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CRS SCIENTIFIC JOURNAL Otology & Audiology Article Review

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An effective decisionmaking aid for patients with tinnitus: A retrospective review of 205 patients.

Hearing Outcomes of Treatment for Acute Noise-induced Hearing Loss: A Systematic Review and Meta-analysis Cortical Neuroplasticity and Cognitive Function in Early-Stage, Mild-Moderate Hearing Loss: Evidence of Neurocognitive Benefit from Hearing Aid Use

CONTENT

- 35 INFLUENCE OF COCHLEAR DEAD REGIONS ON HEARING OUTCOME IN SUDDEN SENSORINEURAL HEARING LOSS Choi JE., Shim HJ., An Y., et al. Otology and Neurotology (2020) 41(7), 889-94.
- 36 SUBJECTIVE HEARING DIFFICULTY AND FALL RISK Criter RE. & Gustavson M. American Journal of Audiology (2020): 29, 384–90.
- 37 PERCEPTION OF ONE'S OWN VOICE AFTER HEARING AID FITTING FOR NAIVE HEARING AID USERS AND HEARING AID REFITTING FOR EXPERIENCED HEARING AID USERS Hengen J., Hammarström I. & Stenfelt S. European Archives of Oto-Rhino-Laryngology (2020): 277, 669-77.
- 39 AN EFFECTIVE DECISION MAKING AID FOR PATIENTS WITH TINNITUS: A RETROSPECTIVE REVIEW OF 205 PATIENTS Murphy D. & Phillips J. Clinical Otolaryngology (2020): 45(5), 818–22.
- 40 INVESTIGATING THE PREVALENCE AND IMPACT OF DEVICE-RELATED PROBLEMS ASSOCIATED WITH HEARING AID USE Bennett RJ., Kosovich EM., Stegeman I., et al.

International Journal of Audiology (2020): 59(8), 615–23.

- 41 LONG-TERM AUDIOLOGIC OUTCOMES AFTER COCHLEAR IMPLANTATION FOR SINGLE-SIDED DEAFNESS. Sullivan CB., Al-Qurayshi Z., Zhu V., *et al.* Laryngoscope (2020): 130, 1805–11.
- 42 AGE-RELATED CENTRAL AUDITORY PROCESSING DISORDER, MCI, AND DEMENTIA IN AN OLDER POPULATION OF SOUTHERN ITALY

Sardone R., Battista P., Donghia R., et al. Otolaryngology–Head and Neck Surgery (2020): 163(2), 348-55.

43 HEARING OUTCOMES OF TREATMENT FOR ACUTE NOISE-INDUCED HEARING LOSS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Koochakzadeh S., Gupta A., Nguyen SA., et al. Otology & Neurotology, 2020: 41(7), e848-53.

44 CORTICAL NEUROPLASTICITY AND COGNITIVE FUNCTION IN EARLY-STAGE, MILD-MODERATE HEARING LOSS: EVIDENCE OF NEUROCOGNITIVE BENEFIT FROM HEARING AID USE

Glick HA. & Sharma A. Frontiers in Neuroscience (2020): 14(93), 1-22.

45 RELATIONSHIPS BETWEEN COPING BEHAVIOURS AND SOCIAL LONELINESS IN ADULTS WITH SELF-REPORTED HEARING PROBLEMS

Warringa TL., Henke CE., Pronk M., et al. Ear & Hearing (2020): 41(4), 1040-50.

47 USE OF A MILD-GAIN HEARING AID BY MIDDLE-AGE NORMAL-HEARING ADULTS WHO DO AND DO NOT SELF-REPORT TROUBLE HEARING IN BACKGROUND NOISE Singh J. & Doherty KA. American Journal of Audiology (2020): 29, 419–28.

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EDITORIAL



"An individual can make a difference, but a team can make a miracle." – Doug Pederson



reetings from the Editorial Board of the Amplifon's Centre for Research Studies (CRS) Scientific Journal. I am Rakhee (Chandra) Smyth, Head of Audiology and Retail Training Manager at Amplifon Australia. I am honoured to present the 9th issue of CRS Scientific Journal. Through the years, CRS has carved out a niche in the areas of research,

development, and education relevant to the audiological and otological fields. Yet again, this edition of CRS Scientific Journal has an array of brilliant write-ups that showcase research and analyses putting forward stimulating theories & outcomes that inspires further debate taking the field forward. This year of the COVID-19 pandemic has only strengthened my belief in the importance of teamwork if we want the outcomes to be greater than the sum of all individual efforts.

I am very excited to introduce 15 wonderfully creative and skilled editors from Amplifon Australia to join the CRS editorial panel. Their involvement, participation & commitment has not only added value in regard to development of our clinical protocols, but they have also proactively engaged and assisted clinicians with regards to core clinical concepts and troubleshooting.

In the world's pandemic control efforts, people have faced social loneliness at the global level, the kind we have never known in our lifetimes. In this context, I feel apt to mention the efforts of Warringa L. et al. for their report on examining adults with hearing loss to determine if the use of helpful coping behaviours will reduce feelings of social isolation.

The retrospective study reported by Murphy and Phillips, "An effective decisionmaking aid for patients with tinnitus – based on the Pure Tone Audiogram", presents an effective tinnitus management triage pathway that could open up the path for customised triage tools for health care systems around the world. Another medically relevant article, "A Systematic Review and Meta-analysis on the Hearing Outcomes of Treatment for Acute Noise-induced Hearing Loss" - the authors have achieved encouraging results with treatment of acute acoustic trauma using a pharma regime that includes a nootropic drug. Another pick, "Evidence of Neurocognitive Benefit from Hearing Aid Use in Early Stage, Mild-Moderate Hearing Loss" suggests that the use of hearing aids can improve auditory processing as well as cognitive function in untreated presbycusis. This stresses the importance of correction of hearing loss in the elderly, and the consideration of presbycusis as more than just an inconvenience. This edition of CRS is filled with such gems, and I hope you will enjoy reading the articles that advance our understanding of many critical issues and clarify many approaches that are relevant in clinical practice.

Rakhee Chandra Smyth, Audiology Excellence & Retail Training Manager (Head of audiology) Amplifon Australia





INFLUENCE OF COCHLEAR DEAD REGIONS ON HEARING OUTCOME



Choi JE., Shim HJ., An Y., et al. Otology and Neurotology (2020) 41(7), 889-94.

By Min Roh – New Zealand

This prospective multicentre study evaluates the prevalence of cochlear dead regions using the TEN test, and its use as a prognostic factor in cases of sudden sensorineural hearing loss. The authors conclude that dead regions may be a poor prognostic factor for sudden sensorineural hearing loss.

A cochlea dead region (DR) is defined as a region of the cochlea where the inner hair cells (IHC) or its associated auditory nerve is entirely non-functioning. Basilar membrane motion in this DR would not be able to be detected by that neuron. However, if the sound is loud enough, the increase in basilar membrane motion may be detected by its adjacent neurons that are tuned to either higher or lower frequencies. DRs have important implications in rehabilitation, as amplifying DRs may not give functional benefit and may cause distortion.

DRs are difficult to identify on the pure-tone audiogram alone as the threshold measured may be a result of the 'off-frequency listening' described above, with the actual threshold being much worse. It is widely accepted that DRs are most prevalent in hearing losses of at least 70dB HL, where there is nearly always associated IHC damage on top of OHC damage.

The Threshold-Equalising Noise (TEN) test utilises a tone-in-noise paradigm, where pure-tone thresholds are obtained in the presence of ipsilateral noise. If a DR is present, the noise would mask the adjacent neurons and prevent 'off-frequency' listening, causing the threshold to be masked down.

Sudden sensorineural hearing loss (SSNHL) is defined as a rapid loss of hearing of at least 30dB HL in three adjacent octave frequencies occurring over the course of three days. Although some causes are attributable to pathologies such as Meniere's disease, vestibular schwannoma, viral infections, or congenital anomalies, most causes of SSNHL are idiopathic, with both the configuration of hearing loss as well as the prognosis of treatment being widely variable. This study sought to investigate the usefulness of the TEN

CRITICAL NOTE

This study is one of the first to evaluate hearing outcomes in SSNHL according to the presence of cochlea DRs, which is a more significant predictor of the degree of hearing gain compared to age. DRs were observed in 21% of SSNHL participants. One limitation of this study is that the TEN test is unable to test hearing loss of greater than 95dB HL, therefore excluding profound hearing loss from the analysis. Another downside is that a large number of participants did not follow through to the final assessment. Use of the TEN test to identify DRs in order to predict potential outcomes of SSNHL treatment may be useful in the clinical setting, as the test

itself does not take long to administer. Further studies are recommended to assess the usefulness of the TEN test in more detail.

test to identify the prevalence of DRs and their use as a prognostic factor for SSNHL patients.

A total of 130 subjects with SSNHL without a known cause participated in this study. TheTEN test was performed before and after steroid treatment (systemic and/or intratympanic). Of the 130 participants with SSNHL, 20.8% had one or more DRs, with the DRs mainly observed in low frequencies and in the moderately severe region. When participants were assigned to a DR+ group (those who had DRs) or a DR- group (those who did not have DRs), the only difference was the word recognition score, with the DR+ group performing significantly worse than the DR- group.

Of the 130 participants, only 68 followed through to the post-treatment assessment. These participants were assigned to a hearing improved group and a hearing non-improved

group to identify key predictors for hearing improvement. The proportion of participants with a DR in the non-improved group was 34% compared to 14% in the improved group. Other factors related to hearing recovery were the absence of comorbid disease, a better word recognition score, and the method of steroid treatment.

Multiple regression analysis resulted in the following variables (in order of strength of association to hearing gain from highest to lowest): initial pure tone average, method of steroid treatment, presence of DRs, age. •

SUBJECTIVE HEARING DIFFICULTY AND FALL RISK



Criter RE. & Gustavson M. American Journal of Audiology (2020): 29, 384–90. By Sayantanee Ghosh Saikia – Australia The goal of this study was to investigate the relation between subjective hearing difficulties and the risk of falls in older adults using a case history, three questionnaires, including the Hearing Handicap Inventory for the Elderly (HHIE), Dizziness Handicap Inventory (DHI), Activities-Specific Balance Confidence Scale (ABC), and one functional balance measure, the Timed Up and Go (TUG) test . The authors compared between non-audiology patients and audiology patients with & without hearing aids and found significant positive correlations between HHIE and DHI scores for audiology patients without hearing aids and between HHIE score and number of recent falls for audiology patients with hearing aids.

The risk of falls is associated with hearing loss and this risk increases with age. Since hearing loss also increases with age, both issues strongly overlap and this overlap may not be coincidental. In many studies investigating the risk of falls, hearing loss is not measured. In the Lin and Ferrucci study, only limited age groups (40–69 years) using audiometric data available from the National Health and Nutrition Examination Survey which was based solely on better ear pure-tone average were evaluated (Lin and Ferrucci, 2012).

Pure-tone audiometric results provide essential information for audiologists, but they do not provide any accurate measurements of self-reported hearing difficulties.

Self-reported hearing difficulty, such as the Hearing Handicap Inventory for the Elderly (1982), evaluates the subjective perception of hearing functionality in one's day to day activities, and has been a useful tool for various research studies for many years. According to the authors of the study, there was a need to investigate further to determine the relation of the risk of falls to audiometric hearing loss and to self-reported hearing functionality. The participants in the study were community-dwelling adults, aged 60 years or over, who fulfilled necessary safety criteria. These subjects were classified into three groups: non-audiology patients (n=28), audiology patients with hearing aids (n=18) and audiology patients without hearing aids (n=28). For each subject, there was a case history detailing medications and history of falls within the past 12 months, three questionnaires (Hearing Handicap Inventory for the Elderly (HHIE), Dizziness Handicap Inventory (DHI), Activities-Specific Balance Confidence Scale (ABC)) and one functional balance measurement, the Timed Up and Go (TUG) test. After analysing the group differences in mean age using a one-way analysis of variance (ANOVA), the authors used Pearson and Spearman correlations to evaluate how subjective hearing difficulty (i.e., HHIE score) related to other measurements.

The results of the study depicted the averageTUG times, ABC score, DHI score, the number of medications, and the number of recent falls. These were then plotted according to group and HHIE score category (mild, moderate, severe). The authors found that both HHIE score and categories were associated with an increasing DHI score in audiology patients who had not been fitted with hearing aids. For hearing aid users, the unaided HHIE results were related to the reported number of falls during the last year.

Furthermore, the results of this study suggested that increasing levels of subjective hearing difficulty, as measured by the HHIE, are significantly correlated with some fall risk factors in older adult participants, including their history of falls.

Overall, participants had an increased risk of falls when they had a higher degree of subjective hearing difficulty. Also, there were less reported falls for audiology patients with hearing aids than for those without them.

The authors conclude that there is a crucial need to investigate the potential role that hearing and hearing aids have on fall risk in a wider population using longitudinal studies. They also suggest the inclusion of other variables such as aided versus unaided HHIE scores, comparative pure-tone thresholds, data-logging or stating the usage of the hearing aids, particularly during TUG tests. Further

CRITICAL NOTE

This interesting study provides a detailed analysis of the correlation between risk of falls, hearing loss, and the importance of hearing aid usage, which can be further incorporated into various clinical counselling tools to facilitate regular hearing aid usage along with the early management of hearing loss in the elderly.

Limitations of this study were that it was mainly dependent on subjective measurements and had an unequal number of subject distributions across the studied groups, which reduced its scope to evaluate whether long-term hearing aid usage reduced the risk of falls.

suggestions include the equal distribution of subjects in each group of interest, exploration of the gender factor, hearing-related fatigue, and social interaction in fall risk. •

PERCEPTION OF ONE'S OWN VOICE AFTER HEARING-AID FITTING FOR NAIVE HEARING-AID USERS AND HEARING-AID REFITTING FOR EXPERIENCED HEARING-AID USERS



Hengen J., Hammarström I. & Stenfelt S. European Archives of Oto-Rhino-Laryngology (2020): 277, 669–77. By Angela Ryall – Canada This article investigated own voice perception before and after hearing aid fitting amongst new and experienced users, through the use of questionnaires. Researchers found that issues surrounding own voice perceptions are common with first-time and experienced users with no relation to the acoustic properties (dome versus custom earmold).

INTRODUCTION

Patients' concern regarding own voice perception has been a longstanding issue when fitting hearing aids (HA). Potential influences for dissatisfaction with one's own voice are the occlusion effect when using custom earmolds or closed domes, the time difference in the digital processing of air conduction sounds, and the person's bone conduction component of their voice, as well as the settings on the HA (e.g., high compression ratios and directional microphones). Many clinicians counsel patients that their perception of their own voice was based on the altered tonal quality caused by their hearing loss, and that with HA they are now hearing how their voice should sound, reassuring the patients that they will get used to the sound of their voice over time. Adjustments can be performed to try and reduce discomfort, such as reducing the compression or

decreasing the gain for low frequency sounds, but this is not always successful.

The goal of the study was to investigate the participants' own voice perception before and after a HA fitting/refitting. Specifically, the researchers hypothesised that first-time users would report a greater difference in their own voice perception than experienced users and that those who required an earmold would report more issues than those with an open fitting.

• METHODS

There were three participant groups: first time HA users (n=70, average age =74 years old), experienced HA users fitted with new technology (n=70, average age=75), and an unaided control group (n=70, average age=71). For the first-time users, there were 50 HA fitted with domes and 20 HA with earmolds. For the experienced users, there were 21 HA with domes and 49 HA with earmolds.

The HA fitting process involved approximately four appointments over 3-4 months. Participants completed questionnaires and forms discussing their self-reported hearing problems, their perceived own voice quality, and additional demographic information before and after the fitting process. The questionnaires employed in this study were: 1) The Hearing Handicap Inventory for the Elderly (HHIE), used to gather participants' self-reported hearing problems, 2) a modified version of the Own Voice Quality (OVQ) questionnaire, used to gather information regarding participants' own voice, and 3) the Voice Handicap Index (VHI), to gather information on any voice problems described by participants.

• FINDINGS

Both first-time users and experienced users had reduced post-fitting scores on the HHIE when compared to prefitting, indicating increased satisfaction with their hearing ability using a HA. With the VHI, first-time users had higher scores post-fitting, indicating an increase in self-rated voice problems, whereas experienced users again had lower postfitting scores on the VHI. When asked about their agreement with the statement 'the sound of my own voice is a problem for me' on the OVQ questionnaire, experienced users had higher scores (more problems) pre-fitting compared to firsttime users and the control group. Post-fitting, there was no significant difference in scores between experienced and first-time users, which suggested that first-time users had more issues regarding the sound of their voice after the HA fitting. The control group had the lowest scores across all questionnaires compared to the first-time users and experienced users, suggesting they had little to no issues regarding their own voice perception.

When comparing earmold versus dome users, more firsttime users fitted with earmolds indicated having problems with their own voice than those fitted with domes. There

CRITICAL NOTE

The questionnaires used in this study were briefly described, but additional information about each one could have been included. For example, the OVQ questionnaire was not provided in any supplementary files. Furthermore, the authors did not mention the length of each questionnaire: the OVQ questionnaire was 102 questions, and this may have influenced the participants' responses. Additionally, although the authors propose that clients will always have low satisfaction with their voice, it would have been interesting to see the results of the first-time users a month after the hearing aid fitting to see if counselling had improved their perception or satisfaction. This interesting study provides clinicians with information that can benefit interactions with clients, especially when counselling on own voice perception (e.g., that hearing loss and hearing aids

were no significant differences between experienced users of domes and earmolds: both groups had fewer problems with their own voice post-fitting but, in general, still had some issues concerning their voice.

are both contributing to own voice perception).

Participants' perceived ability to simultaneously speak and hear in conversations was different between the first-time users and experienced users: first-time users' perceived ability was better than that of experienced users pre- and post-fitting. Both groups reported more issues concerning speaking and hearing in a conversation than the control group, suggesting that this was influenced by hearing loss and not necessarily the HA.

First-time users had similar scores to the control group prefitting regarding disturbing sound qualities, suggesting that hearing loss has less influence on the perception of one's own voice compared to the HA. Experienced users did not differ from first-time users post-fitting when discussing any disturbing sound qualities of their own voice. This result indicates that the low satisfaction of own voice perception will not go away over time. Perhaps patients become more accepting of the new quality of their own voice as a compromise for better hearing.

• CONCLUSION

There was an increase in dissatisfaction of own voice perception after HA fitting with first-time users. In contrast, experienced users had fewer issues with their own voice post refitting. The researchers believe that both hearing loss and HA may influence participants' voice intensity and their ability to speak and hear in conversations, but that the disturbing sound quality that participants hear in their own voice is significantly related to the HA. •



AN EFFECTIVE DECISION MAKING AID FOR PATIENTS WITH TINNITUS: A RETROSPECTIVE REVIEW OF 205 PATIENTS



Murphy D. & Phillips J. Clinical Otolaryngology (2020): 45(5), 818–22.

By Nadine Martins – Portugal

This article researches the success of a triage pathway in patients with tinnitus. The authors make this analysis through a study of 205 cases identified over 12 months.

There is a considerable increase in the number of people with tinnitus. In the UK, 10.2% - 14.2% of the population has this symptom.

To guarantee a referral of patients with tinnitus, it is important to have an effective triage pathway that facilitates the identification of the need for therapy in primary and secondary health care. Through a clear triage model, it is possible to reduce waiting times and costs associated with monitoring these cases.

The authors assessed the effectiveness of the triage pathway put in place in 2015 at the Norfolk and Norwich University Hospitals NHS Foundation Trust.

The referral process considers multidisciplinary skills, referring cases according to the combination of results obtained in the pure tone audiogram (PTA), presence of red flag symptoms, and results obtained in the Tinnitus Handicap Inventory (THI) questionnaire. The referral can consist of group therapy, individual therapy, or counselling and guidance regarding self-management of tinnitus, depending on the severity of the case.

Patients with mild tinnitus are provided with written and online material so they can self-regulate their tinnitus. Cases of moderate tinnitus (THI up to 56) are referred to group therapy sessions. The goal is to have more knowledge about tinnitus, to learn techniques to reduce its intensity (for example, relaxation techniques), and to meet other people with the same symptoms. This therapy reduces waiting times, as well as decreasing the costs associated with the therapy while maintaining its effectiveness. Individual therapy sessions (ITS) are indicated for patients with severe tinnitus. In addition to the techniques presented in group sessions, ITS allow individual monitoring of the case with psychological support, as well as exploring relaxation solutions and techniques for improving sleep. A hearing aid assessment is performed in all cases with

CRITICAL NOTE

The health system needs to ensure that a clear triage pathway and referral process is effective to facilitate the success of therapy in patients with tinnitus. It is also important that primary and secondary health services are aware of this reality. At the same time, it is essential to reduce waiting times and costs associated with tinnitus therapy, so that appropriate health services are available for all patients with tinnitus.

hearing loss. In cases of severe or profound hearing loss, hearing rehabilitation is completed before tinnitus therapy. The authors defined cases where triage and therapy took place within 12 months as "successful triage". They defined that a "triage failure" consists of referral to insufficient therapy, resulting in a re-referral to more effective therapy. To analyse the success of the triage pathway, the authors identified individuals followed in the service within a period of 12 months, from 01 January 2017 to 31 December 2017. Of the 205 cases identified, eleven were re-referred to the service, but only one due to a "triage failure". Ten of the patients were re-referred due to external causes such as refusal of treatment or missed appointments. The only case of "triage failure" was due to an error in the calculation of the result of the THI questionnaire.

The authors consider, given the low failure rate, that this triage pathway is effective, and it is important to guarantee the simplicity of the process and the instruments used (e.g., THI) to reduce "user errors."

As indicated by the authors, it would be useful to analyse the effectiveness of this triage pathway in other health systems and relate to the economic level of patients. There is also a need to consider the effectiveness of the triage in relation to the geographical location of medical services.



INVESTIGATING THE PREVALENCE AND IMPACT OF DEVICE-RELATED PROBLEMS ASSOCIATED WITH HEARING AID USE

International provided Audiology Bennett RJ., Kosovich EM., Stegeman I., et al. International Journal of Audiology (2020), 59(8), 615–23. By Tali Bar-Moshe – Israel Participants who owned their hearing aid (HA) for more than a year, and those with poor HA management skills and knowledge, self-reported a larger number of problems. Participants who self-reported more HA problems also reported lower levels of HA benefits and satisfaction. There was an association between sound quality and performance problems with HA outcomes.

Research has shown that although hearing aid (HA) technology has improved in recent years, there are still many clients who are not using their HA due to the problems they experience with them. These problems relate to physical fit, sound quality, and handling and maintaining the HA. Audiologists can address most of the problems through modification of the HA and by educating and training the clients. It seems that some of the HA owners do not recognise their problems, some do not report them to their audiologists and, in other cases, clients that seek help for their problems do not get the right solutions from their audiologists.

The purpose of this study was to explore the prevalence of problems related to HA use, to investigate help-seeking behaviours of HA owners for problems they have with their HA, and to identify the outcome and demographic factors associated with these problems.

413 Australian HA owners (34-97 years old) participated in the study with HA experience of 6 months to 61 years. 61% were male, 92.7% had binaural HA, and 84.6% wore a BTE (behind the ear) HA. All participants completed the following: 1) a brief clinical history, 2) a survey regarding HA problems, developed especially for this study, 3) a question asking if they had sought help for each problem mentioned in the survey, 4) the International Outcome Inventory for Hearing Aids (IOI-HA), 5) The self-administered Hearing aid Skills and Knowledge Inventory (HASKI-self). The survey developed for this study was based on previous research. It contained 26 items related to HA management (14) and HA sound quality and performance (12). Results showed that 98% of the participants experienced at least one of the HA problems included in the survey. The three most commonly reported problems were difficulty hearing conversation in both noisy environments and windy environments, and difficulty hearing certain voices. The least reported problem was with changing batteries.

CRITICAL NOTE

This research emphasises the extent to which HA owners face HA related problems. Many of the problems are not reported to the audiologist or remain unsolved, although they can be helped by fine-tuning of the HA or by educating and training the clients. The development and use of clinical questionnaires that identify HA related problems may help clients to recognise and report all problems they face with their HA. This would give the audiologist the necessary information to decide which actions will solve clients' problems without creating new ones in the process. This investigation adds to a series of studies putting an important spotlight on the recognition of clients' HA management skills and knowledge, responding to the problems clients face with their HA and the professional answers and solutions audiologists provide to them. For clinicians, it is essential to be aware of these problems, know how to recognise them, and find the right professional solutions. The tools developed for this study may have important implications for clinicians and can be implemented in daily practice.

Less than half of the problems (46.3%) were reported to the clinic. The three problems most commonly reported to the audiologist but that were not solved related to sharp and high-pitched sound quality, what to do in the case of the HA no longer working, and sounds being too loud. Participants who owned their HA for more than a year and those with poor HA management skills and knowledge self-reported a greater number of problems. Participants who self-reported more HA problems also reported lower levels of HA benefits and satisfaction. There was an association between sound quality and performance problems and HA outcomes. •

LONG-TERM AUDIOLOGIC OUTCOMES AFTER COCHLEAR IMPLANTATION FOR SINGLE-SIDED DEAFNESS



Sullivan CB., Al-Qurayshi Z., Zhu V., et al. Laryngoscope (2020): 130, 1805–11

By Reddy Sivaprasad – India

This large group study measured speech perception scores and localisation ability over long-term postimplantation in subjects diagnosed with single-sided deafness. Results indicated that there was an immediate improvement in scores such as speech in quiet and head shadow effect, and that localisation ability gradually improved over time.

Single-sided deafness (SSD) affects a variety of hearing abilities where binaural hearing is crucial. Speech understanding in noise, localisation, understanding the depth and movement of the sound source are some of the abilities that get hampered by SSD. Traditionally, a CROS/ BiCROS device is provided as an immediate option to rehabilitate SSD. With obvious limitations, CROS has delivered mixed results to these individuals.

With the increasing use of Cochlear implantation (CI), studies are now evaluating the benefits of CI to individuals with SSD. While most of these are pre- and post-CI studies, the longitudinal study of benefits is essential. CI usage in SSD versus bilateral sensorineural hearing loss is very different. In implanted SSD individuals, central neural adaptations between acoustic and electric hearing may take longer to result in any benefits. With this hypothesis in mind, the authors made a longitudinal study of the audiometric outcomes, sound localisation abilities, tinnitus changes, and binaural benefits.

Sixty subjects (33 male and 22 female, with an average age of 52 years) with SSD who had been implanted with Nucleus, Med-El, Clarion, and Advanced Bionic devices in the deaf ear between 2011 and 2017 were included in this study. They were examined pre-op and post-op at intervals of 3, 6, and 12 months, and then annually. Speech perception scores for words and sentences in quiet, Hearing in Noise Test (HINT) with different azimuths, and a localisation test with environmental sounds were the measurements obtained at all these intervals, all in sound field conditions. Tinnitus was measured using the lowa Tinnitus Handicap Questionnaire during each visit.

The findings were as follows:

CRITICAL NOTE

This study had the largest group of subjects on this topic ever published. Authors considered a variety of variables that may be affecting the performance to understand its diversity. All statistical measurements were appropriate for the research question. While the aetiology of hearing loss was included as a factor, further analysis is needed of factors such as the device type, signal processing algorithm, number of hours of use, age of the subject and number of years with SSD.

1. There was a 42% mean and significant improvement of word scores in quiet in the first post-op test. Further tests did not show significant improvement.

2. There was a significant improvement of sentence scores in quiet in the first post-op test. Further tests did not show significant improvement

3. Localisation scores did not show improvement in the first post-op test but the scores improved gradually over time in subsequent post-op tests

4. From HINT scores, the performance was calculated for head shadow effect and binaural squelch effect. Results showed that the head shadow effect improved significantly, but the squelch scores did not improve postoperatively.

5. In subjects with tinnitus, there was no definite pattern/ improvement seen in ITHI scores postoperatively.

Authors concluded that CI has brought in immediate improvements in understanding speech in quiet and head shadow effects, and gradual improvements were seen in localisation abilities. These findings support the benefit provided by CI in SSD groups.





AGE-RELATED CENTRAL AUDITORY PROCESSING DISORDER, MCI, AND DEMENTIA IN AN OLDER POPULATION OF SOUTHERN ITALY



Sardone R., Battista P., Donghia R., et al. Otolaryngology-Head and Neck Surgery, 2020: 163(2), 348-55 By Reddy Sivaprasad – India

Age-related hearing loss leads to cognitive dysfunction in older age. The authors found another missing link to this theory using a large population-based cross-sectional study, concluding that age-related central auditory processing disorder has a stronger association with mild cognitive impairment than with peripheral hearing loss.

Age-related central auditory process disorder (CAPD), now considered an aspect of age-related hearing loss (ARHL), leads to poor speech understanding in noise or in situations with multiple speakers. As a result of poor auditory perception, adults with CAPD rely more on visual cues and the development of compensatory strategies to communicate. Several studies, systematic reviews, and meta-analyses have shown that there is a link between ARHL and later age cognitive disorders, including mild cognitive impairment (MCI). This population-based study analysed the association between age-related CAPD and MCI.

The study was conducted between 2013-18. All subjects (n=1647), whose age was above 65 years, underwent several examinations. Blood samples were collected to check the serological markers. Audiological assessments included pure tone audiometry (PTA), impedance tests, and Synthetic Sentence Identification – Ipsilateral Competing Message test (SSI-ICM for subjects with PTA < 40 dB HL). CAPD was diagnosed when scores were < 50% in the better ear for a 0 dB message-competition ratio. A battery of neurological and neuropsychological tests was conducted to evaluate the cognitive functions. Based on these tests, three subgroups were formed – normal cognition, MCI (n=260), and dementia (n=59). Notable findings were as follows:

CRITICAL NOTE

This landmark study attempts to find data support for the link between ARHL and MCI. Its strengths were the use of appropriate statistical methods and the substantial collection of data. The conclusions are thought-provoking and instigate clinicians to change aspects of their assessment and rehabilitation.

1. Prevalence of CAPD was 14%. More in males (55%) compared to females (45%)

Mean - age 74 years, education 7 years, MMSE score 27
Prevalence of CAPD increased with age

4. Lower SSI-ICM scores were seen in the better ear (with lower PTA) in MCI and dementia groups compared to the normal group.

5. CAPD has been a good predictor of a diagnosis of MCI. With every single unit increase of SSI-ICM score, the MMSE score also increased

6. The degree of hearing loss (PTA) could not affect the prediction of MCI using CAPD

The authors called for more such population-based studies for further insights. For clinical use, they indicated the need for a more comprehensive audiological examination, including CAPD assessment in this age group. The authors also acknowledged some limitations that could be considered in future studies. •





HEARING OUTCOMES OF TREATMENT FOR ACUTE NOISE-INDUCED HEARING LOSS: A SYSTEMATIC REVIEW AND META-ANALYSIS



Koochakzadeh S., Gupta A., Nguyen SA., et al. Otology & Neurotology (2020): 41(7), e848-53. By Reddy Sivaprasad – India

pharmacological options to treat acute acoustic trauma. The authors conducted a first-ever systematic review and meta-analysis of the published literature on this subject. Strong statistical techniques and relevant observations were drawn from this study.

There have been numerous studies of the

It is well known that exposure to loud noise is the single largest preventable cause of hearing loss both in adults and teens. Short exposure to loud noises results in acute acoustic trauma (AAT) and repeated exposures lead to a higher degree of permanent loss. At the AAT stage, several changes are seen in the stereocilia of inner and outer hair cells, the organ of Corti, supporting cells, and blood vessels. Though these changes are initially seen in the apical region of the basilar membrane, repeated exposures create similar changes all across the basilar membrane. Various pharmacological agents – vasodilators, antioxidants, vitamins, steroids, JNK inhibitors, and hyperbaric oxygen therapy (HBOT) have been used to treat AAT. The authors conducted a systematic review and meta-analysis to review the effectiveness of the various drugs reported in the literature.

Included in this review were studies from medical databases up to 2018, where subjects had sudden impulse noise exposure, detailed measurements of hearing thresholds, and use of one of the pharmacological agents. Sixteen studies were analysed using the Downs and Blacks quality assessment tool for the quality of methodology. Four studies (n=187 subjects) were included in the meta-analysis of proportions. Firearms and other weapons were the leading cause of AAT, as reported in 14 studies. The outcome of the treatment was the difference in HTLs before and after the treatment.

• META-ANALYSIS SHOWED:

a. The improvement after medication was seen in high-

CRITICAL NOTE

This study is probably the first systematic review of acoustic trauma treatment. Its strengths are the methodology and statistical techniques. The study successfully highlights the critical time period and effective drug regimes. However, some factors such as age or gender are not considered in the meta-analysis.

frequency HTLs, but not seen in low-frequency HTLs b. Significant HTL improvement was seen within 48 hours of exposure. The effect was not significant after 48 hours. c. Pharmacological agents used were: steroids, vascular agents, nootropics, antioxidants, vitamins, and cell apoptotic pathway inhibitors. The use of nootropic drugs along with a pharmacological agent resulted in significant HTL improvement. The same pharmacological agent when administered without a nootropic drug was not effective. d. 47% of subjects showed full recovery with drugs, 33% showed part recovery (10 dB or greater) and 32% did not show any improvement.

e. Steroids and HBOT showed significant effects in all reported studies.

The authors concluded that acute acoustic trauma can be treated effectively within the reported timeframes using a pharmacological regime that includes a nootropic drug.







Glick HA. & Sharma A. Frontiers in Neuroscience (2020): 14(93), 1-22. By Imran Dhamani – Australia Even a mild to moderate degree of untreated age-related sensorineural hearing loss can lead to deficits in auditory speech perception in noise and cognitive functioning. The use of a hearing aid can reduce listening effort, which can therefore lessen the cognitive effort required for top-down modulation of auditory processing.

It is now common knowledge amongst audiologists that auditory deprivation after hearing loss can lead to longstanding implications regarding cognitive function and neural plasticity as well as neural atrophy. There have been several studies recently which indicate a strong link between age-related hearing loss and the risk for mild cognitive impairment and/or dementia, as well as an accelerated decline in cognitive function over time. Amongst the various risk factors for dementia and accelerated cognitive decline, hearing loss is one of the important reversible factors. One of the most commonly proposed hypotheses for cognitive issues following agerelated hearing loss is the cognitive load theory, which suggests that due to lack or degradation of input to the auditory system, there is an increased listening effort which requires excessive use of top-down cognitive resources such as attention and memory. This, in turn, affects the availability of these cognitive resources for other tasks which can manifest in terms of cognitive decline. As clinicians, we often counsel our clients about these possible implications. However, there are only a few studies that have objectively demonstrated the benefit of using hearing aids as well as early intervention.

This study by Glick and Sharma is one of those clinical gems that could help to achieve a better objective understanding of some cognitive and neural changes that may occur as a consequence of auditory deprivation and the importance of correcting hearing loss. Previous studies have shown that cross-modal reorganisation can happen as a consequence of hearing loss, whereby the neural structures responsible for auditory processing can be gradually and extensively deployed for other sensory tasks such as visual and tactile perception after long periods of auditory deprivation.

In this study, the authors focus on the finding that auditory deprivation caused by presbycusis can lead to reorganisation of auditory cortical structures for visual perception. They divided the participants into two main age-matched groups (mean age = 64 years). These were a control group consisting of normal-hearing participants and an experimental group which consisted of 28 adults with an untreated mild-moderate degree of age-related sensorineural hearing loss. They then measured cortical visual evoked potentials (CVEPs) using 128 high density EEG recordings, cognitive function, and speech perception abilities for these participants. Later, they fitted the hearing-impaired participants in the experimental group with bilateral well-fitted hearing aids and re-evaluated them. The results indicated the following:

1)The hearing-impaired participants indicated extensive recruitment of auditory cortical neurons in a visual motion processing task used during the measurement of CVEPs. This result corroborates the previous finding of a cross-modal reorganisation of the auditory cortex for a visual task after age-related hearing loss and auditory deprivation. It also suggests that even a short period of auditory deprivation can cause compensatory changes in cortical neuroplasticity.

2) Greater deployment of right side auditory cortical structures in a visual task was associated with greater severity of hearing loss, poor speech perception in noise as well as cognitive performance. This may imply that there could be a link between such cross-modal reorganisation and prognosis with hearing aids.

CRITICAL NOTEma) There were a smaller number of participants in the control group as the authors found it hard to find normal hearing individuals in that age range. b) Both groups were matched for age, gender, education level, and handedness before statistical comparisons.duc) The hearing-impaired participants did not have any prior history of hearing use. d) The inclusion criteria for the experimental group was a high-frequency pure tone average (2, 4, 6kHz) > 25 dB HL in both ears and absence of air-bone gap or interaural asymmetry.phe) Probe-microphone measurements were taken to verify hearing aid fitting and gain was adjusted toph	neet NAL-NL2 prescribed targets. b) Before baseline testing, the experimental groups were fitted with hearing aids for a noticeably short duration to remove the confounding factor of audibility/ familiarity. g) The QUICKSIN test was used to measure speech perception in noise ability and the Arizona auditory- visual test for assessing auditory-visual speech perception at conversational level (60 dB SPL). h) The cognitive domains that were measured were global cognitive function, executive function, processing speed, visual and auditory working memory. c) One of the limitations of the study was that they did not have age-matched controls during the second phase, where they evaluated the experimental group after six months of hearing aid use.
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3) There was a reversal in the observed cross-modal reorganisation as well as improvement in performance on cognitive and speech perception tasks for the hearing-impaired participants when they were tested six months after the fitting of hearing aids. This suggests that the use of hearing aids can improve auditory processing as well as cognitive function.

CLINICAL IMPLICATIONS

 Even a mild to moderate degree of untreated age-related sensorineural hearing loss can lead to deficits in auditory speech perception in noise and cognitive functioning.
Hearing aid use can reduce listening effort, which can therefore lessen the cognitive effort required for topdown modulation of auditory processing. This may thus enhance cognitive function or, in other words, reverse the cognitive changes which would have occurred due to the consequence of age-related hearing loss.

3) Cross-modal reorganisation that can occur due to untreated presbycusis can be reversed due to neural plasticity even above 60 years of age by consistent hearing aid use for at least six months.

4) Changes due to hearing loss such as visual cross-modal reorganisation can explain the variability in outcomes with hearing aid use, as well as possible reasons for low uptake of hearing aids. •

RELATIONSHIPS BETWEEN COPING BEHAVIOURS AND SOCIAL LONELINESS IN ADULTS WITH SELF-REPORTED HEARING PROBLEMS



Warringa TL., Henke CE., Pronk M., et al. Ear & Hearing (2020): 41(4), 1040-50. By Majda Basheikh – Canada This study examined adults with hearing loss to determine if the use of helpful coping behaviours can reduce feelings of social isolation. Statistical analyses were applied to evaluate the relationship between measurements of six coping behaviours and social loneliness. This study gives excellent insight into the value of adequate coping behaviours in the hearingimpaired.

Hearing loss is a disabling condition that results in significant impacts on daily communication. Social settings typically become more difficult to manage with hearing loss due to the increased need for audibility in the presence of multiple speakers and background noise. Previous studies have indicated a relationship between hearing loss and feelings of loneliness, whereby loneliness and social withdrawal are more likely to be reported by individuals with hearing loss. Understandably, there is greater pressure to be able to hear in an environment as demanding as a social setting. How a person reacts concerning these social pressures and their hearing loss can potentially affect their social abilities. In this study, it is hypothesised that adults who utilise adequate coping behaviours are less likely to report feelings of social loneliness.

A review was made of data from 686 individuals from the Netherlands Longitudinal Study of Hearing with reported hearing problems. The De Jong Gierveld loneliness scale was used to measure each participant's loneliness score on a five-point response scale (ranging from 0 [not socially lonely] to 5 [severely socially lonely]). Coping behaviours were measured using six subscales from the Communication Profile for the Hearing Impaired (CPHI). The selected subscales covered the following coping behaviours: maladaptive behaviour, stress and withdrawal, verbal strategies, nonverbal strategies, acceptance of loss, and self-acceptance. Participants answered 35 items in the subscales using a five-point scale (ranging from 1 [almost never/strongly disagree] to 5 [almost always/ strongly agree]. Further self-reported data related to such subjects as socioeconomic and demographic factors were also gathered to account for potential confounding factors that could affect both general psychosocial wellbeing and coping behaviours.

The relationship between social loneliness and coping behaviour was explored using statistical analyses of the reported data. It was found that 66.9% of the participants reported moderate to severe levels of social loneliness.

CRITICAL NOTE

Psychosocial well-being should not be overlooked as it can potentially determine how well hearing aid users will adapt to their listening environments. This study suggests that adopting adequate coping behaviours, such as the use of communication strategies, will likely positively impact an individual's reported limited social functioning due to their hearing loss. Counselling in audiology service provision about these coping behaviours is highly valuable as it can ultimately affect patient outcomes.

Furthermore, strong correlations were found between social loneliness and all six coping behaviours. More adequate coping strategies were defined via such CPHI scores as higher levels of self-acceptance or acceptance of loss, lower scores for levels of stress and withdrawal, and infrequent use of maladaptive behaviours. It was found that participants with fewer feelings of social loneliness reported more use of these adequate coping strategies. Similar correlations were found with the other subscales of the CPHI, but some correlations were specific to certain subgroups examined. Regular use of nonverbal strategies in communication (i.e. gestures) were reported more in participants with lower levels of social loneliness (and a paid job as per the subgroup whereby this was measured). Additionally, regular use of verbal strategies in communication (among participants with reported hearing loss of 5 years or less) was found to be associated with lower levels of social loneliness.

The results of this study emphasise the importance of psychosocial well-being among the hearing impaired. Measured responses corresponding to more adequate coping behaviours were associated with fewer reports of social loneliness. Moreover, the authors allude to the potential positive impact that hearing care professionals can have on their patients by identifying any inadequate coping behaviours and giving appropriate counselling.





USE OF A MILD-GAIN HEARING AID BY MIDDLE-AGE NORMAL-HEARING ADULTS WHO DO AND DO NOT SELF-

REPORT TROUBLE HEARING IN BACKGROUND NOISE



Singh J. & Doherty KA. American Journal of Audiology (2020): 29, 419–28. By Thomas Zacharia – Australia This study aimed to find whether individuals with clinically normal hearing, who self-reported to either have or not have difficulty hearing speech in background noise, benefited from the use of a mild gain hearing aid over two weeks.

Between 5%-12% of the total clinical population has normal hearing but report that they have difficulty understanding speech in background noise. Previous studies have identified the benefit of mild gain hearing aids for normal-hearing adults who had reported difficulties understanding speech in background noise. For this reason, the current study focused on understanding the effect of mild gain hearing aids on hearing handicap, motivation, and attitudes toward hearing aids in two groups of subjects: individuals with normal hearing who self-report to have hearing difficulties (Group 1) and normal hearing individuals who did not report any hearing difficulties (Group 2).

The current study used the hearing handicap questionnaire (HHQ), University of Rhode Island Change Assessment (URICA), The Hearing Attitudes in Rehabilitation Questionnaire (HARQ) and Extended High Frequency (EHF) across both groups. HHQ measures the effect of hearing loss on personal and social domains of life. URICA determines how motivated the clients are in seeking help and categorise them into three stages of change (pre-contemplation, contemplation, and action). HARQ measures attitudes towards hearing and hearing aids. EHF thresholds were measured from 9 to 14 kHz.

Participants were seen three times over a 2-week period. Pure tone audiometry was performed on the first visit. Questionnaires and EHF were completed before fitting the subjects with hearing aids. The participants were also asked to respond 'YES' or 'NO' to the question "Would you consider purchasing hearing aids?"

• Standard audiometric threshold tests revealed Group 1 participants to have a significantly higher average standard audiometric threshold compared to Group 2.

• The EHF test showed Group 1 candidates had a significantly

CRITICAL NOTE

The current study concluded that the use of a mild gain hearing aid could only improve hearing handicap levels for normal-hearing candidates who self-reported difficulty hearing speech in background noise. These groups were interested in learning about their hearing problems but not ready to take any actions by purchasing hearing aids. The reduction in hearing aid stigma will better prepare an individual to consider the future use of a hearing aid with fewer negative associations.

lower score when compared to Group 2, which is clinically insignificant.

• The HHQ revealed a significant reduction in hearing handicap for Group 1 after two weeks of hearing aid trial but did not reveal a change for Group 2 candidates.

• Based on the URICA report, it was understood that normal-hearing participants who did not report any hearing concerns were in the pre-contemplation stage at both week 0 and week 2 and the majority who reported to have trouble hearing speech in background noise were in the contemplation stage (i.e. interested in knowing more about their hearing problems but not ready to do anything about it).

• The HARQ results revealed that the score for hearing loss stigma and hearing aid attitude was significantly reduced for both groups after wearing hearing aids for two weeks. After two weeks of hearing aid use, only 20% of the participants who reported to have difficulty hearing in background noise responded 'YES' to the question "Would you consider purchasing hearing aids?" •





