

Contributory Factors of Hearing Handicap in individuals with Sensorineural Hearing loss and Auditory Neuropathy Spectrum Disorder

by Jijo P.m.

FILE	DR_JJO1.DOC (76.5K)	WORD COUNT	2383
TIME SUBMITTED	21-JUL-2016 01:39PM	CHARACTER COUNT	13035
SUBMISSION ID	690870997		

Part A

1.0 Title of the Project: **Contributory Factors of Hearing Handicap in individuals with Sensorineural Hearing loss and Auditory Neuropathy Spectrum Disorder (ANSD).**

Area of research: Speech, language and hearing

1.1 Principal Investigator :Dr. Jijo P M

1.2 Co-Investigators: Dr. Hemanth N

1.3 Co-investigators: Dr. Ajith Kumar U

1.4 Collaborating Institution: Nil

Total Grants required: 4,54,000 INR

1.5 Duration of the project: One year

2.0 Project Summary:

It is clear from literature that prevalence of late onset ANSD is very high in Indian population (Kumar & Jayaram, 2006; Jijo & Yathiraj, 2013) compared to that of western population (Starr et al., 2000; Berlin et al., 2010). However, little research has been focused on the handicap due to ANSD in Indian population. Present study aimed to measure quantum of handicap in individuals with ANSD. The study also identifies the possible contributory factors of hearing handicap in ANSD. Further, the quantum of handicap will be compared between those with SNHL and ANSD. In order to assess communication problems due to hearing loss self assessment of hearing handicap (Vanaja & Nikam, 2000) will be administered in both the study participants. The impact of hearing loss on quality of life will be evaluated using World Health Organization Quality of Life (WHO-QOL). To probe in to possible contributory factors of handicap, speech identification in quiet, speech perception in noise, temporal and spectral processing abilities will be measured. Such an investigation will throw light on quantum of handicap in individuals with ANSD and its possible contributory factors.

3.0. Introduction:

In India, certificate of disability for individuals with hearing impairment is issued based on degree of hearing loss and speech discrimination scores (PWD Act, 2005). In case of sensorineural hearing loss (SNHL) there is a good agreement between degree of hearing loss and speech discrimination scores. Hence, certificate of disability for those with SNHL is

issued solely on the basis of their degree of hearing loss. The present criteria to issue certificate of disability is suitable for individuals with SNHL, as there is a good agreement between their degree of hearing loss and speech understanding. Auditory Neuropathy Spectrum Disorder (ANSD) is a form of SNHL in which speech understanding is severely impaired and is disproportionate with their degree of hearing loss (Kumar & Jayaram, 2006; Jijo & Yathiraj, 2013). The disparity between speech understanding and degree of hearing loss in individuals with ANSD questions the ability of current criteria that decide disability in them.

A retrospective study by Hemanth, Jijo and Kumar (2016) compared SIS obtained in individuals with SNHL and ANSD having similar degree of hearing loss. Additionally, the relation between degree of hearing loss and SIS in these two participant groups was studied. The results revealed that for subjects with SNHL, SIS decreased with increasing degree of hearing loss. However, in case of ANSD, no such trend was observed between SIS and degree of hearing loss. It was found that speech understanding in those with ANSD who had even mild degree of hearing loss was poorer than those with SNHL having profound degree. This infers that speech understanding ability in ANSD does not depend on hearing thresholds.

Additionally, preliminary data was collected on number of individuals with SNHL and ANSD who received certificate of disability (Hemanth, Jijo, Kumar, 2016). The results revealed that all the 48 individuals with SNHL who had hearing loss above moderately severe degree received certificate of disability (Hemanth, Jijo, Kumar, 2016). In contrast, only 2 of 36 clients with ANSD received certificate of disability though their hearing thresholds were above moderately severe degree. Thus, clients with ANSD were precluded from receiving certificate of disability though they met the criterion for hearing disability. The major reason for excluding those with ANSD was the presence of oto acoustic emissions that indicate normal outer hair cell functioning. However, studies have shown that presence of oto acoustic emissions does not play any role in hearing ability as well as speech understanding (Rance 2005). Hence, the current criteria to issue certificate of disability is not appropriate for individuals with ANSD.

3.1 Definition of the problem:

It is clear from literature that individuals with ANSD have severe speech perception problems. Unlike SNHL, their speech understanding is not related to degree of hearing loss. It was found that speech understanding in those with ANSD having mild degree of hearing loss was poorer than those with SNHL having profound degree. However, current criteria to decide percentage of disability utilize pure-tone hearing thresholds rather than speech

understanding. Thus, many individuals with ANSD were precluded from receiving certificate of disability though they have severe communication problems and met the criterion of hearing disability. The major reason for excluding those with ANSD was the presence of otoacoustic emissions that indicate normal outer hair cell functioning. From the above literature it is clear that individuals with ANSD have severe communication problem that make them handicap. Unlike SNHL, the extend of handicap in ANSD may not depends on degree of hearing loss. It is essentials to estimate the amount of handicap in ANSD and also to identify the contributory factors of handicap in them.

3.2 Specific objectives:

To compare individuals having SNHL and ANSD having similar degrees of hearing loss in terms of their communication problems due to hearing loss

To compare individuals with SNHL and ANSD having similar degrees of hearing loss in terms of their quality of life

To evaluate factors such as speech perception in quite, noise, spectral and temporal processing abilities, objective hearing threshold (measured using LLR) in the participants of the study

- a) To determine the role of contributory factors on hearing handicap in individuals with SNHL and ANSD having similar degrees of hearing loss
- b) To check the relation between objective hearing threshold (measured using LLR) and handicap due to ANSD.

c)

6

3.3 Review of status of research and develop in the project

International status:

Very few investigations have been carried out on handicap due to hearing problems in ANSD. In a recent study, Lima, Mantello and Anastasio (2016) monitored hearing handicap and the recognition threshold of sentences in silence and in noise in a patient with ASND using hearing aid. The study participant aged 47 years, had moderate degree of hearing loss. Hearing Handicap Inventory for Adults (HHIA) was administered before HA adaptation and after 3 months of HA use. The evaluation of perception of hearing handicap before HA adaptation demonstrated that, all responses were attributed to the “always” option regarding both the emotional and social subscales. This corresponding to a severe degree of perception (100 points). Three months after HA adaptation, there was a 40-point reduction of hearing

10

2

handicap, although perception continued to be of a severe degree. Thus the study showed significant reduction of hearing handicap after 3 months of HA use. The results of the study inferred that individuals with ANSD exhibit severe handicap due to their hearing problems. However, extensive research is required in a large group of ANSD.

National status:

It is clear from literature that prevalence of late onset ANSD is very high in Indian population (Kumar & Jayaram, 2006; Jijo & Yathiraj, 2013) compared to that western population (Starr et al., 2000; Berlin et al., 2010). However, little research has been focused on the handicap due to ANSD in Indian population. Further, individuals with ANSD are generally precluded from receiving certificate of disability. A preliminary investigation that was carried out in the department of Audiology AIISH, Mysore revealed that only 2 of 36 clients with ANSD received certificate of disability though their hearing thresholds were above moderately severe degree (Hemanth, Jijo, Kumar, 2016). In contrast all the individuals with SNHL who had hearing loss above moderately severe degree received certificate of disability. From the above study it was evident that speech understanding in those with ANSD having mild degree of hearing loss was poorer than those with SNHL having profound degree. This probably makes the ANSD group more handicapping compared to that of SNHL. However, these individuals with ANSD were not considered to be handicap due to their lesser degree of hearing loss. Furthermore, presence of oto-acoustic emissions precluded many clients with ANSD from receiving certificate of disability though they met the criterion in terms of degree of hearing loss. Even though hearing threshold estimated using LLR is utilized to issue certificate of disability (Singh, 2007), LLR is not present in many of the clients with ANSD. Additionally, the relation between objective hearing threshold (measured using LLR) and handicap due to ANSD is not known. Given this background the current criteria that decide hearing handicap in India are not applicable for those having ANSD.

3.5 . Importance of proposed project in the context of current status:

The present criteria for issuing certificate of disability for hearing impairment preclude individuals with ANSD being certified as disabled. However, communication problems in those with ANSD in real life are much higher than that of SNHL. This leads to poor social interaction, emotional and vocational problems in individuals with ANSD. The current study tries to estimate the quantum of handicap due to hearing problems in ANSD. Additionally, the study identifies the possible contributory factors of handicap in individuals with ANSD. The study will give information on handicap due to hearing problems in ANSD. Such

information is essential for policy making towards changing the current criteria that decide hearing disability.

4.0 Work Plan:

Participants

Sixty individuals having two different forms of SNHL will be participated in the study. Among them ⁴thirty individuals having late onset ANSD and the remaining 30 will have SNHL. The diagnosis of ANSD will be carried out according to the criteria given by Starr et al. (2000) and Berlin et al. (1995) As per the above criteria, clients who had preserved cochlear amplification (presence of otoacoustic emission/cochlear microphonics), ⁴impaired neural response (absent or abnormal brainstem responses and middle ear reflexes), normal otological function and no space occupying lesion (identified based on clinical neurological examination) were included. All the individuals with SNHL will have normal middle ear function, indicated by 'A' type tympanogram. All of them will have speech identification scores that were proportional to their degree of hearing loss. None of the subjects with SNHL wil have signs of retrocochlear dysfunction, specifically all had present acoustic reflexes and Wave V was present less than or equal to 0.8 ms between 11.1/ s and 90.1 /s repetition rate. Both the study participants will be grouped based on their degree of hearing loss.

Instruments:

Routine audiological evaluations will be carried out in both the study participants. Pure tone thresholds, speech recognition threshold (SRT) and SIS will be obtained using a dual channel calibrated diagnostic audiometer. Tympanometry and Acoustic reflex assessment will be carried out using middle ear analyzer. Further, oto-acoustic emission auditory brainstem and cortical evaluations will be carried out using appropriate instrumentation.

Stimuli/material:

1. Speech identification in quite will be obtained using a ⁵recorded version of phonetically balanced word lists in Kannada language developed by Yathiraj and Vijayalakshmi (2006).

2. Speech perception in noise will be obtained using the sentence test in Kannada developed by Geetha, Kumar, Manjula and Pavan (2014).
3. Temporal and spectral processing abilities will be measured using TMTF and DLF.
4. In order to assess communication problems due to hearing loss self assessment of hearing handicap (Vanaja & Nikam, 2000) will be administered in both the study participants.
5. In order to assess the impact of hearing loss on **quality of life World Health Organization Quality of Life (WHO-QOL)** will be administered in both the study participants.

Procedure:

Each participant will be evaluated to assess their speech perception abilities in quiet and noise. The stimuli were played using a computer. The output of the computer was routed through a calibrated audiometer and heard by the participants through a loud speaker kept at a distance of 1 meter at 0° azimuth. The stimuli were presented at 40 dB HL. No participant heard the same list more than once to avoid any familiarity effect. The participants were instructed to repeat the stimuli and the responses were noted by the experimenter. The SNR was adjusted depending on the participant's response to obtain 50% response. Similarly, the word identification scores was calculated by counting the number of words identified correctly.

Temporal processing abilities will be measured using TMTF. A three-alternative forced-choice method was used, where un-modulated and modulated stimuli were randomly presented with an inter-stimulus interval of 500 ms. Participants were instructed to identify the stimulus that was different from the others. The Apex software (Version 3) was used to present the stimuli and obtain the plotted response. Initially, the stimuli having 100% modulation (0 dB) was presented. The modulation depth was gradually decreased once the participant identified the modulated signal. A step size of 4 dB was used initially and then reduced to 2 dB after two reversals. This procedure has been estimated to provide the value of amplitude modulation necessary to obtain a 70.7% correct responses (Levitt, 1971). The mean of the last eight reversals in a block of 14 reversals was taken as the threshold.

Electro-physiologic late latency response (LLR) will be recorded by far field recording using Biologic Navigator Pro instrument. Three electrodes will be placed, one on

the test ear mastoid (inverting), others on the forehead (ground) and the vertex (non-inverting) respectively. Additionally an ocular channel will be enabled to remove eye blinks. Each participant will be instructed to watch audio muted video and to avoid body movement during the test. Tone burst stimulus will be delivered through insert earphone in alternating polarity at 65 dB nHL to record LLR. Post-stimulus time of 500 ms and 50 ms of pre-stimulus time will be utilized. Sweeps of 200 were presented at the repetition rate of 1.1/s. Each epoch elicited will be filtered online by 0.1 Hz to 30 Hz. The epoch will be rejected if the amplitude exceeded $\pm 75 \mu\text{V}$. Finally epochs which are free from artifacts will be averaged. Threshold estimated through LLR will be used as an objective indicator of hearing. However, this will be carried out only in those individuals in whom LLR is present.

Implications of study:

The study will give information on handicap due to hearing problems in ANSD. Such information is essential for policy making towards changing the current criteria that decide hearing disability.

Contributory Factors of Hearing Handicap in individuals with Sensorineural Hearing loss and Auditory Neuropathy Spectrum Disorder

ORIGINALITY REPORT

22%

SIMILARITY INDEX

10%

INTERNET SOURCES

11%

PUBLICATIONS

10%

STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to University of Mysore, Mysore Student Paper	7%
2	thieme-connect.com Internet Source	4%
3	www.audiologyresearch.org Internet Source	4%
4	Mathai, Jijo Pottackal, and Sabarish Appu. "Perception of Hearing Aid-Processed Speech in Individuals with Late-Onset Auditory Neuropathy Spectrum Disorder", Journal of the American Academy of Audiology, 2015. Publication	3%
5	Submitted to All India Institute of Speech & Hearing Student Paper	1%
6	www.aiishmysore.in Internet Source	1%
7	M., C., K. M., A. Al-meqbel, and R. B..	

"Cochlear Implantation in Auditory Neuropathy Spectrum Disorder", Cochlear Implant Research Updates, 2012.

Publication

1%

8

www.ncbi.nlm.nih.gov

Internet Source

<1%

9

www.aulamedica.es

Internet Source

<1%

10

Lima, Aline, Erika Mantello, and Adriana Anastasio. "Monitoring the Hearing Handicap and the Recognition Threshold of Sentences of a Patient with Unilateral Auditory Neuropathy Spectrum Disorder with Use of a Hearing Aid", International Archives of Otorhinolaryngology, 2015.

Publication

<1%

EXCLUDE QUOTES ON

EXCLUDE MATCHES < 7 WORDS

EXCLUDE BIBLIOGRAPHY ON