unaided hearing, i.e., the time interval between the onset of hearing loss and surgery, ranged from 0.16 to 40 years (mean: 9.16 years). PID, i.e., the time interval between the date of surgery and assessment, ranged from 0.16 to 19 years (mean: 3.88 years). The mean three-frequency CI-assisted average was 23 dBHL. Thirteen participants had undergone rehabilitation for a minimum of six sessions before recruitment in the study, whereas 13 participants had not undergone any prior rehabilitation. Participants whose CI-assisted thresholds exceeded 30 dBHL were excluded from the study.

Participants were explained about the study, and written consent was obtained. The assessment was carried out in a noise-free environment. Researcher sat on the side of the CI for better audibility and participants were not given any visual cues. An example was given for each exercise of every level to ensure that the participant understood the task. In both the sections, i.e., analytic and synthetic, responses of the participant were recorded as follows:

1. "+": Correct response in auditory only condition
2. "–": No response/incorrect response.

The level at which the participant successfully got 80% correct response was considered to be achieved and the next level was administered. Participants were given a score of 1 for each level achieved and 0 (zero) for the level unachieved. Three consecutive negatives were used as the criterion to stop the assessment. Remarks were made against each level about whether normal rate was used or participant needed slow rate or any other relevant detail was noted. The total score was calculated for the analytic and synthetic sections separately. The assessment was conducted in one session of 1–1½ hour with breaks.

Further, in the study, 2 out of the 26 participants who were ready to participate for the rehabilitation program were recruited for a step-by-step aural rehabilitation program of eight sessions. Sessions were taken on a weekly basis each lasting for 45 min. Training manual was used for rehabilitation. In rehabilitation sessions, various listening strategies such as slow rate of speech, speaking near the participant, speaking in a good signal-to-noise ratio, appropriate pausing were used to make them perceive the words/sentences better. Breaks were given in between if the participant complained of auditory fatigue. The exercises ranging from easy to difficult were administered on the participant. At the end of the session, their latest level of functioning was ascertained using probes from the adapted material. Practice effect was ruled out by using separate probes pre- and post-rehabilitation and by using therapy exemplars mutually exclusive from the probes.

Results

The adapted tool was used to assess the auditory performance of the recipients. Analytic scores of the recipients were in the range of 13–28, out of 29 (mean: 21.69). Although, the total raw scores of the synthetic section were calculated out of 16; for statistical convenience, this total raw score was converted to 29 to match the total raw scores of the analytic section. Thus, the converted synthetic scores for all the participants ranged from 1.81 to 29 (mean: 13.8). Eighteen out of 26 participants (69.23%) acquired a score of 20 and above on analytic section. On synthetic section, 10 out of 26 participants (38.46%) acquired a score >20. Thus, synthetic section appeared to be more challenging for most of the participants.

Figures 1 and 2 depict performance of participants in each individual level of analytic and synthetic sections respectively. From Figure 1, it appears that all the participants could achieve level 1 (Syllable counting) and level 4 (high-low frequency discrimination). More than 50% of them could achieve level 2 (word stress) and level 6 (text following). However, <50% of the participants could achieve level 3 (consonant and vowel phonemes) and level 5 (over-learned speech).

From Figure 2, it appears that >50% of the participants could achieve level 1 (fill in the blanks), level 2 (closed-set indirect identification), level 4 (topic of conversation-topic clue only), level 5 (topic of conversation– key phrase in initial position), level 7 (topic of conversation– key phrase in final position), level 8 (topic of conversation– key topic sentences phrase clue), and level 10 (context clues– common sentences) which concludes that they were comparatively easy to achieve. Contrary to this, level 3 (topic of conversation– key topic/word clue), level 6 (topic of conversation-key phrase in middle position), level 9 (topic of conversation– unrelated sentences with clue words), level 11 (common sentences used every day), level 12 (information transfer), level 13 (open-set fill in the sentences), level 14 (seeking information: Role play situation), level 15 (open-set: No clue words), and level 16 (easy interactive story) were more challenging to achieve.

Based on the above data, difficulty index was calculated for each level of both the sections using the formula: Difficulty index = number of participants with correct response divided by the total number of participants. Table 1 depicts the difficulty index for each level in both sections.

Levels of analytic section showed an "easy" difficulty while those on synthetic section showed "average" difficulty.

Further, five participants agreed to participate in a rehabilitation program using the adapted resource, however, only two participants (Participants 1 and 24) completed the 8 session program. Their results are described below.

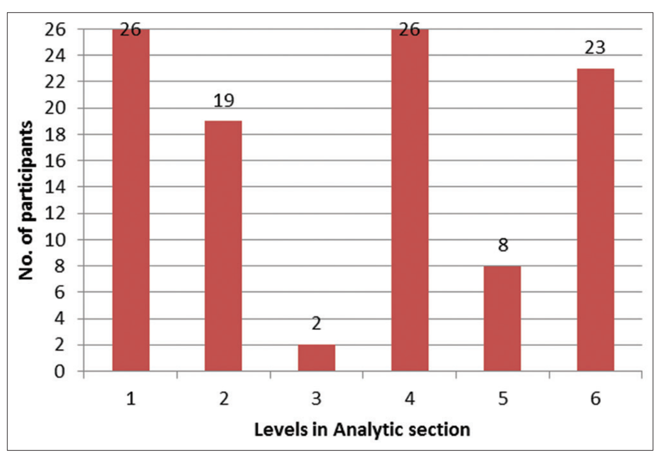

Figure 1: Graphical representation of number of participants who could achieve the individual levels in analytic section

Table 1: Difficulty index for each level

Section/level	Difficulty index	Mean difficulty index
Analytic		
1	1	0.66
2	0.73	
3	0.07	
4	1	
5	0.31	
6	0.88	
Synthetic		
1	1	0.51
2	0.73	
3	0.35	
4	0.65	
5	0.73	
6	0.38	
7	0.54	
8	0.5	
9	0.38	
10	0.69	
11	0.42	
12	0.35	
13	0.42	
14	0.46	
15	0.38	
16	0.19	

Participant number 1

For analytic section, a score of 21 was achieved pre-rehabilitation and a score of 26 post-rahabilitation. However, for synthetic section there was no improvement in scores. Figure 3 shows the levels of analytic section achieved individually by participant number 1, pre- and post-rehabilitation.

From Figure 3, it appears that level 2, level 3, and level 6 were not achieved pre-rehabilitation. However, post-rehabilitation, they were achieved. Level 5 did not reach 80% cutoff criterion but improvement in the percentage of the level achieved was seen, i.e., from 28% in pre-rehabilitation to 65% post-rehabilitation. The pre-rehabilitation analytic score was 21 and post-rehabilitation analytic score was 26. Thus, there was improvement in scores by 5 points. Figure 4 depicts synthetic scores for participant 1 pre- and post-rehabilitation.

For synthetic section, the total raw score was the same for post-rehabilitation compared to pre-rehabilitation conditions. It appears that levels 1, 3, 6, 7, 9, 11, 12, and 13 were not achieved previously. However, post-rehabilitation levels 1 and 7 were achieved (reached the cutoff criterion of 80%). Levels 3, 6, 9, and 13 showed improvement but was considered to be unachieved as it did not reach 80%. A paradoxical decrease in percentage score was seen for level 5 which could not be explained. It was also seen that no improvement was seen for level 12 pre- and post-rehabilitation.

Participant number 24

For the analytic section, a score of 19 was achieved pre-rehabilitation and a score of 25 was achieved post-rehabilitation. However, for synthetic section a score of 13 was achieved pre-rehabilitation, and a score of 15 was achieved post-rehabilitation.

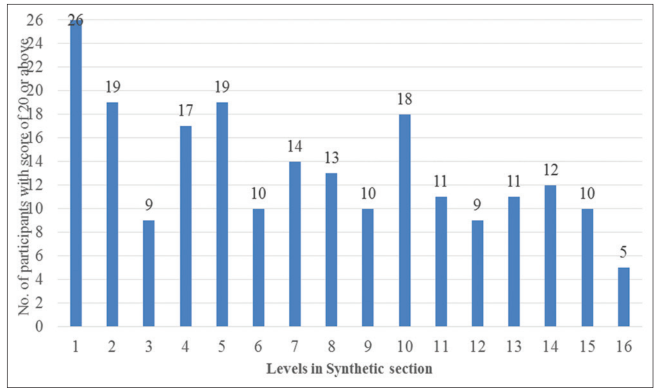

Figure 2: The performance of participants in the individual levels of the synthetic section

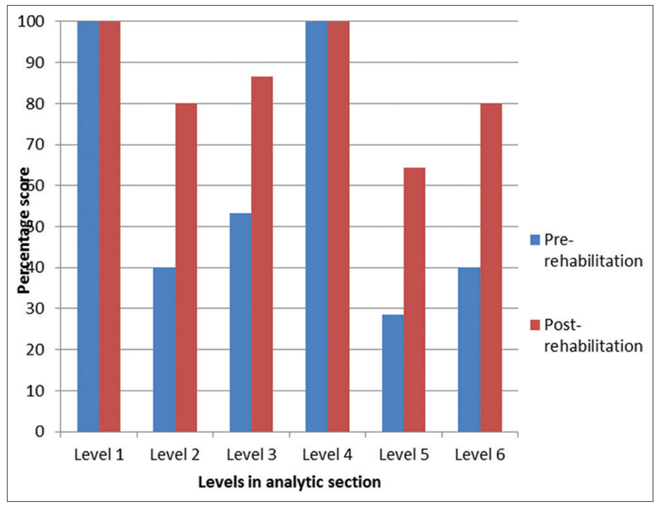

Figure 3: Graphical representation of the levels achieved individually for analytic section by participant number 1, pre- and post-rehabilitation. Note: 80% was used as a cutoff criterion for the levels achieved/not achieved

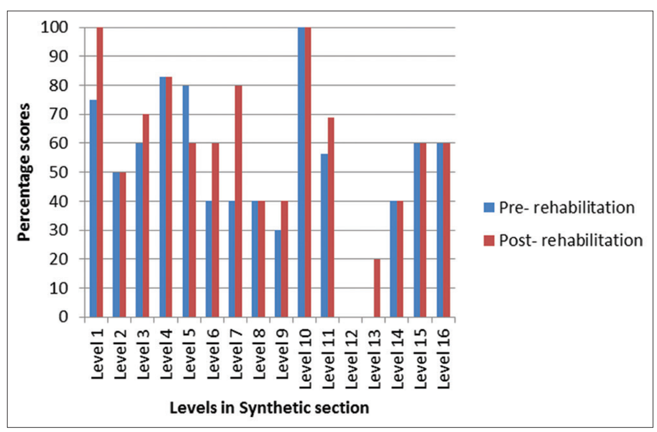

Figure 4: Synthetic scores for participant 1 pre- and post-rehabilitation. Note: 80% was used as a cutoff criterion for the levels achieved/not achieved

Figure 5 shows the levels of analytic section achieved individually by participant No. 24, pre and post-rehabilitation.

From Figure 5, it appears that the levels 3 and 6 from the analytic section that were not achieved pre-rehabilitation were achieved post-rehabilitation. Furthermore, there was improvement in the raw scores pre- and postrehabilitation by 6 points. Figure 6 shows the levels of synthetic section achieved individually by participant number 24, pre- and post-rehabilitation.

Figure shows that the level 10 and level 15 were not achieved pre-rehabilitation however, were achieved successfully post-rehabilitation. A paradoxical decrease in percentage score was seen for level 8 and level 9 which could not be explained. Furthermore, the pre-rehabilitation scores which were 13 improved to 15, post-rehabilitation. Thus, there is improvement in the raw score for synthetic section by 2 points. Overall, participant number 24 showed better improvement with rehabilitation compared to participant number 1.

The next objective was to study whether there was a significant correlation between chronological age, duration of unaided hearing, post-implant duration and training, with auditory performance on this test. The independent variables were– age (years), duration of unaided hearing (years), PID (years), and training (with training– yes: 1 and without training– No: 0) and the two dependent variables were analytic and synthetic scores. The results are depicted in Table 2. Analytic score was positively correlated with both synthetic scores as well as with training ($p < 0.05$). Correlation between analytic and synthetic scores was moderate but the correlation between training and analytic scores was weak. Age (years), duration of unaided hearing (years), and PID (years) were not correlated with either the analytic or synthetic scores ($p > 0.05$).

Further, the study compared the analytic scores obtained by participants who had undergone prior rehabilitation as opposed to those who had not [Table 3].

The unpaired *t*-value associated with the difference in the two group means (3.23) was statistically significant ($t_{[24]} = -2.17$, $p = 0.04$]. Thus, the mean analytic scores of participants who had undergone previous training before recruitment in the study were higher on an average by approximately 3.0 points (with 95% confidence interval, 0.16–6.30) than that of participants without prior training. The effect size for the obtained difference was large (0.85), suggesting the practical importance of the difference. However, the power of the test (0.54) was far below the expected level of 0.80 indicating need to repeat the study with a larger sample size.

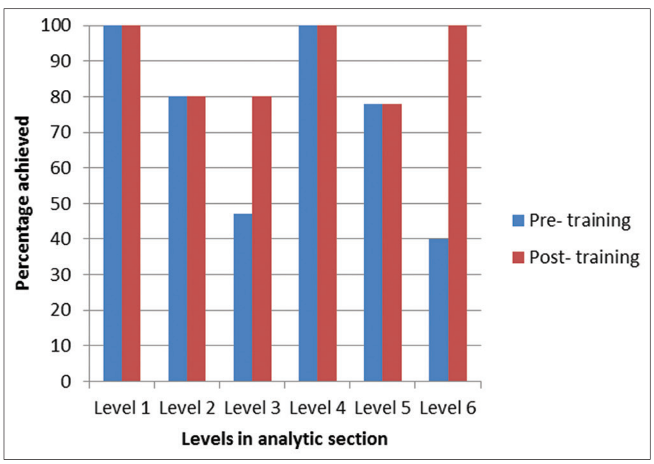

Figure 5: Graphical representation of levels achieved for analytic section individually of participant 24, pre- and post-rehabilitation. Note: 80% was used as a cut off criterion for the levels achieved/not achieved

Discussion

In the present study, most participants could achieve a score of 20 and above for analytic section but a score <20 in synthetic

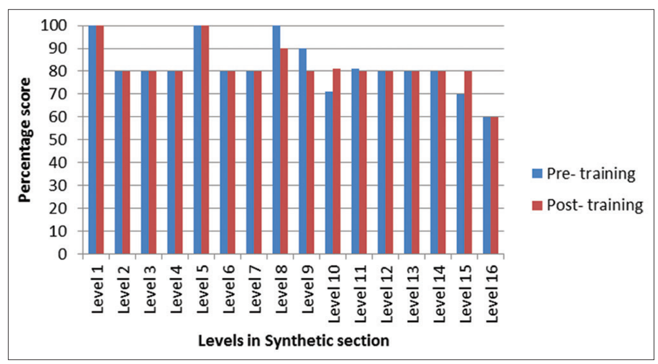

Figure 6: Graphical representation of the levels achieved individually in synthetic section of participant 24, pre- and post-rehabilitation

Table 2: Results of correlation analysis

Paired variables	Test used	Correlation coefficient	*p*	Remark
Age (years); analytic score	Pearson's	−0.212	0.298	NA
DUH (years); analytic score	Pearson's	0.182	0.534	NA
PostImplant duration (years); analytic score	Pearson's	−0.051	0.806	NA
Training given; analytic score	Spearman's	0.405*	0.04	Positive, weak
Age (years); synthetic score	Pearson's	−0.205	0.316	NA
DUH (years); synthetic score	Pearson's	−0.384	0.053	NA
Postimplant duration (years); synthetic score	Pearson's	0.139	0.497	NA
Training; synthetic score	Spearman's	0.103	0.617	NA
Analytic score; synthetic score	Pearson's	0.695	<0.0005	Positive, moderate

NA: Not available; DUH: Duration of unaided hearing

Table 3: Descriptive statistics for analytic scores in participants with and without prior training

	Number of participants	Mean scores	SD of scores	SEM
Without prior training	13	20.08	4.54	1.26
With prior training	13	23.31	2.87	0.80

SD: Standard deviation; SEM: Standard error of the mean

section out of maximum score of 29. The difficulty indices for the sections showed analytic tasks to be simpler than synthetic tasks. Further, ceiling and floor effects were not seen for the scores and a wide range of scores was obtained by participants in both the sections. This indicates that the tool shows good responsiveness and is capable of measuring change in recipients' performance over time. Thus, the tool is clinically useful to ascertain CLAF in adult recipients.[11]

Qualitatively, few participants needed repetition of speech stimuli or instructions for analytic section; and the responses were quicker for analytic section. Most participants reported auditory fatigue; insisted for repetition of instruction; and needed slow rate of speech for comprehension of tasks in the synthetic section. Thus, overall all participants found the analytic section easier as compared to synthetic section. The analytic section is based on bottom-up processing and assesses the ability of the recipients to perceive speech contrasts by presenting the speech components in isolation. All the participants could achieve syllable and high-low frequency discrimination. Discriminating word stress and following text from a paragraph spoken to them was also quite well achieved. However, participants found auditory identification of minimal contrasting pairs challenging. Thus, although they achieved auditory discrimination based on supra-segmental features of duration and stress; discrimination based on segmental features was difficult for almost all participants. The task of over-learned speech required repetition of auditorily presented sentences of increasing length. This task was achieved by only eight participants. Difficulty in this task increased with the length of the sentences, leading to the speculation that the recipients' limited auditory memory could contribute to their low scores.

Synthetic section involved top-down processing which required the recipients to make use of contextual and linguistic cues for word/sentence identification. One would expect postlingual CI recipients to perform well in this section in view of their premorbid linguistic abilities. However, participants found this section very challenging. Although, identification of sentences in closed-set and identification of common sentences used in daily life was achieved, performance sharply declined for open-set tasks, for sentences with uncommon words and for longer sentences. In identification of sentences with key phrase, most recipients could repeat sentences when initial phrase was provided. The difficulty increased for key phrase in the final part of sentence; and identification with key phrase in the middle part of the sentence was most challenging. Further, the recipients could not use auditory commands for information transfer, to seek information, and to give appropriate answers in role-play. It appears that, although the implant does provide access to auditory information across the frequency range, use of this information to derive linguistic meaning and to integrate the new auditory information with previous language repertoire using contextual cues will need specific training. Recipients could not use higher auditory processing strategies to help in top-down processing of continuous discourse, especially for uncommon words/phrases. Questions about self, family, and health issues were repeated correctly and comprehended, probably due to rote learning effects but generalization to noncommonly used exemplars was poor.

Fu and Galvin also reported that adult CI recipients show improvement in their auditory performance postimplantation but do not perform at par with individuals with normal hearing sensitivity.[12] They stated that cochlear implant provides inadequate representation of the acoustic signal and recipients need active listening training to reach optimal performance. This active adaptation training involves bottom-up as well as top down processing, the latter being more important in adverse listening conditions.

The importance of higher-level factors such as attention and working memory capacity in auditory performance of postlingual recipients was highlighted in a study by Knutson *et al*.[13] They observed that performance on a visual monitoring task (VMT) could predict audiological performance postimplantation. They concluded that the cognitive skills underlying VMT may be useful in auditory processing auditory of speech and led to successful use of a cochlear implant.

The study showed the usefulness of the adapted resource in monitoring progress of two participants. The responsiveness and use of the adapted manual in aural rehabilitation progress needs to be documented on a larger sample to comment on its responsiveness and efficacy as a tool to monitor progress.

Another aim of the study was to determine the effect of variables such as chronological age, duration of unaided hearing, PID, and training on the scores obtained.

Chronological age and scores

In the present study, no correlation was observed between chronological age and auditory performance. This is consistent with the findings in the literature. Noble *et al.* reported no effect of aging on performance when the age range of 55–65 years was considered a cut off between older and younger adults.[14] Contrary to this, the performance was found to be lower for older adults of age 70 years and above compared to those whose age was <70 years.[15] Similarly, Vermeire *et al*. studied the effect of chronological age on the performance of the CI recipients using monosyllable recognition speech perception test.[16] They classified recipients into three subgroups i.e., <55 years, 56–69 years and 70 years and >70 years. The oldest subgroup showed statistically significant poor speech performance compared to the other two groups, but this group had poor performance even before implantation. Thus, the researchers concluded that the groups did not differ in their speech perception abilities postimplantation. These findings suggest that there is no upper limit of the chronological age for considering adults with postlingual hearing impairment for implantation. In the absence of medical and radiological contraindications, older adults may be expected to show auditory performance comparable to younger adults.

Duration of unaided hearing and scores

In the present study, the range of duration of unaided hearing varied from 0.16 to 40 years-a very broad range, yet there was no correlation between duration of unaided hearing and scores on the test. This is contrary to the findings of Blamey *et al*.[9,10] who reported the large negative influence of duration of unaided hearing on the auditory performance of the recipients in their 1996 study. However, in a larger 2011 study, they reported that the duration of unaided hearing had lesser effect on the performance of the CI recipients. This was attributed to the fact that the latter study recipients had a limited range of duration of unaided hearing owing to relaxed candidacy criteria, use of bimodal listening, residual hearing, greater awareness of rehabilitation opportunities, and improved surgical methods. In the present study, although the range of unaided hearing was quite large as in the 1996 study, there was no correlation between duration of unaided hearing and scores. Theoretically, one expects greater duration of unaided hearing would cause reduced spiral ganglion cells due to auditory deprivation leading to poorer speech perception. However, recent studies claim that auditory performance is affected by more central factors such as cortical plasticity and higher order processing than number of spiral ganglion cells.[17-19]

Post-implant duration and scores

In the present study, the range of PID varied from 0.16 to 19 years. No correlation was observed in PID and the performance of postlingual CI recipients. This was contrary to the results of Blamey *et al*.[9,10] who reported the greatest effect of PID on performance in the 1st year after implantation. After 3.5 years, they reported an average improvement in performance by 10% in the 1996 study and 20% in the 2011 study. The present study did not systematically analyze the performance of participants longitudinally at regular intervals; rather it was a cross-sectional study that attempted to study the correlation of PID with scores in a limited number of participants; hence, such effects may not be observed.

Training and scores

The present study revealed a weak positive correlation between training and analytic scores; but training and synthetic scores were not correlated. However, there was moderate positive correlation in the analytic and synthetic scores of recipients. Further, the mean analytic scores of the recipients who had prior training were better than those who had not undergone training by three points. This difference was statistically significant with a large effect size which indicates that training does affect the performance of recipients in the analytic section. Therefore, although there was no correlation between training (taken or not taken) and synthetic scores; the fact that analytic scores were better in group with training and the fact that analytic scores statistically correlated with synthetic scores, lead us to believe that the presence of training would probably affect synthetic scores too.

Thus, to maximize the benefit from implantation, it is important to provide active auditory rehabilitation to CI recipients.[12] Auditory rehabilitation involves both bottom-up and top-down approach which is required for comprehension of speech. Both the processes have an effect on neural plasticity that enables the neurons to modify their tuning properties and thus benefit from rehabilitation.[20]

Conclusions

This study could successfully bring out a systematic assessment protocol in Marathi for postlingual CI recipients, which is the need of the hour to facilitate the determination of their baseline auditory performance and monitor their progress over time. Performance of participants on this tool was not correlated with their age, duration of unaided hearing and PID but was better in participants who had undergone rehabilitation sessions before their recruitment, thus highlighting the importance of rehabilitation.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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