

**DEVELOPMENT OF VIDEO FOR COUNSELLING HEARING AID USERS
AND CHECK ITS EFFICACY USING HEARING AID HANDLING SKILLS**

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**This Dissertation is submitted as part fulfillment for the
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CERTIFICATE

This is to certify that this dissertation entitled *“Development of video for counselling hearing aid users and check its efficacy using hearing aid handling skills”* is a bonafide work submitted in part fulfillment for degree of Master of Science (Audiology) of the student Registration Number: 16AUD004. This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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ABSTRACT

Counselling the first time hearing aid users is a tedious task. Counselling is a broad term, in that hearing aid orientation is considered as major part in the process of rehabilitation for hearing aid users. It is also stated that if the naïve hearing aid user is not satisfied with the hearing aid, then the usage of hearing aid reduces. They even feel overloading of information, when they are oriented about the care and maintenance of the hearing aid verbally for the first time and they tend to forget the information. Hence, the current study focused on development and validation of BTE and RIC video and comparing the differences of performance for 30 (15 in each group) participants, one group who attended video and other group who attended face to face, first time hearing aid orientation under HAHST (Hearing Aid Handling Skills Test). The HAHST revealed that second group i.e., participants who attended hearing aid orientation through video performed better in more number of tasks under HAHST, when compared with the other group. When comparison of handling skills was done task wise, naïve hearing aid users from first group had difficulty with tasks such as cleaning vent portion of the hearing aid, placement of phone in relation to hearing aid, knowledge about voltage of hearing aid battery, detecting blocked ear mould/tip, detecting hearing aid is not working, usage of the device as advised by the audiologists, and knowledge about significance of serial number on hearing aids. The overall difficulty with tasks is less for second group than first group of

participants. Therefore, development of counselling video will help us to design a standardized tool for counselling hearing aid users.

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CHAPTER 1

INTRODUCTION

Hearing or auditory perception is the ability to perceive sound by detecting vibrations and changes in the pressure of the environment (Plack, 2014). Hearing is a complex process of picking sounds and attaching meaning to it. The human ear is fully developed part in our body at birth and responds to sounds that are very faint as well as sounds that are very loud. **Hearing loss**, also called as **hearing impairment**, is a total or partial lack of ability to hear. Little to no hearing will be seen in persons with no residual hearing. Occurrence of hearing loss can be in one ear or both the ears. Hearing loss can be temporary or permanent. In adults hearing problems may lead to difficulties related to work, but in children, it will have an effect on the ability to learn verbal language. Hearing loss can lead to isolation, particularly in case of older people. In some people, particularly older people, hearing loss can result in loneliness.

The World Health Organization (WHO), 2012 provided an estimate of 360 million (5.3%) people of the world's population suffer from disabling hearing loss. In India, there is significantly a high incidence and prevalence for hearing loss that is around 63 million people (6.3%). In South- East Asia, the prevalence ranges from 4.6% to 8.8%.

Hearing loss refers to diminished ability to hear sounds. Speech perception and communication difficulties can be caused due to hearing loss, whereas in case of adults it can pave way for depression, problems with employment, increase in risk for dementia, withdrawal from community and quality of life also decreases (Davis, Smith, Ferguson, and Stephens, 2007). The amount of hearing disability completely depends upon the type

and degree of hearing loss. In comparison with conductive hearing loss, sensorineural hearing loss is common in adult population (Gatehouse, 2002).

Depending upon the type and degree of hearing loss, the management varies. The “audiologic rehabilitation” is the term which involves the use of high tech knowledge and skills to improve interpersonal and communicative performance in hearing impaired adults. It is also considered as an exercise that solves problems which take account of two components (i.e.) evaluation and treatment, aimed at detection of the disability nature and taking avoiding or decrement action for the quantity of disability (Stephens & Hetu, 1991). Technology and service deliverance are considered as the two elements of treatment, for example, (hearing aids, assistive listening devices, counseling) which improves psychosocial welfare and facilitate pleasing communication in daily listening circumstances.

In adults, hearing aids play important role in intervention process (Kochkin, 2009). A hearing aid is an electroacoustic device which typically fits in or behind the ear of the user. It is also designed to amplify and modulate the sounds in the environment for the persons with hearing loss. Hearing aids are mostly given to persons with sensorineural hearing loss and mixed hearing loss. Conductive hearing loss can be treated by medicines as it is a problem in the outer or middle ear, if the problem is not resolved then hearing aid can be suggested. The technical developments in hearing aids have not produced a corresponding improvement in user satisfaction and hearing aid use. One possible reason for this may be that the scientific basis of hearing aid fitting has fallen far behind the technological developments in hearing aids (Cox, 2005). The three essential parts of hearing aid includes: a microphone, amplifier, and speaker. The sound from the

environment is collected from the hearing aid through a microphone where the acoustic energy is converted into electrical voltages and it will be sent to the amplifier. In amplifier the power of the signals are enhanced and it will then be sent to the ear by means of the speaker National Institute on Deafness and other Communication Disorders (NIDCD, 2017).

There are different styles of hearing aids. One among them is behind the ear (BTE) hearing aids. They consist of a hard plastic case that is worn behind the ear and is attached to the ear mold that fits inside the outer ear. BTE aid is suggested for people with mild to profound hearing loss of all ages. Another new sort of BTE aid is open-fit aid which is a good option for people with earwax problems where only a thin tube is placed into the ear canal which allows the canal to stay open and the aid fits behind the ear wholly (National Institutes of Health/ National Institute on Deafness and other Communication Disorders, NIH/NIDCD, 2017).

In-the-ear (ITE) hearing aids consist of a case that holds the components of aid and it is suggested for mild to severe hearing loss. ITE aids usually are not given to young children because as the ear matures the case has to be changed. The Canal aids such as in-the-canal (ITC) that fits the size and shape of the ear canal and completely-in-canal (CIC) that is almost concealed in the ear canal fits into the ear canal are used for mild to moderately severe hearing loss. They are not given for young children with severe to profound hearing loss. They usually are not recommended for young children or for people with severe to profound hearing loss as the compact size of the aid confines their power and volume (NIDCD, 2017).

The most common type of hearing disorder in adults is sensorineural hearing loss (Arlinger, 2003). Since this hearing loss is irreversible, the first intervention often consists of providing a hearing aid. The number of persons suffering from hearing loss is expected to increase in accordance with the increased average life span, causing an associated increase in the demand for hearing health care services. New patient groups with greater demands for quality of life are requiring hearing care, and the main goal of this dissertation is to develop new approaches in audiological rehabilitation to meet these demands and to achieve user satisfaction. The major part of aural rehabilitation consider in educating the use of hearing aid and strategies to improve communication and speech perception and counselling to improve contribution in daily life (Boothroyd, 2007).

Usually the naïve hearing aid users have high hope which in turn leads to idealistic expectations (Meyer, 2014). It is estimated that 51% of naïve hearing aid users experience complexity in handling their hearing aids (Action on Hearing Loss, 2011). The American Speech-Language-Hearing Association (2004) conveys that it is important to enlighten the client with handling and care of hearing aids. The verbal information which is delivered by the audiologist clinically is not being remembered by the naïve hearing aid user. It is reported that the first time aid user tend to forget 40% and 80% of information after the clinical appointment (Kessels, 2003).

Counselling is a vital part of interaction between the client and audiologist. The counselling is a combination of communication skill training and hearing aid orientation. Clarification of clients worry, understanding the client and to provide information based on the clients concern including recommendation for additional follow up and if required advising referral to specialized professionals constitutes the counselling process. For the

hearing aid user to obtain maximal benefit from the hearing aid it is important to create awareness about the counselling (Advisory Committee on Services to Hearing Impaired People, ACSHIP, 1975; Markides, 1977). Individuals with sensorineural hearing loss usually require treatment based on self-care skills, such as the effective use of hearing aids (HA). Achieving success in this treatment depends on different factors, including the provision of information and training regarding the handling of hearing aids, thus ensuring their proper use and functioning. It is important to think about the methods such as making video for Television, Personal Computer and internet for delivering counselling to the hearing aid user population (Clark & Martin, 1994).

During the period of counselling demonstration will be provided about the handling of hearing aids in a 45 minutes session. It is also important to note that after counselling; hearing aid handling skills are understood and acquired properly by the client (Kochkin & Hear, 2005). To ensure that the hearing aid users are benefitted by their hearing aid, proper functioning of the aid, the necessity to avoid repairs and replacements, it is important to gain knowledge in handling of the hearing aid. Brooks (1981) suggests that advanced age makes it harder to learn new tasks required to operate hearing aids, whereas these skills are mostly retained in to advanced age if they have been learned at an earlier age.

At the instance of hearing and hearing aid evaluation, the patients might feel overloaded with the amount of information they get about their new hearing aid during their first fitting process. Anyways patients tend to easily forget the amount of information provided. The patients do not satisfy much with the hearing aids, when there is some problem with the hearing aid or if they cannot perform simple tasks for care and

maintenance of the hearing aid (Nair & Cienkowski, 2010). Recent research suggests benefit in using instructional videos for new hearing aid users. The frequent number of visits and the need of counselling repeatedly will be reduced with the use of instructional videos. It is also important for the patient to understand the use, care, maintenance and trouble shooting of hearing aids to become a successful hearing aid user. The number of return visits for programming or counseling is highly correlated with patient satisfaction.

Kochkin, Beck, Christensen, and Fligor (2010), did a study and found forty percentage of patients who are in the limited success rate (i.e.) below average. Half of the participants, out of forty percent returned to the clinic often for programming of hearing aids. Hence, the sequence of instructional videos was developed for use in Audiology clinics to provide better clarity information for counselling the hearing aid user. The hypothesis in the dissemination of these videos is that they will increase patient satisfaction of new hearing aid users and also help these users remember key information related to their hearing test results, hearing aid use, and use of communication strategies. If there is greater satisfaction obtained with the hearing aids, then the benefit obtained also will be greater, which in turn helps in better and daily use of hearing aids.

1.1 Need for the study:

Literature has accounted the presence of difficulty experienced by the hearing aid user in handling the hearing aid, even after the counselling, which is provided verbally by the audiologists. The chief goal of counselling is to provide information about the type and degree of their hearing loss, to enhance the skills, which is essential to control their hearing aid and to change the behaviour related to communication (Dillon, 2001; Boothroyd, 2007).

As we know the outcome of the post fitting counselling can be influenced by many factors like knowledge of the clinician, work load in the audiology clinic, mother tongue of clinician and the hearing aid user etc. So, there is a need for a uniform way of counselling after fitting session of hearing aid. However, there are some public education videos for the same, but those have never been standardized in India.

1.2 Aim of the study:

To develop a standardized video for counselling the behind-the-ear and receiver-in-the ear/canal digital hearing aid user about the handling of the aid and also to check the handling skills for those who attends hearing aid orientation through face to face or video. The various tasks given under Hearing Aid Handling Skills Test (HAHST) includes common skills like switch on/off, program switching, volume control etc. associated with knowledge about trouble shooting, care and maintenance etc.

1.3 Objectives:

This study is addressed to satisfy the following objectives:

- To develop a video for digital BTE and RIC/RIE hearing aid orientation, this included all the concepts essential for hearing aid management, during post hearing aid fitting session.
- To find out outcome of the video using hearing aid handling skill test (Mittal & Krishna, 2016).
- To compare handling skills of the participants who were oriented face-to-face by clinician with those participants who were oriented through video during the first post fitting session.

CHAPTER 2

REVIEW OF LITERATURE

Bennett, Meyer, Eikelboom, and Atlas, (2018) carried out a study to find the significance of the skills, knowledge and tasks needed for management of hearing aids from the clinician and hearing aid user in order to achieve success with hearing aids as a whole. The participants included 24 hearing aid users in the age range of 56 to 91 years and 22 clinicians in the age range of 32 to 69 years. The method focused on the technique of mapping concept for key theme identification, where the participants task is to generate, sort and rate the significance of statements such as “what must hearing aid user do in order to use, handle, manage, maintain, and care for their hearing aids?”, in response to question asked. The results showed that the participants found 6 concepts are very important in the management of hearing aids, they are, a) “Daily Hearing Aid Use,” (b) “Hearing Aid Maintenance and Repairs,” (c) “Learning to Come to Terms with Hearing Aids,” (d) “Communication Strategies,” (e) “Working With Your Clinician,” and (f) “Advanced Hearing Aid Knowledge.” The clinicians found the concept of “Advanced Hearing Aid Knowledge” was not much important for the hearing aid user; otherwise both the clinician and hearing aid user gave similar importance for other 5 concepts. Hence they concluded that the skill required for hearing aid handling is very essential for management of hearing aids.

Ferguson, Brandreth, Brassington, Leighton, and Wharrad, (2016), in order to cover wide range of various psychosocial and realistic issues with respect to first time hearing aid user management, wanted to develop short interactive videos or Reusable Learning Objects (RLO's). There were two groups of participants, one group of

participants called as intervention group (RLO+, n=103) received traditional clinical services along with RLO's; other group of participants called as waitlist control group (RLO-, n=100) received traditional clinical service alone. RLO's includes video clips, photos, sounds and animations along with captions. After six weeks of hearing aid fitting, RLO's effectiveness was evaluated by delivering it through DVD for PC and TV. The results showed that RLO's help in self-management of hearing aids, it was also reported to be enjoyable experience. RLO+ group showed significant more hearing aid use and good knowledge with realistic issues than RLO- group. Hence, result proves that the RLO's provides greater learning support and benefit for first time hearing aid users, thus it can be implemented for standard clinical practice.

Ferrari, Jokura, Silvestre, Campos, and Paiva, (2015), evaluated the results of the "Practical Hearing Aid Skills Test (PHAST)" in new hearing aid users and also to assess the inter-rater reliability of the PHAST. The PHAST was administered to 60 new users 34 males and 26 females, aged between 29 and 94 years (mean 69.7 years) of behind-the-ear and in-the-ear hearing aid, instantly and following the hearing aid fitting that is after 10 days. Two independent evaluators assessed, analyzed and scored the recorded samples. Fair and poor performance on the about 55% of the participants showed fair and poor performance on the PHAST. Battery replacement and hearing aid insertion tasks were the most difficult to complete. Total scores as well as "opening battery compartment" and "hearing aid insertion" tasks scores, improved significantly between the first and second administration of the PHAST. The PHAST performance was correlated with the participant's age. Inter-rater reliability was high and significant concerning the total score and for six PHAST individual tasks.

Bozza, Ferrari, and Campos, (2014) made an effort to evaluate hearing aid handling skills in 37 experienced and inexperienced hearing aid users in the age range of 18 years and above. Also the authors tried to measure how the skills influence wearer's satisfaction and benefit. Here all the participants were asked to complete the tasks of "Practical Hearing Aid Skills Test (PHAST)", and then it was recorded on 5 point rating scale, where better hearing aid handling skills were depicted by higher scores. Experienced hearing aid users also responded to "International Outcome Inventory for Hearing Aids (IO-IHA)" and "Hearing Handicap Inventory (HHIA/HHIE)" considered for hearing aid benefit for handicap reduction. They found no significant difference for PHAST in between groups and lower score for tasks of volume control manipulation and telephone usage. They also found a moderate correlation between IOI-HA benefit and quality of life items and the PHAST scores. Hence, they concluded that hearing aid handling skills affect satisfaction and benefit obtained from the hearing aids, for hearing aid user.

McCormack and Fortnum (2013) found that 80% of adults who are in the age range of 55-74 years have limited usage of their hearing aids, even though they obtained benefit with those hearing aids. Their research was a scoping study of 10 papers related to non-hearing aid use. They reported some of the main factors for the limited use of hearing aids which includes hearing aid value and clarity of speech, comfort of the fit, care and maintenance of the aids, and device malfunction. Specifically, issues with background noise, help with insertion of the aid, dexterity issues, not understanding about the usage of device, and disappointment in function of the aid were all major factors that

affected the usage. Hence, the results showed that the issues with the hearing aid can be overcome through the techniques of better counselling.

Doherty and Desjardins (2012) revised (rPHAST) Practical Hearing Aid Skills Test by Desjardins and Doherty (2009) from 5 to 3-point rating scale and included two more tasks cleaning of battery of the hearing aid and they reanalyzed the data of original PHAST with revised PHAST and they found no significant difference in experienced and non-experienced hearing aid users. To observe how well hearing aid orientation (HAO) information is retained instantly and 1 month after the HAO, and whether the ability to remember this information differs as a function of the audiologist providing the information, patient's age, degree of hearing loss, and prior knowledge of hearing aids. In this study, sample of 100 older adults completed a multiple-choice test of hearing aid knowledge immediately following the HAO and 1 month later. The results showed that on average, participants recognized 74% of the information immediately following hearing aid orientation (HAO) and 78% at 1 month (Reese et al, 2005).

Kemker, Goshorn, and Kaplan (2012) investigated relationship between self-report ratings of hearing instrument use or satisfaction with time based measures of hearing instrument operation in 20 male new hearing aid users with no previous experience of hearing aid use. The hearing instrument operation checklist (HIOC; Kemker, 1999) was administered, which includes tasks like, take out battery from hearing aid and replace it with new batteries, remove hearing aid from ears, turn on and off the instruments and manipulation of the volume. These tasks were administered at initial fitting and 1 year post fitting and it was correlated with hours of use and user satisfaction at 6 weeks and 1 year post fitting using a satisfaction survey. The results suggest that the

users were capable of operating their devices if they used it regularly and manipulate it efficiently.

Henshaw, Clark, Kang, and Ferguson, (2012), carried out a study to discover the consequence of hearing difficulty on use of internet and Personal Computer (PC) in adults. The adult participants with hearing difficulty, who were in the age range of 50 to 74 years were given postal questionnaires on hearing difficulty, internet use and PC skills (n=3629) and subsample of 84 respondents also finished second questionnaire in detail for confidence to use mouse, keyboard and track pad. The scores were computed together and referred as “PC confidence index” this index was used to confirm the PC skill categories in the postal questionnaire. The results revealed significant difference between the categories for PC skill by PC confidence index. It was also found that PC and internet use was better in younger respondents (50-62 years) when compared to older respondents (63-74 years). Hence, PC and internet delivery is feasible for people with hearing difficulties.

Recent research suggests benefit in using instructional videos for new hearing aid users. A 2010 MarkeTrak survey by Kochkin and colleagues, did a survey hearing aid dispensing protocols on 46,843 households and its correlation with successful patient outcomes. Participants completed questions that used a 7 point Likert scale to evaluate things such as fit and comfort of the device, sound quality, counseling, and attributes of the Audiologist or dispenser both personally and in terms of their office space. The participants also answered questions on self-generated scales of benefit and satisfaction. In addition, the participants reported on the fitting protocol when they received their hearing aids. Interestingly, about 5% (n=44) of hearing aid users reported receiving some

sort of instructional video as part of the hearing aid fitting protocol. For these new hearing aid users that received a video, a small positive effect was noted for hours of usage, subjective benefit, and benefit in various listening environments (Watson, 2013).

Pothier and Bredenkamp (2006) compared the ability of the patient to insert their hearing aids with their ability after an observation from the Audiologist. 85 participants provided a rating on the level of their confidence to insert the devices using a visual analog score (VAS) and that was compared with VAS of their observed level of ability assessed by an audiologist. They found a weak to moderate correlation between the visual analog scores, so they suggested considering patients perceived level of ability for acceptance of hearing aids.

Reese and Smith (2006) in their pilot study on 28 elderly adults tried to find out that how much the elderly adults can recall hearing aid knowledge using a self-developed questionnaire, Hearing Aid Probed Recall Inventory (HAPRI) which contained of 25 items. They assessed the skills in new hearing aid users just after counselling and after four weeks. They found no significant change in the performance but overall executions declined from 80% to 77% which indicate some amount of information were forgotten by some participants. They recommend that there is necessity for more emphasis on certain important skills and care information during hearing aid orientation.

Uriarte, Denzin, Dunstan, Sellars, and Hickson (2005) examined satisfaction with the hearing aid for a group comprised of 1284 older adults in Australia, who were programmable digital hearing aid users. The participants of the study were subjected to take part in two questionnaire survey i.e. Satisfaction with Amplification in Daily Life (SADL) and Client Satisfaction Survey (CSS). It was found that out of 1284 participants,

1014 of them responded for the survey and there was also significant satisfaction with their hearing aids, specifically the problem was faced sometimes by 90% of participants and mostly by 4% of participants in 4th question of CSS which included questions about handling skills of the hearing aid such as removing the hearing aid from the ear canal, discomfort with the ear mould and difficulty with adjusting the controls, etc resulted in negative correlation with SADL questionnaire which shows that if the hearing aid user is not satisfied with the hearing aid, then it may in turn leads to poor handling of the hearing aid.

Cox, Alexander, and Gilmore (1991) administered the Profile of Hearing Aid Benefit (PHAB), the parent version of the Abbreviated Profile of Hearing Aid Benefit (APHAB), to a sample of 42 experienced hearing aid users to determine whether differences in subjective ratings of Hearing aid benefit emerge across different types of listening environments. Benefit for the PHAB represents a change in percentage of problem situations on selected subscales. The PHAB data indicated that hearing aid benefit is maximized in easy listening conditions and that the magnitude of benefit decreases as the listening situation becomes more difficult. This study support the notion that hearing aids promote speech understanding in quiet and reduce the extent of self perceived auditory disabilities associated with hearing impairment experienced by adults and older adults.

CHAPTER 3

METHOD

3.1 Participants:

3.1.1 Inclusion criteria:

- 30 adults in the age range of 18 to 70 years who had mild to profound (conductive, sensorineural and mixed) hearing loss served as subjects for the study. The subjects were divided into two groups, in which each group comprised of 15 participants. The first group of participants attended face-to-face post fitting counselling session, and the second group were counseled through a video about the hearing aids usage.
- All participants recruited for the study were speakers of English with basic reading skills.
- All the participants of the study were naïve users of digital behind the ear or receiver in the canal / receiver in the ear hearing aids.

3.1.2 Exclusion criteria:

- The participants with any history or presence of psychological and neurological problem were excluded from the study.
- Participants who had dexterity problems were also disqualified.
- If the participant's caregiver was performing the hearing aid operations, then they were excluded.
- If they have other associated problems (restricted limb movements and tremors), they were also excluded.

3.2 Procedure:

The procedure was divided into five phases:

- Development of the script for video and face-to-face counselling
- Video recording the script material
- Administration of counselling through the script material developed for face-to-face and through the video developed.
- Administration of Hearing Aid Handling Skills Test
- Scoring of HAHST

3.2.1 Development of the script for video and face-to-face counselling:

In the first stage, script was developed in English language which included:

- 1) The basic information about Behind the Ear and Receiver In The Canal /Ear hearing aids
- 2) Description about different parts of BTE and RIC hearing aids
- 3) Battery information
- 4) Insertion and removal of BTE and RIC hearing aids into and out of the ear
- 5) Realistic expectations with the hearing aids
- 6) Telephone use
- 7) Additional hardware's
- 8) Wax guards and different types of domes for RIC hearing aids
- 9) Care and maintenance (Do's and Don'ts)
- 10) Trouble shooting of hearing aids

After developing the script, 5 expert audiologists with 3 to 5 years of experience in the field of Audiology were requested to grade the script for its appropriateness of the

content and obtained a common script based on linguistic style and preference for words. The easier, clearer and more colloquial version was selected.

For this, the participants were asked to rate the script in 'yes' or 'no' response about its simplicity, clarity, relevancy and comfort. The responses were analyzed to check for correctness and necessary changes were incorporated to prepare the final version of the video script.

3.2.2 Video recording the script material:

The second phase included video recording the process of counselling. Once the script material had been approved by five audiologists, the script for counselling the first time hearing aid user was recorded as a video with the help of NIKON DSLR camera for better quality of the video. The video recorder was placed in the room away from environmental noise, well-lit and ventilated. The process of hearing aid orientation was video recorded and then it was played as counselling video for one group of participants of the study, and the other group of participants was given face-to-face counselling. The duration of each video i.e., 16 minutes and 34 seconds for Behind the Ear and 16 minutes for Receiver In the Ear hearing aids.

3.2.3 Administration of face-to-face and video:

This stage included the direct administration of the video to the hearing aid users and also for face to face counselling. In this third phase, the first time hearing aid users were randomly divided into two groups. Among those, one group was played counselling video about hearing aid handling and the other group was provided with face-to-face counselling. Other doubts regarding the hearing aid were clarified, if some information is

not understood by the patient and if the client asked for repetition of specific parts of the video was also be taken care of, and further modifications were made.

3.2.4 Administration of Hearing Aid Handling Skills Test:

The next phase included the administering of Hearing Aid Handling Skills Test (HAHST) for both the groups after counselling the first time hearing aid user, in order to check their handling skills for the specified tasks mentioned in HAHST for the behind-the-ear or receiver-in-the canal /receiver in-the-ear hearing aid users. It is also important to note that after counselling; hearing aid handling skills are understood and acquired properly by the client (Kochkin & Hear, 2005). The tasks covers up the following skills, they are as follows:

- 1) **Hearing aid removal:** It consists of 2 tasks which included Grasping aid/ Dexterity and removal of hearing aid from ears.
- 2) **Opening the battery door:** It consists of 2 tasks which included locating and opening of battery compartment.
- 3) **Changing the hearing aid battery:** It consists of 2 tasks which included removal of old battery and insertion of new battery.
- 4) **Cleaning the aid:** This skill consists of 3 tasks which included cleaning microphone, sound bore of ear mould, and acoustical vent.
- 5) **Hearing aid insertion:** It included 2 tasks such as grasping skills and placement of hearing aid back into the ear.
- 6) **Manipulating the volume control:** It included 2 tasks such as turning up and turning down the volume.

- 7) **Telephone use:** It included 2 tasks such as correct use of t-coil program and placement of phone receiver in relation to hearing aid.
- 8) **Use of different programs:** This skill included 2 tasks such as using of program switch properly and information regarding when to change programs.
- 9) **Handling ear mould:** This skill also included 2 tasks such as connecting the mould to ear hook of hearing aid and identifying right/ left mould.
- 10) **Switch off/ Switch on:** This included task such as switching the hearing aid on/ off.
- 11) **Knowledge about battery:** This memory related skill included 4 tasks such as information about life of battery, size of battery, battery cover removal for insertion into battery compartment and voltage of battery.
- 12) **Simple troubleshooting:** This included 3 tasks, where the hearing aid user is asked to troubleshoot the problems such as blocked ear mould, old batteries and non-functional hearing aid.
- 13) **Usage of hearing aids:** In this task the client was enquired about the situations in which they are not supposed to use hearing aids such as bathing, sleeping, during active discharge and if advised by Audiologist.
- 14) **Knowledge about serial number:** this included 3 tasks such as knowledge about presence of serial number, if yes then the client has to identify it, and has to tell the importance of that on hearing aids.

3.2.5 Scoring of HAHST:

The participants were asked to perform each task and the handling skills were scored from 4 to 0 on a five point rating scale based on their performance. The scoring

criteria are given in table 3.1. The overall handling skills performance of the two groups was compared using the total score obtained for each tasks specified in HAHST.

Table 3.1: *Hearing Aid Handling Skills Test (HAHST) Five point rating scale*

Scores	Remarks	Explanation
4	Excellent	The participant concludes the task without any mistakes
3	More than satisfactory	The participant makes one mistake, however, still completes the task successfully
2	Satisfactory	The participant makes more than one mistake, but concludes the task successfully
1	Less than satisfactory	The participant tries to conduct the task, but cannot conclude it successfully, or requires other means to conclude it
0	Not satisfactory	The participant cannot execute the task

The data obtained in HAHST with video and face to face counselling was subjected to various statistical procedures. Descriptive statistics would be carried out on different tasks under HAHST to obtain mean, standard deviation, median, and Inter-Quartile range. Both the groups were subjected to check whether there is a significant difference or not, with the help of Mann Whitney U test and Independent t-test.

The results are discussed in the following chapter:

CHAPTER 4

RESULTS AND DISCUSSION

The current study aimed to explore the hearing aid handling skills of naïve hearing aid users by comparing face to face hearing aid counselling with that of video counselling. A total of 30 participants were included in the study and they were divided into two groups. Naïve hearing aid users were selected and separated into two groups in a random manner. Both the groups are administered with the adapted and standardized version of HAHST (Hearing Aid Handling Skills Test). The scoring for responses were done based on the scoring instructions, which was already mentioned in the method portion. The scores for each task and overall scores of all the tasks in the Hearing Aid Handling Skills Test were totaled and tabulated. The overall scores are converted into percentage for both the groups and the data obtained from both the groups was analyzed using Statistical Package for the Social Sciences (SPSS) software version 20, the most widely used statistical software. The software covers summarization of data, significance tests, study of relationship between variables and prediction, time-series analysis, and graphs.

The statistical procedures used are as follows:

- Descriptive statistics was utilized for different tasks incorporated underneath HAHST (Hearing Aid Handling Skills Test) to get the mean, standard deviation, median, and Inter-Quartile range.
- Ratings are used, hence non-parametric test- Mann Whitney U test was applied to compare the difference between each tasks given under HAHST. Mean rank was used, if median was overlapping.

- Tests of Normality: Shapiro Wilk's test was used, to check the normality of the distribution.
- Independent t-test was used, as the data was normally distributed and also to check for overall difference between two groups for various tasks under HAHST.

The results obtained for both the groups for each of the task and overall performance of tasks between both the groups has been presented and discussed in this chapter under various sections:

1. Comparison of both the groups within each sub task i.e., 33 tasks under HAHST.
 - GROUP 1- Face to Face counselling,
 - GROUP 2- Video counselling.
2. Overall comparison of two groups.

4.1 Comparison of various tasks underneath HAHST for both the groups.

The performance of both the groups was analyzed for 33 tasks under Hearing aid handling skills test (HAHST). The tasks incorporated were t1a-Grasping aid/dexterity while removing the hearing aid, t1b-Removal of aid from ear, t2a-Locate the door, t2b-Open the door, t3a-Remove old battery, t3b-Insert new battery, t4a-Show how to clean sound bore of ear mould, t4b-Show how to clean microphone, t4c-Show how to clean vent, t5a-Grasping aid/dexterity while inserting the hearing aid, t5b-Placement in the ear, t6a-Turn up volume, t6b-Turn down volume, t7a-Correct use of program/t-coil switch, t7b-Placement of phone in relation to hearing aid, t8-How to use different programs, t9a-Connecting ear mould to the ear hook, t9b-Identifying right/left ear mould, t10-Switch on/off the hearing aid, t11a-Life of battery, t11b-Size of battery, t11c-Battery cover

removal for insertion into the battery compartment, t11d-Voltage of battery, t12a-Detecting blocked ear mould, t12b-Detecting old battery, t12c-Detecting hearing aid is not working, t13a-Not to use hearing aid while bathing, t13b-Not to use hearing aid while sleeping, t13c-Not to use hearing aid during active discharge, t13d-As advised by Audiologists, t14a-Do they know that there is serial number on hearing aids, t14b-Where is serial number located on their hearing aids, t14c-Do they know the significance of the serial number located on their hearing aids.

Descriptive statistics supplies essential characteristics for the purpose of reaching conclusions at a later stage. The data was subjected to descriptive statistical procedures to obtain mean, standard deviation, median, and Inter-Quartile range. Table 4.1 illustrates the mean, standard deviation, median, and Inter-Quartile range values of various tasks included in the Hearing Aid Handling Skills Test (HAHST).

Table 4.1 *Descriptive statistics for various tasks of HAHST and performance of both the groups*

TASKS	GROUP 1				GROUP 2			
	Mean	SD	Median	*IQR	Mean	SD	Median	*IQ R
t1a	3.67	0.61	4.00	1	3.73	0.45	4.00	1
t1b	3.13	0.83	3.00	2	3.67	0.48	4.00	1
t2a	3.47	0.64	4.00	1	3.87	0.35	4.00	0
t2b	3.53	0.64	4.00	1	3.93	0.25	4.00	0
t3a	3.07	0.79	3.00	2	3.47	0.51	3.00	1
t3b	3.33	0.61	3.00	1	3.60	0.50	4.00	1
t4a	1.33	1.11	2.00	2	2.13	0.64	2.00	1
t4b	2.07	1.22	2.00	2	3.13	0.91	3.00	2
t4c	.60	0.98	.00	1	1.33	0.61	1.00	1
t5a	3.13	0.83	3.00	2	3.87	0.35	4.00	0
t5b	2.93	0.79	3.00	2	3.73	0.45	4.00	1
t6a	3.53	0.51	4.00	1	3.93	0.25	4.00	0

t6b	3.67	0.48	4.00	1	3.93	0.25	4.00	0
t7a	2.27	0.88	2.00	1	2.73	0.59	3.00	1
t7b	1.60	1.12	1.00	1	2.93	0.70	3.00	1
t8	1.93	0.88	2.00	1	3.13	0.64	3.00	1
t9a	1.60	0.98	2.00	1	2.87	0.74	3.00	1
t9b	3.07	1.22	3.00	1	3.53	0.74	4.00	1
t10	3.53	0.64	4.00	1	3.67	0.61	4.00	1
t11a	2.67	1.11	2.00	2	3.13	0.83	3.00	2
t11b	2.00	0.92	2.00	2	3.53	0.64	4.00	1
t11c	3.40	0.73	4.00	1	3.93	0.25	4.00	0
t11d	1.20	1.08	1.00	2	1.87	1.06	2.00	2
t12a	1.20	1.01	1.00	2	2.13	0.99	2.00	1
t12b	1.47	1.18	2.00	2	2.27	0.96	2.00	2
t12c	1.33	1.23	1.00	2	1.27	0.96	1.00	1
t13a	3.67	0.61	4.00	1	3.73	0.59	4.00	0
t13b	3.60	0.63	4.00	1	3.80	0.41	4.00	0
t13c	2.53	1.45	3.00	3	3.33	0.90	4.00	1

t13d	1.53	1.12	1.00	2	2.27	1.33	2.00	2
t14a	2.13	1.64	3.00	4	2.93	1.10	3.00	2
t14b	1.67	1.54	2.00	3	2.93	1.10	3.00	2
t14c	1.07	1.22	1.00	2	1.27	0.96	1.00	2

**IQR-InterQuartile Range*

t1a-Grasping aid/dexterity while removing the hearing aid, t1b-Removal of aid from ear, t2a-Locate the door, t2b-Open the door, t3a-Remove old battery, t3b-Insert new battery, t4a-Show how to clean sound bore of ear mould, t4b-Show how to clean microphone, t4c-Show how to clean vent, t5a-Grasping aid/dexterity while inserting the hearing aid, t5b-Placement in the ear, t6a-Turn up volume, t6b-Turn down volume, t7a-Correct use of program/t-coil switch, t7b-Placement of phone in relation to hearing aid, t8-How to use different programs, t9a-Connecting ear mould to the ear hook, t9b-Identifying right/left ear mould, t10-Switch on/off the hearing aid, t11a-Life of battery, t11b-Size of battery, t11c-Battery cover removal for insertion into the battery compartment, t11d-Voltage of battery, t12a-Detecting blocked ear mould, t12b-Detecting old battery, t12c-Detecting hearing aid is not working, t13a-Not to use hearing aid while bathing, t13b-Not to use hearing aid while sleeping, t13c-Not to use hearing aid during active discharge, t13d-As advised by Audiologists, t14a-Do they know that there is serial number on hearing aids, t14b-Where is serial number located on their hearing aids, t14c-Do they know the significance of the serial number located on their hearing aids.

Median and Inter-Quartile range was considered to write results, as rating scale was used for scoring. Median cannot be explained, if it was equal or overlapping, then mean rank was taken into consideration. The median values and also the performance of some tasks are equal for both the groups, which includes tasks such as t1a[G1(M=4.00), G2(M=4.00)]; t2a[G1(M=4.00), G2(M=4.00)]; t2b[G1(M=4.00), G2(M=4.00)]; t3a[G1(M=3.00), G2(M=3.00)]; t4a[G1(M=2.00), G2(M=2.00)]; t6a[G1(M=4.00,

G2(M=4.00)]; t6b[G1(M=4.00), G2(M=4.00)]; t10[G1(M=4.00), G2(M=4.00)]; t11c[G1(M=4.00), G2(M=4.00)]; t12b[G1(M=2.00), G2(M=2.00)]; t12c[G1(M=1.00), G2(M=1.00)]; t13a[G1(M=4.00), G2(M=4.00)]; t13b[G1(M=4.00), G2(M=4.00)]; t14a[G1(M=3.00), G2(M=3.00)], t14c[G1(M=1.00), G2(M=1.00)]. The median values are equal for both the groups, hence median cannot be considered. Mean rank was taken into consideration because of equal values of median for both the groups.

Non-parametric tests have fewer assumptions compared to parametric tests. They do not rely on assumptions like normality, homogeneity of variance etc. Mann-Whitney U test was used directly, in which mean rank were utilized to compare the difference between each task for both the groups. It was addressed in table 4.2.

The descriptive statistics mentioned in the above table 4.1 also showed that for fewer tasks, the performance of the participants was not satisfied or less than satisfactory for both the groups. Those tasks which showed poor or less than satisfactory performance in the first group who attended face to face hearing aid orientation included t4c (M=0.00), t7b (M=1.00), t11d (M=1.00), t12a (M=1.00), t12c (M=1.00), t13d (M=1.00), t14c (M=1.00). Similarly, in the second group who attended video counselling, the tasks which showed poor or less than satisfactory performance included t4c (M=1.00), t12c (M=1.00), t14c (M=1.00).

However, when comparing both the groups, it was clear that the number of tasks which was showing poor or less than satisfactory performance in group 2 was less when compared to group 1. The participants had difficulty performing tasks such as cleaning vent portion in the hearing aid, placement of phone in relation to hearing aid, knowledge about voltage of hearing aid battery, detecting blocked ear mould, detecting that the

hearing aid is not working, not using hearing aid as advised by the audiologists, and knowledge about significance of serial number on hearing aids. This present study findings were also in relation with the findings of other studies which declare that naïve hearing aid users tends to forget the information given on counselling and fail to perform some tasks as they feel overloading of information (Desjardins & Doherty, 2009; Campos, 2014).

Table 4.2: *Mann-Whitney U Test, comparison of groups across each task for both the groups*

Ranks				
Tasks #	Group	N	Mean Rank	Sum of Ranks
t1a	Group 1	15	15.37	230.50
	Group 2	15	15.63	234.50
	Total	30		
t1b	Group 1	15	12.83	192.50
	Group 2	15	18.17	272.50
	Total	30		
t2a	Group 1	15	12.93	194.00
	Group 2	15	18.07	271.00

	Total	30		
t2b	Group 1	15	12.97	194.50
	Group 2	15	18.03	270.50
	Total	30		
t3a	Group 1	15	13.43	201.50
	Group 2	15	17.57	263.50
	Total	30		
t3b	Group 1	15	13.80	207.00
	Group 2	15	17.20	258.00
	Total	30		
t4a	Group 1	15	12.47	187.00
	Group 2	15	18.53	278.00
	Total	30		
t4b	Group 1	15	11.87	178.00
	Group 2	15	19.13	287.00
	Total	30		
t4c	Group 1	15	11.60	174.00

	Group 2	15	19.40	291.00
	Total	30		
t5a	Group 1	15	11.73	176.00
	Group 2	15	19.27	289.00
	Total	30		
t5b	Group 1	15	11.33	170.00
	Group 2	15	19.67	295.00
	Total	30		
t6a	Group 1	15	12.50	187.50
	Group 2	15	18.50	277.50
	Total	30		
t6b	Group 1	15	13.50	202.50
	Group 2	15	17.50	262.50
	Total	30		
t7a	Group 1	15	13.00	195.00
	Group 2	15	18.00	270.00
	Total	30		

t7b	Group 1	15	10.50	157.50
	Group 2	15	20.50	307.50
	Total	30		
t8	Group 1	15	10.20	153.00
	Group 2	15	20.80	312.00
	Total	30		
t9a	Group 1	15	10.53	158.00
	Group 2	15	20.47	307.00
	Total	30		
t9b	Group 1	15	13.90	208.50
	Group 2	15	17.10	256.50
	Total	30		
t10	Group 1	15	14.57	218.50
	Group 2	15	16.43	246.50
	Total	30		
t11a	Group 1	15	13.67	205.00
	Group 2	15	17.33	260.00

	Total	30		
t11b	Group 1	15	9.60	144.00
	Group 2	15	21.40	321.00
	Total	30		
t11c	Group 1	15	12.43	186.50
	Group 2	15	18.57	278.50
	Total	30		
t11d	Group 1	15	13.03	195.50
	Group 2	15	17.97	269.50
	Total	30		
t12a	Group 1	15	11.83	177.50
	Group 2	15	19.17	287.50
	Total	30		
t12b	Group 1	15	12.50	187.50
	Group 2	15	18.50	277.50
	Total	30		
t12c	Group 1	15	15.57	233.50

	Group 2	15	15.43	231.50
	Total	30		
t13a	Group 1	15	15.03	225.50
	Group 2	15	15.97	239.50
	Total	30		
t13b	Group 1	15	14.40	216.00
	Group 2	15	16.60	249.00
	Total	30		
t13c	Group 1	15	13.33	200.00
	Group 2	15	17.67	265.00
	Total	30		
t13d	Group 1	15	13.07	196.00
	Group 2	15	17.93	269.00
	Total	30		
t14a	Group 1	15	13.63	204.50
	Group 2	15	17.37	260.50
	Total	30		

t14b	Group 1	15	11.93	179.00
	Group 2	15	19.07	286.00
	Total	30		
t14c	Group 1	15	14.50	217.50
	Group 2	15	16.50	247.50
	Total	30		

t1a-Grasping aid/dexterity while removing the hearing aid, t1b-Removal of aid from ear, t2a-Locate the door, t2b-Open the door, t3a-Remove old battery, t3b-Insert new battery, t4a-Show how to clean sound bore of ear mould, t4b-Show how to clean microphone, t4c-Show how to clean vent, t5a-Grasping aid/dexterity while inserting the hearing aid, t5b-Placement in the ear, t6a-Turn up volume, t6b-Turn down volume, t7a-Correct use of program/t-coil switch, t7b-Placement of phone in relation to hearing aid, t8-How to use different programs, t9a-Connecting ear mould to the ear hook, t9b-Identifying right/left ear mould, t10-Switch on/off the hearing aid, t11a-Life of battery, t11b-Size of battery, t11c-Battery cover removal for insertion into the battery compartment, t11d-Voltage of battery, t12a-Detecting blocked ear mould, t12b-Detecting old battery, t12c-Detecting hearing aid is not working, t13a-Not to use hearing aid while bathing, t13b-Not to use hearing aid while sleeping, t13c-Not to use hearing aid during active discharge, t13d-As advised by Audiologists, t14a-Do they know that there is serial number on hearing aids, t14b-Where is serial number located on their hearing aids, t14c-Do they know the significance of the serial number located on their hearing aids.

Table 4.3: *Z values to declare difference between two groups across tasks*

Tasks	Z	Significance
t1a	-0.10	0.91
t1b	-1.84	0.06
t2a	-1.99	0.04*
t2b	-2.14	0.03*
t3a	-1.40	0.15
t3b	-1.20	0.22
t4a	-2.03	0.04*
t4b	-2.33	0.01*
t4c	-2.56	0.01*
t5a	-2.74	0.00*
t5b	-2.83	0.00*
t6a	-2.43	0.01*
t6b	-1.79	0.07
t7a	-1.72	0.08
t7b	-3.21	0.00*

t8	-3.44	0.00*
t9a	-3.22	0.00*
t9b	-1.11	0.26
t10	-0.70	0.48
t11a	-1.20	0.23
t11b	-3.81	0.00*
t11c	-2.46	0.01*
t11d	-1.58	0.11
t12a	-2.36	0.01
t12b	-1.92	0.05*
t12c	-0.04	0.96
t13a	-0.39	0.69
t13b	-0.88	0.37
t13c	-1.43	0.15
t13d	-1.55	0.12
t14a	-1.20	0.22
t14b	-2.29	0.02*

t14c	-0.64	0.51
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*p ≤ 0.05

t1a-Grasping aid/dexterity while removing the hearing aid, t1b-Removal of aid from ear, t2a-Locate the door, t2b-Open the door, t3a-Remove old battery, t3b-Insert new battery, t4a-Show how to clean sound bore of ear mould, t4b-Show how to clean microphone, t4c-Show how to clean vent, t5a-Grasping aid/dexterity while inserting the hearing aid, t5b-Placement in the ear, t6a-Turn up volume, t6b-Turn down volume, t7a-Correct use of program/t-coil switch, t7b-Placement of phone in relation to hearing aid, t8-How to use different programs, t9a-Connecting ear mould to the ear hook, t9b-Identifying right/left ear mould, t10-Switch on/off the hearing aid, t11a-Life of battery, t11b-Size of battery, t11c-Battery cover removal for insertion into the battery compartment, t11d-Voltage of battery, t12a-Detecting blocked ear mould, t12b-Detecting old battery, t12c-Detecting hearing aid is not working, t13a-Not to use hearing aid while bathing, t13b-Not to use hearing aid while sleeping, t13c-Not to use hearing aid during active discharge, t13d-As advised by Audiologists, t14a-Do they know that there is serial number on hearing aids, t14b-Where is serial number located on their hearing aids, t14c-Do they know the significance of the serial number located on their hearing aids.

As illustrated in table 4.2, the mean rank of various tasks of Hearing Aid Handling Skills Test (HAHST) was taken into consideration for comparison of different tasks for both the groups, as median was equal for both the groups and also it cannot be explained. Hence, Median cannot be subjected to comparison.

It was noted that in table 4.3, for tasks t2a (/Z/=1.99, p=0.04); t2b (/Z/=2.14, p=0.03); t4a (/Z/=2.03, p=0.04); t4b (/Z/=2.33, p=0.01); t4c (/Z/=2.56, p=0.01); t5a (/Z/=2.74, p=0.00); t5b (/Z/=2.83, p=0.00); t6a (/Z/=2.43, p=0.01); t7b (/Z/=3.21, p=0.00); t8 (/Z/=3.44, p=0.00); t9a (/Z/=3.22, p=0.00); t11b (/Z/=3.81, p=0.00); t11c (/Z/=2.46, p=0.01); t12a (/Z/=2.36, p=0.01); t14b (/Z/=2.29, p=0.02); there was statistically significant difference when they were subjected to comparison of these tasks

between both the groups i.e. Group 1 and Group 2, and the p value was less than or equal to 0.05.

Therefore, it was made clear from the above results that there was significant difference in the tasks such as locating the door, opening the door, cleaning the sound bore of ear mould, cleaning the microphone, cleaning the vent part, grasping aid/dexterity while insertion, placement of hearing aid in the ear while insertion, turn up the volume, placement of phone in relation to hearing aid, how to use different programs, connecting ear mould to the ear hook, knowledge about size of the battery, knowledge about battery cover removal for insertion into battery compartment, detecting blocked ear mould, identification the location of serial number in the hearing aid.

Improvement in the handling skill for tasks under HAHST was evident for group 2 participants who attended hearing aid orientation through the video than group 1 participants who attended hearing aid counselling face to face without any videos as performance was limited for more number of tasks, when compared to second group. Ferguson et al in 2016 had proved in the study that short interactive videos provides greater learning support and benefit for first time hearing aid users, thus it can be implemented for standard clinical practice, the result of this study is again in agreement with the present findings of the study.

4.2 Overall comparison of group 1 and group 2 under HAHST:

The overall performance of both the groups was investigated with the help of Hearing Aid Handling Skills Test (HAHST), which consists of 33 tasks. The performance of each task was rated with 5 point rating scale, which ranges from 0 to 4 and the scoring was done, as mentioned in the above table 3.1. The data obtained in HAHST for the two

groups, that is one group who attended face to face hearing aid counselling and the other group attended hearing aid counselling through video, were subjected to descriptive statistics.

The descriptive statistics was done to get the mean, standard deviation, median, and inter-quartile range and then the data was converted for total percentage. The overall Median values for group 1(M= 63.63) and group 2(M= 76.51) are considered for comparison. First group of participants needed additional assistance to handle the tasks than second group under HAHST. However, it was found that group 2 had better handling of the hearing aid with various tasks except little confusion, compared to group 1 and this observation was made with the assistance of total percentage of median values obtained with descriptive statistics. The present study is in agreement with MarkeTrak survey by Kochkin and colleagues, 2010, in which new hearing aid users who received some sort of instructional video as a part of hearing aid counselling, a small positive effect was noted for usage, subjective benefit, and benefit in various listening environments.

Table 4.4 Descriptive statistics in terms of percentage for both the groups under comparison.

TOTAL PERCENTAGE								
Group								
	Group 1				Group 2			
	Mean	SD	Median	IQR*	Mean	SD	Median	IQR*
Statistic	61.31	9.86	63.63	14.39	76.96	5.43	76.51	9.09

**IQR- Inter-Quartile Range*

In order to confirm whether the difference found was statistically significant or not, decision about the parametric and non-parametric test is very important. Before making the decision, normal distribution of data for both the groups has to be checked. The data must follow normal distribution, since most of the parametric tests are based on the normality assumption. To check whether the population was normally distributed, tests of normality was done. Shapiro-Wilk's test in terms of total percentage was carried out.

Shapiro-Wilk's test is used as a method to study normality because of the small sample and it is also called as significance test of normality. From the below table 4.5 it is obvious that both the population under overall comparison falls under normal distribution as the overall p value is greater than 0.05. i.e., G1 (p= 0.84), G2 (p= 0.59). Hence, $t(15) = 0.96, p > 0.05$ for group 1 and $t(15) = 0.95, p > 0.05$ for group 2. It is

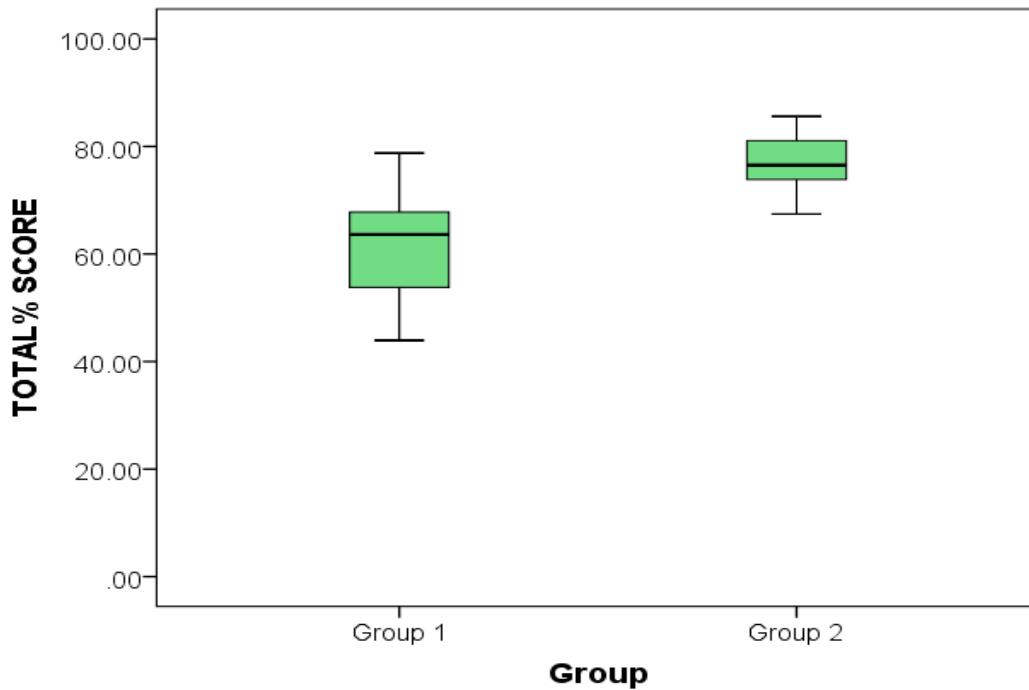
shown that p value is higher, hence there is high probability to get the observed result due to chance.

Table 4.5 Significance tests of normality for two groups of participants.

Tests of Normality				
	Group	Shapiro-Wilk's test		
		Statistic	Df	Sig.
TOTAL	Group 1	0.96	15	0.84
PERCENTAGE	Group 2	0.95	15	0.59

At this point, conclusion can be made about the choice of parametric or non-parametric tests. The parametric tests are used to check for significant difference between two groups, because both the group of participants follows normal distribution of data. Specifically Independent t-test was used to make comparison between both the groups and to check if the overall difference was statistically significant. The results of Independent samples t-test revealed statistically significant difference between overall values of both the groups for different tasks in HAHST. The graphical representations of overall performance of both the groups with respect to handling skills are depicted in the figure 4.1.

Figure 4.1 overall performances of two groups using Box-plots.



On comparison of both the groups based on independent samples t-test, it was noted that there was significant difference between two groups. Even though, it was seen that the overall performance of second group was better compared to the first group of participants, poor execution of some tasks were noted in the counselling session for few participants in the group 2 who attended video counselling. The tasks include cleaning the vent portion, Detecting hearing aid is not working, and knowledge about the significance of serial number located on their hearing aids. Fewer group 2 participants got confusions to understand certain parts of the video. Those specific portions of video, which created confusion to the participants was considered and necessary modifications were implemented in the video for better delivery of hearing aid counselling to the participants.

Table 4.6: *Verification of Significant difference between two groups using Independent sample t-test*

Independent Samples Test				
		t-test for Equality of Means		
		T	df	Significance
Total Percentage	Equal variances assumed	5.38	28	0.00

The handling skills were better for both the groups for certain tasks and poorer for certain tasks. But the handling skill performance was satisfactory for the second group than the first group. The present study results are in agreement with the another study which put forth the same point that if the hearing aid user is not satisfied with the hearing aid, then it may in turn leads to poor handling of the hearing aid (Uriarte et al, 2005). $t(28) = 5.38, p \leq 0.05$, there was statistically significant difference between two groups as mentioned in the above table 4.6.

One of the minor reason for better handling skills in the group 2 participants is that most of them are younger and this is supported by a study done by Brooks (1981), who suggests that advanced age makes it harder to learn new tasks required to operate hearing aids, whereas these skills are mostly retained in to advanced age if they have been learned at an earlier age. It was also found that PC and internet use was better in younger respondents (50-62 years) when compared to older respondents (63-74 years). Hence, PC and internet delivery is feasible for younger people with hearing difficulties

(Kochkin et al, 2012). Again this study is in agreement with the current study and shows that better performance in second group was also due to more number of younger participants.

The verbal information which is delivered by the audiologist clinically is not being remembered by the first time hearing aid user (Kessels, 2003). The results obtained in this study is supporting the results of present study, in the way that better handling skills obtained for second group than first group who attended only face to face counselling, as the first time hearing aid users tend to forget information given by the audiologist verbally.

The dissemination of these videos was that they will increase patient satisfaction of new hearing aid users and also help these users remember key information related to their hearing test results, hearing aid use, and use of communication strategies (Kochkin et al, 2010) If there is greater satisfaction obtained with the hearing aids, then the benefit obtained also will be greater, which in turn helps in better and daily use of hearing aids. Therefore, this hypothesis is in relation with the present study that good satisfaction leads to better handling of hearing aids.

CHAPTER 5

SUMMARY AND CONCLUSION

Hearing loss refers to diminished ability to hear sounds. Speech perception and communication difficulties can be caused due to hearing loss, whereas in case of adults it can pave way for depression, problems with employment, increase in risk for dementia, withdrawal from community and quality of life also decreases (Davis et al, 2007).

The World Health Organization (WHO), 2012 provided an estimate of 360 million (5.3%) people of the world's population suffer from disabling hearing loss. In India, there is significantly high incidence and prevalence for hearing loss that is around 63 million people (6.3%). In South- East Asia, the prevalence ranges from 4.6% to 8.8%. The amount of hearing disability completely depends upon the type and degree of hearing loss. In comparison with conductive hearing loss, sensorineural hearing loss is common in adult population (Gatehouse, 2002).

Depending upon the type and degree of hearing loss, the management varies. Technology and service deliverance are considered as the two elements of treatment, for example, (hearing aids, assistive listening devices, counseling) which improves psychosocial welfare and facilitate pleasing communication in daily listening circumstances.

Hearing aids are mostly given to persons with sensorineural hearing loss and mixed hearing loss. Conductive hearing loss can be treated by medicines as it is a problem in the outer or middle ear, if the problem is not resolved then hearing aid can be suggested. The technical developments in hearing aids have not produced a corresponding improvement in user satisfaction and hearing aid use. One possible reason

for this may be that the scientific basis of hearing aid fitting has fallen far behind the technological developments in hearing aids (Cox, 2005).

New patient groups with greater demands for quality of life are requiring hearing care, and the main goal of this dissertation is to develop new approaches in audiological rehabilitation to meet these demands and to achieve user satisfaction. The major part of aural rehabilitation consider in educating the use of hearing aid and strategies to improve communication and speech perception and counselling to improve contribution in daily life (Boothroyd, 2007).

Achieving success in this management depends on different factors, including the provision of information and training regarding the handling of hearing aids, thus ensuring their proper use and functioning. It is important to think about the methods such as making video for Television, Personal Computer and internet for delivering counselling to the hearing aid user population (Clark & Martin, 1994).

The current study intended to investigate the handling skills in first time hearing aid users and also to compare the overall performance of tasks under Hearing Aid Handling Skills Test (HAHST) for first group who attended face to face counselling verbally and second group who attended hearing aid orientation counseling through video. The study comprised of 30 participants of BTE or RIC users and they were divided into 2 groups, each group consisted of 15 participants. A hearing aid orientation video of 16 min 34 sec for BTE and 16 min for RIC was developed, validated, and administered on second group of participants to obtain their proficiency to handle various tasks of HAHST.

Descriptive statistics was carried out to compare each tasks under HAHST and also for overall comparison between both the groups and to find mean, standard deviation, median and inter-quartile range. Mann Whitney U test was used to find out difference between tasks of each group. Significance test of normality: Shapiro Wilk's test was employed to check for normality across groups and Independent sample t-test is done to ensure for overall significant difference.

The end results of current study disclosed that;

When comparison of handling skills was done task wise, first time hearing aid users from first group had difficulty with tasks such as cleaning vent portion of the hearing aid, placement of phone in relation to hearing aid, knowledge about voltage of hearing aid battery, detecting blocked ear mould/tip, detecting hearing aid is not working, usage of the device as advised by the audiologists, and knowledge about significance of serial number on hearing aids. The results obtained with the present study is in relation with earlier findings of the study where they talk about estimation that 51% of first time hearing aid users experience complexity in handling their hearing aids, because verbal information which is delivered by the audiologist clinically is not being remembered by the first time hearing aid user (Action on Hearing Loss, 2011; Kessels, 2003). Hence, the handling skills of the first group were less compared to second group.

The second group of participants had difficulty in executing tasks such as cleaning vent portion of the hearing aid; detecting hearing aid is not working, and knowledge about significance of serial number on hearing aids. The handling skills of this group are better because recent research suggests benefit in using instructional videos for new hearing aid users (Nair & Cienkowski, 2010).

The overall handling skills of both the groups are compared and it was found that the second group is significantly better than the first group and this findings is in agreement with the results of previous study that dissemination of these videos will increase patient satisfaction of new hearing aid users and also help these users remember key information related to their hearing test results, hearing aid use, and use of communication strategies (Kochkin et al, 2010). Another reason for better performance of group 2 is due to less number of older participants and this point is supported in the literature that advanced age makes it harder to learn new tasks required to operate hearing aids, whereas these skills are mostly retained in to advanced age if they have been learned at an earlier age (Brooks, 1981).

The inferences from the results of current study are as follows,

- Naïve hearing aid users tend to forget information which is provided verbally, this may be because of feeling of overloading of information; whereas key information is remembered through hearing aid orientation with videos.
- With advancing age, the hearing aid handling skills deteriorates.
- Considerations for using simple videos for hearing aid orientation should be done and implementation of the same in clinics should be encouraged.
- Video counselling provides better clarity than face to face verbal counselling.
- The frequent number of visits and the need of counselling again and again will be reduced with the use of short instructional videos.
- Few tasks were performed better by first group of participants, but satisfaction was seen for second group. Hence, face to face as well as video counselling will

be decided based on satisfaction. Because better the satisfaction, better the handling skills.

FUTURE IMPLICATIONS:

- The counselling video which was developed for hearing aid orientation will help us to design a standardized tool for counselling hearing aid users.
- The study will help in instructing or training patients to improve their handling skills for the usage of hearing aid.
- Based on the problems encountered in handling skills and feedback given by the hearing aid users, suitable modifications can be made.
- The performance of the group who attended video counselling was better, this might be due to more number of younger participants in that group. Hence, in the future age wise comparisons can be made.

References

- Arlinger, S. (2003). Negative consequences of uncorrected hearing loss- a review. *International Journal of Audiology, 42*, 517-520.
- Beaton, D. E., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine, 25(24)*, 3186-3191.
- Bennet, R. J., Meyer, C. J., Eikelboom, R. H., & Atlas, M. D. (2018). Investigating the knowledge, skills, and tasks required for hearing aid management: perspectives of clinicians and hearing aid owners. *American Journal of Audiology, 27(1)*, 67-84. doi:doi: 10.1044/2018_AJA-18-0059
- Brooks, D. N. (1970). Counselling and its effect on hearing aid use. *Scandinavian Audiology, 8:2*, 101-107. doi:10.3109/01050397909076308
- Brooks, D. N., & Johnson, D. L. (1981). Pre-issue assessment and counselling as a component of hearing-aid provision. *British Journal of Audiology, 15:1*, 13-19. doi:10.3109/03005368109108948
- Campos, P. D., Bozza, A., & Ferrari, D. V. (2014). Hearing aid handling skills: Relationship with satisfaction and benefit. *Sociedade Brasileira de Fonoaudiologia, 26(1)*, 10-16.
- Chisolm, T. H., Johnson, C. E., Danhauer, J. L., Portz, L. J., Abrams, H. B., Lesner, S., . . . Newman, C. W. (2007). A systematic review of health-related quality of life and hearing aids: Final report of the american academy of audiology task force on the

health-related quality of life benefits of amplification in adults. *Journal of the American Academy of Audiology*, 18, 151-183. doi:203.129.241.87

Clark, J. G., & Martin, F. N. (1994). *Effective counseling in audiology : perspectives and practice*. New Jersey, Australia: Prentice Hall.

Cox, R. M., & Alexander, G. C. (1995). The abbreviated profile of hearing aid benefit. *Ear and Hearing*, 16(2), 176-186. doi:0196/0202/95/1602-0176

Davis, A., Smith, P., Ferguson, M., Stephens, D., & Gianopoulos, I. (2007). Acceptability, benefit and costs of early screening for hearing disability: a study of potential screening tests and models. *Health Technology Assessment*, 11(42), 1-294.

Dillon, H., Kontschoner, E., Battaglia, J., Lovegrove, R., Ginis, J., Mavvias, G., . . . Macaskill, F. (1994). Rehabilitation effectiveness- assessing the needs of clients/ assessing outcomes for clients. *The Australian Journal of Audiology*, 13(2), 55-65.

Doherty, K. A., & Desjardins, J. L. (2012). The practical hearing aids skills test-revised. *American Journal of Audiology*, 21(1), 100-105.

Ferguson, M., Brandreth, M., Brassington, W., Leighton, P., & Wharrad, H. (2015). A randomized controlled trial to evaluate the benefits of a multimedia educational program for first-time hearing aid users. *Ear and Hearing*, 30, 123–136. doi:10.1097/AUD.0000000000000237

- Ferrari, D. V., Jokura, P. R., Silvestre, N. A., Campos, P. D., & Paiva, P. M. (2015). Practical hearing aid skills test: results at the time of fitting and comparison of inter-rater reliability. *Audiology Communication Research*, 20(2), 110-115. doi:http://dx.doi.org/10.1590/S2317-64312015000200001501
- Gatehouse, S., Naylor, G., & Elberling, C. (2003). Benefits from hearing aids in relation to the interaction between the user and the environment. *International Journal of Audiology*, 77-85. doi:10.3109/14992020309074627
- Hartmut, M., Isabel, L., Juergen, K., Hassovon, W., & Martin, W. (2002). Identifying the needs of elderly, hearing-impaired persons: the importance and utility of hearing aid attributes. *European Archives Otorhinolaryngology*, 259, 531-534. doi:10.1007/s00405-002-0495-5
- Henshaw, H., Clark, D. P., Kang, S., & Ferguson, M. A. (2012). Computer skills and internet use in adults aged 50-74 years: influence of hearing difficulties. *Journal of Medical Internet Research*, 14(4), 113.
- Johnson, D. N. (1981). Pre-issue assessment and counselling as a component of hearing-aid provision. *British Journal of Audiology*, 13-19. doi:10.3109/03005368109108948
- Kemker, B. E., Goshorn, E. L., & Kaplan, H. (2012). Analysis of hearing instrument use, satisfaction, and operation in independent elderly male veterans. *Asia Pacific Journal of Speech, Language, and Hearing*, 15(1), 19-28.

- Kessels, R. P., & Haan, E. H. (2003). Implicit learning in memory rehabilitation: A meta-analysis on errorless learning and vanishing cues methods. *Journal of Clinical and Experimental Neuropsychology*, 25(6), 805-814.
- Knudsen, L. V., Oberg, M., Nielsen, C., Naylor, G., & Kramer, S. E. (2010). Factors influencing help Seeking, hearing aid uptake, hearing aid use and satisfaction with hearing aids: a review of the literature. *Trends in Amplification*, 14(3), 127-154. doi:DOI: 10.1177/1084713810385712
- Kochkin, S., & MarkeTrak, V. (2000). " Why my hearing aids are in the drawer": The consumers' perspective. *The Hearing Journal*, 53(2), 34-41.
- Kochkin, S., Beck, D. L., Kristensen, L. A., & Conley, C. (2010). The impact of the hearing healthcare professional on hearing aid user success. *Hearing Review*, 17, 12-34.
- Lin, F. R., Metter, J., & O'Brien, R. J. (2011). Hearing loss and incident dementia. *Archives of Neurology*, 68(2), 214-220. doi:10.1001
- McCormack, A., & Fortnum, H. (2013). Why do people fitted with hearing aids not wear them? *International Journal of Audiology*, 52(5), 360-368. doi:doi:10.3109/14992027.2013.769066
- Nordqvist, C. (2015). *Deafness and hearing loss: causes, symptoms and treatments*. Medical news today.
- Oberg, M. (2008). *Approaches to audiological rehabilitation with hearing aids*. Sweden: Published medical dissertation for disability research.

- Plack, C. J. (2014). *The sense of hearing*. Psychology Press Limited.
- Pothier, D. D., & Bredenkamp, C. (2006). Hearing aid insertion: Correlation between patients' confidence and ability. *The Journal of Laryngology & Otology*, *120*(5), 378-380.
- Reese, J. L., & A., H. J. (2005). Recognition of hearing aid orientation content by first-time users. *American Journal of Audiology*, 94-104.
- Reese, J. L., & Smith, S. L. (2006). Recall of hearing aid orientation content by first time hearing aid users. *Seminars in Hearing*, *27*(4), 337-344.
- Saunders, G. H., Lewis, M. S., & Forsline, A. (2009). Expectations, prefitting counselling, and hearing aid outcome. *Journal of the American Academy of Audiology*, *20*, 320-334. doi:10.3766/jaaa.20.5.6
- Uriarte, M., Denzin, L., Dunstan, A., Sellars, J., & Hickson, L. (2005). Measuring hearing aid outcomes using the satisfaction with amplification in daily life (SADL) questionnaire: Australian data. *Journal of American Academy of Audiology*, *16*(6), 383-402.
- Varshney, S. (2016). Deafness in India. *Indian Journal of Otology*, *22*, 73. doi:10.4103/0971-7749.182281
- Watson, B. (2013). The impact of instructional videos on perceived satisfaction among new hearing aid users. *Independent Studies and Capstones*, 674.
- WHO. (2012). *World Health Organization, deafness and hearing loss*. Deafness and Hearing Loss.

Appendix 1

HEARING AID HANDLING SKILLS TEST (HAHST)

S. No.	Skills	Tasks	Excellent (4)	More than Satisfactory (3)	Satisfactory (2)	Less than Satisfactory (1)	Not Satisfactory (0)	Remarks
1)	Remove your hearing aid	a) Grasping aid/dexterity						
		b) Removal of aid from ear						
2)	Open the battery door	a) Locate the door						
		b) Open the door						
3)	Change your hearing aid battery	a) Remove old battery						
		b) Insert new battery						
4)	Show me how you can clean your hearing aid/ parts of hearing aid	a) Sound bore of ear mould						
		b) Microphone						
		c) Vent						

S. No.	Skills	Tasks	Excellent (4)	More than Satisfactory (3)	Satisfactory (2)	Less than Satisfactory (1)	Not Satisfactory (0)	Remarks
5)	Put your hearing aid(s) back in your ear(s)	a) Grasping aid/dexterity						
		b) Placement in the ear						
6)	Manipulation of volume control	a) Turn up volume						
		b) Turn down volume						
7)	Show me how you use the telephone with your hearing aid(s)	a) Correct use of program/t-coil switch						
		b) Placement of phone in relation to hearing aid						

S. No.	Skills	Tasks	Excellent (4)	More than Satisfactory (3)	Satisfactory (2)	Less than Satisfactory (1)	Not Satisfactory (0)	Remarks
8)	Show me how to use different programs							
9)	Handling the ear mould/ear tip	a) Connecting to the ear hook						
		b) Identifying left /right ear mould						
10)	Switch off/on the hearing aid							
11)	Knowledge about hearing aid battery	a) Life of battery						
		b) Size of battery						
		c) Battery cover removal for insertion into battery compartment						
		d) Voltage of battery						

S. No.	Skills	Tasks	Excellent (4)	More than Satisfactory (3)	Satisfactory (2)	Less than Satisfactory (1)	Not Satisfactory (0)	Remarks
12)	Simple trouble shooting	a) Detecting blocked ear mould						
		b) Detecting old battery						
		c) Detecting hearing aid is not working						
13)	When will you not use your hearing aid?	a) While bathing						
		b) While sleeping						
		c) During active discharge						
		d) As advised by Audiologists						

S. No.	Skills	Tasks	Excellent (4)	More than Satisfactory (3)	Satisfactory (2)	Less than Satisfactory (1)	Not Satisfactory (0)	Remarks
14)	Knowledge about serial no.	a) Do you know that, there is serial no. on hearing aids						
		b) Identify serial no. where it is located on your hearing aids?						
		c) Do you know the significance of serial no. on hearing aids						