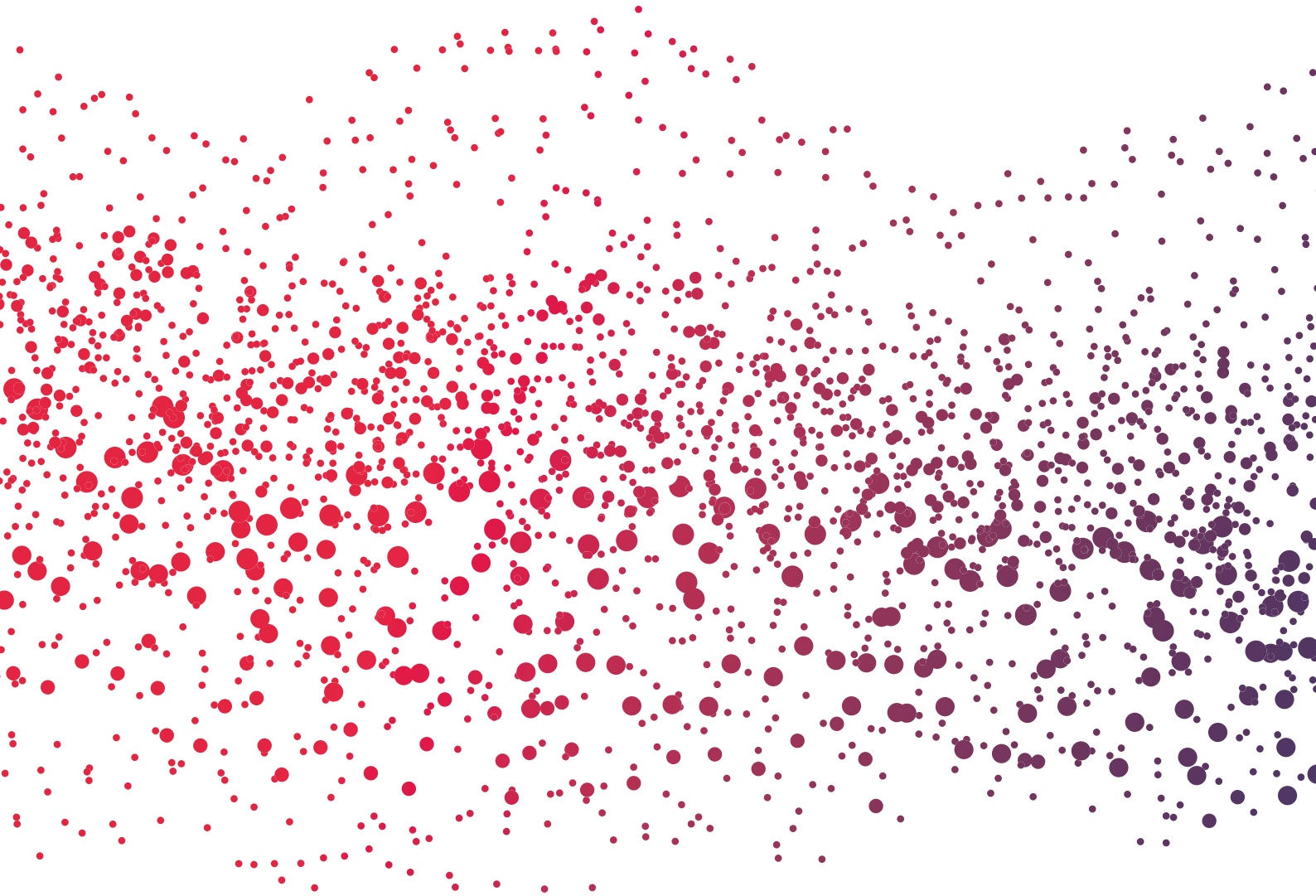
AMPLIFON CENTRE FOR RESEARCH AND STUDIES

amplifon

# CRS SCIENTIFIC JOURNAL

## Otology & Audiology Article Review

Volume 7
December 2024



Hearing Loss and Dementia: Where to From Here?

How Individuals Shape Their Acoustic Environment: Implications for Hearing Aid Comparison in Ecological Momentary Assessment

The Experience of Stigma Related to Hearing Loss and Hearing Aids: Perspectives of Adults With Hearing Loss, Their Families, and Hearing Care Professionals

# CONTENT


67 **HOW INDIVIDUALS SHAPE THEIR ACOUSTIC ENVIRONMENT: IMPLICATIONS FOR HEARING AID COMPARISON IN ECOLOGICAL MOMENTARY ASSESSMENT**
Borschke I., Jürgens T., Schinkel-Bielefeld N.
*Ear Hear. (2024): 45(4), 985–98*
*doi: 10.1097/AUD.0000000000001490. Epub 2024 Mar 22. PMID: 38514463; PMCID: PMC11175760.*

68 **REASONS FOR NON-USE OF HEARING AIDS: PERSPECTIVES OF NON-USERS, PAST USERS AND FAMILY MEMBERS**
Franks I. & Timmer B.
*Int J Audiol. (2024): 63(10), 794–801*
*doi: 10.1080/14992027.2023.2270703.*

70 **THE BENEFITS OF COCHLEAR IMPLANTATION FOR ADULTS: A SYSTEMATIC UMBRELLA REVIEW**
Tang D., Tran Y., Lo C., *et al.*
*Ear Hear. (2024): 45(4):801–7*
*doi: 10.1097/AUD.0000000000001473.*

72 **A STEP TOWARDS PRECISION AUDIOLOGY: INDIVIDUAL DIFFERENCES AND CHARACTERISTIC PROFILES FROM AUDITORY PERCEPTUAL AND COGNITIVE ABILITIES**
Cherri D., Eddins DA. & Ozmeral EJ.
*Trends Hear. (2024): 28, 1–19*
*doi: 10.1177/23312165241263485.*

74 **SPEECH PERCEPTION OUTCOMES IN HEARING-IMPAIRED INDIVIDUALS WITH MICROPHONE & RECEIVER IN THE EAR (M&RIE) HEARING AIDS**
Chaithra MC. & Manjula P.
*Eur Arch Otorhinolaryngol. (2024): 281(7), 3813–20*
*doi: 10.1007/s00405-024-08632-x.*

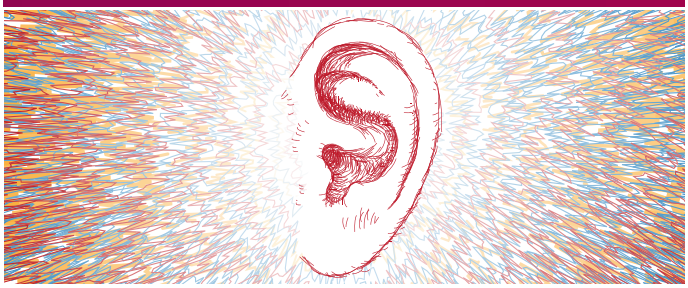
76 **HEARING LOSS AND DEMENTIA: WHERE TO FROM HERE?**
Dawes P. & Munro KJ.
*Ear Hear. (2024): 45(3), 529–36 & Ear Hear. (2024): 45(5), 529–36*
*doi: 10.1097/AUD.0000000000001494*

78 **THE EXPERIENCE OF STIGMA RELATED TO HEARING LOSS AND HEARING AIDS: PERSPECTIVES OF ADULTS WITH HEARING LOSS, THEIR FAMILIES, AND HEARING CARE PROFESSIONALS**
Nickbakht M., Ekberg K., Waite M., *et al.*
*Int J Audiol., (2024)): 2, 1–8*
*doi: 10.1080/14992027.2024.2353862.*

80 **DEVELOPMENT OF MEASURES FOR D/DEAF AND HARD OF HEARING STIGMA: INTRODUCTION TO THE SPECIAL SUPPLEMENT ON STIGMA MEASUREMENT TOOLS**
Stockton MA., Francis HW., West JS., *et al.*
*Ear Hear. (2024): 45(Suppl 1), 4S–16S*
*doi: 10.1097/AUD.0000000000001543.*


Published by Parresia - 23 avenue du Dr Lannelongue - 75014 Paris - France

# EDITORIAL



©iStock-robodread

Dear Reader, the Amplifon Centre for Research and Studies, CRS, houses one of the finest private libraries in the field of audiology and otorhinolaryngology, offering the sector's most important international journals. Every quarter, a team of Amplifon Audiologists from around the globe select the most relevant publications in the field of Otology and Audiology and make a comprehensive review. The Amplifon Centre for Research and Studies coordinates the development of this quarterly review. We are happy to share these new reviews with you. For this issue, our team reviewed eight interesting articles published in the third quarter of 2024.

The first review explores the use of Ecological Momentary Assessment (EMA) to fully capture user experiences in real-life environments. This method provides valuable insights into how hearing aid users shape their acoustic surroundings and utilise various hearing aid programmes.

The EuroTrak reports highlight that only slightly more than 50% of individuals who self-report hearing difficulties adopt hearing aids. The second article delves into the reasons behind this, looking into the perspectives of non-users, current users, former users, and their family members. The analysis underscores the critical need to better involve and inform family members.

Next, a systematic umbrella review highlights the need for clearer communication about the benefits of cochlear implants for adults, emphasising that many individuals who could benefit remain unaware or underinformed.

Two reviews focus on the intersection of hearing and cognition. The first stresses the importance of including diverse auditory perceptual and cognitive abilities into precision audiology to achieve better hearing aid outcomes. The second cautions against positioning hearing care solely as a preventive measure for dementia. Instead, it advocates for emphasising the tangible benefits of addressing hearing loss, such as enhancing communication and improved quality of life. The next paper evaluates a novel directional microphone strategy, whereby the microphone is incorporated directly into the external component of receiver-in-the-ear hearing aids. This innovation demonstrates notable improvements in speech identification in noisy environments and overall sound quality.

The final two reviews address the stigma associated with hearing loss and hearing aids. The first suggests that hearing care professionals may overemphasise the stigma surrounding hearing aids, whereas hard-of-hearing individuals often find hearing loss-related stigma to be a far greater concern. The second article focusing on stigma is part of a special issue of *Ear and Hearing*, where the 'Measures, Models, and Stigma-Reduction Subgroup' of the Lancet Commission on Hearing Loss initiated the development of survey questionnaires aimed at measuring stigma experienced by d/Deaf and hard-of-hearing individuals.

We hope you enjoy this issue of our CRS Scientific Journal.

**Mark Laureyns**
Global International CRS & Medical Scientific Research Manager

# HOW INDIVIDUALS SHAPE THEIR ACOUSTIC ENVIRONMENT: IMPLICATIONS FOR HEARING AID COMPARISON IN ECOLOGICAL MOMENTARY ASSESSMENT


*Borschke I, Jürgens T, Schinkel-Bielefeld N.*
*Ear Hear. 2024 Jul-Aug 01;45(4):985–998*
*doi: 10.1097/AUD.0000000000001490.*
*Epub 2024 Mar 22. PMID: 38514463;*
*PMCID: PMC11175760.*

*By Julin Teo – Italy – Australia*

**The study sought to investigate how participants adjust their acoustic environments when using different hearing aid programmes, and how these adjustments affect the reliability of Ecological Momentary Assessment (EMA) in comparing hearing aid performance.**

The study aimed to assess how modifications to acoustic environments impact the reliability of Ecological Momentary Assessment (EMA) in evaluating hearing aid (HA) performance. Through questionnaires, the research examined key factors such as the frequency, timing, and nature of acoustic modifications experienced by participants, as well as pleasantness ratings before and after adjustments, and how these impacted sound pressure levels. Additionally, the study compared these attributes, usage times and patterns, and acoustic environments between two HA programmes (described below).

A total of 29 participants were remotely fitted with HAs featuring two distinct programmes – Noise-reduction (NR)-on and NR-off – differing in their directionality and noise reduction features. Using an EMA app, participants completed questionnaires whenever they modified or wished to modify an acoustic situation to enhance their listening experience. In addition, the researchers also analysed objective data on sound pressure levels and acoustic environment classifications to collect insights into the participants' experiences.

Participants averaged 2.3 acoustic modifications per day, with no significant difference between the two HA programmes. These adjustments led to a substantial increase in pleasantness ratings, which rose from a mean of 2.9 prior to modification to 5.1 afterward. Most modifications occurred during conversations or media listening and primarily involved increasing the volume of the target signal. Objective data collected by the HAs at the time of modification aligned with the participants' self-reported changes via the EMA app.

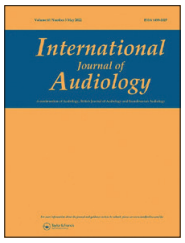
The study also found differences between the two programmes: daily usage time was lower with the NR-off programme; and the distribution of acoustic situations varied between the two programmes.

**CRITICAL NOTE**

*The study offers valuable insights into the validity and implications of using Ecological Momentary Assessment (EMA) for evaluating HAs in real-world environments. However, several limitations warrant further research. One such limitation is the lack of significant differences in findings, which could possibly be attributed to the fact that the two hearing aid (HA) programmes were set at extreme functionalities rather than default settings. Additionally, fitting was performed remotely without real-ear measurements, due to COVID-19 restrictions. This may have skewed results regarding user modifications, potentially reflecting ineffective fittings. The study also underscores the need for a more comprehensive approach that accounts for user biases in self-reporting, subconscious behaviours, and a broader range of experiences beyond speech understanding. Such an approach would strengthen the validity and real-world applicability of EMA findings.*

The study suggests that the marked improvement in pleasantness ratings following acoustic modifications may contribute to the positive bias typically observed in EMA studies. Variations in modification behaviours across hearing programmes could result in an underestimation of hearing difficulties and reduced sensitivity of EMA studies in evaluating or comparing hearing technologies, especially when contrasted with controlled laboratory settings. The authors recommended further research to refine the EMA methodology and gain a better understanding of the impact of both conscious and subconscious modifications on HA effectiveness and user's overall life quality. •

# REASONS FOR NON-USE OF HEARING AIDS: PERSPECTIVES OF NON-USERS, PAST USERS AND FAMILY MEMBERS




*Franks I. & Timmer B.*

*Int J Audiol. 2024 Oct;63(10):794–801*

*doi: 10.1080/14992027.2023.2270703.*

*Epub 2023 Oct 23. PMID: 37870394.*

*By Jan De Sutter – Belgium*

**The study focuses on the reasons behind people's decision not to use hearing aids, from the perspective of both hearing aid (HA) users and non-users with hearing loss, as well as close relatives of HA users.**

The use of amplification, mostly with hearing aids (HAs) is widely recognised as a primary solution for supporting individuals with hearing loss (HL). However, studies from Australia, the UK, and the USA have consistently shown low adoption rates. In addition, among new users who do adopt HAs, many become non-regular users, reducing the return on investment for healthcare services. While adoption and usage rates have been documented extensively, this study shifts focus to explore the underlying reasons behind the decision not to use HAs. It evaluates perspectives from both HA users and non-users with HL, as well as insights from close relatives of HA users.

## DESIGN

A cross-sectional study analysed data from the second phase of a study on help-seeking behaviour among individuals with HL. Participants from Australia, the UK, and the USA were divided into two unlinked groups: people with HL; and family members of individuals with HL.

## RESULTS

- **Participant perspectives**

Participants with HL were categorised into three groups: HA users; past users; and non-users. Among the past user group, the main reasons for discontinuing HA use were device-related issues, discomfort, and a general dislike of the devices. Among the non-user group, non-use was primarily attributed to unaffordability or the fact that HAs were never suggested to them. Surprisingly, despite non-use, this group displayed a generally positive attitude towards HAs.

- **Family perspectives**

Family members of people with HL cited disliking HAs and a lack of skill to manage them as key reasons for discontinuing use in the past user group. For non-users, reasons for not adopting HAs included the perception that HAs might make the user feel old or the assumption that the individual 'would not like them.'

- **Discrepancies Between Groups**

A comparison of responses revealed notable differences between the perspectives of individuals with HL and their family members:

- **Effectiveness of HAs:** Past users were more likely to state that HAs 'did not help', while this concern was mentioned less often by family members.
- **Perceived need for HAs:** Individuals with HL who never used HAs rated the need for such devices and the lack of recommendations for their use lower than family members did.

## CRITICAL NOTE

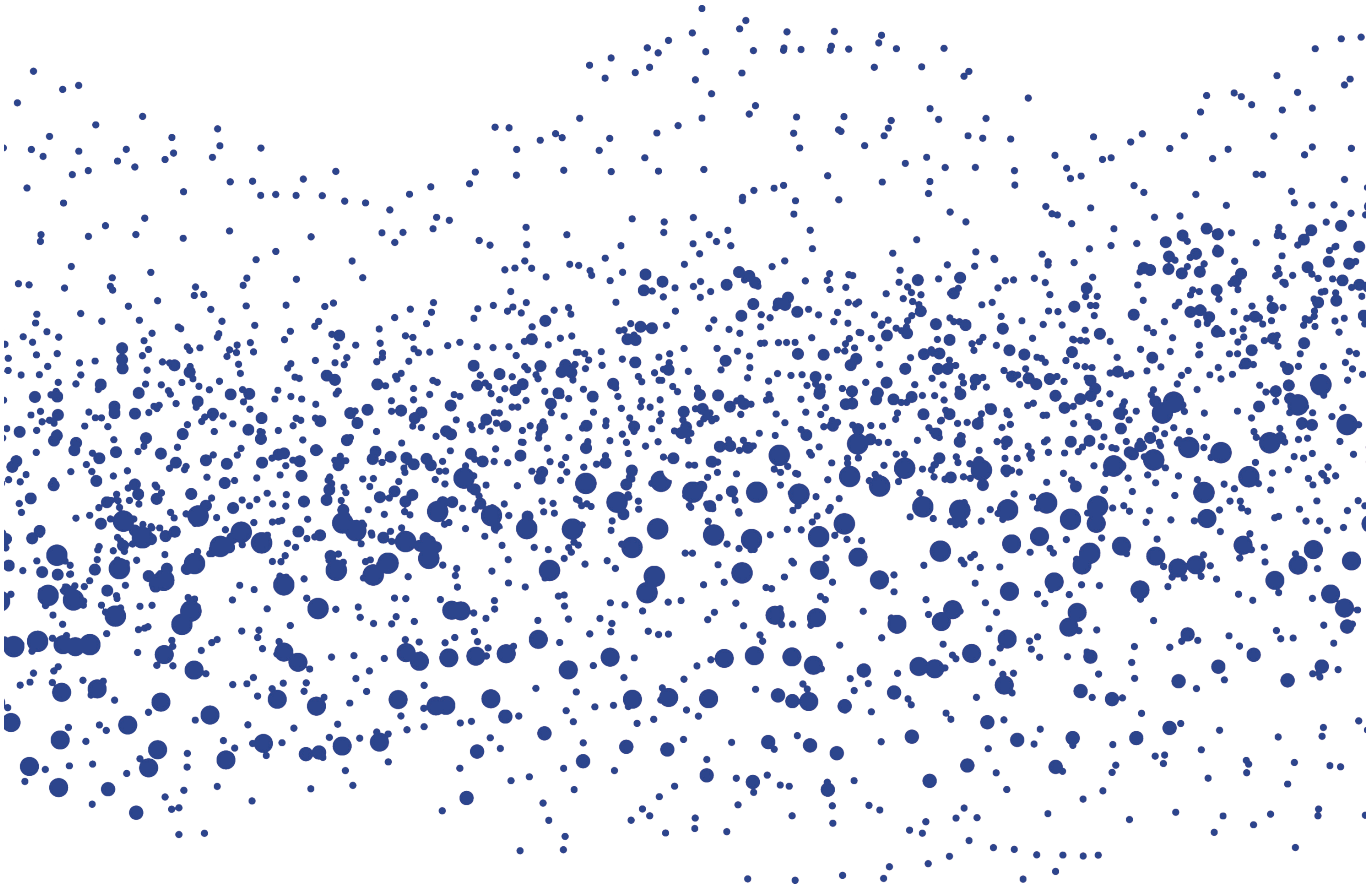
*The disparity in perspectives between participants with hearing loss (HL) and their families underscores the need for a broader, more holistic approach to hearing care. This approach should be implemented from the outset — when HL is first diagnosed — and during the consideration of treatment options. In particular, counselling should extend beyond the HA user, to include their close circle – particularly family members. While it is essential to focus on the balance between hearing performance and wearing comfort, it is equally important to guide both the user and their family on how to maximise the benefits of HAs. In turn, broadening overall support for HA solutions in this way will not only help reduce stigma but also improve the overall return on investment for national healthcare systems.*

## DISCUSSION

A significant majority of people with HL do not use HAs simply because they were never recommended. Previous research supports this finding, highlighting that both general practitioners and ENT specialists often advise against taking further action, which may contribute to this lack of intervention. Moreover, this study, which relies on self-assessment of HL, might suggest that non-use could stem from an underestimation of their hearing challenges. However, the authors emphasise the potential role of miscommunication between healthcare professionals and patients with HL as a contributing factor which should also be considered.

Further, the study reveals a significant discrepancy in perspectives between people with HL and their family members. In both the non-user and past user groups, the cited behavioural and practical reasons for non-use by patients and their families did not align.

This disconnect highlights a communication breakdown, suggesting that the experience of HL may be understood differently by the individual and their family. As family support and attitudes play a crucial role in the success of HL treatment, this mismatch in perceptions should not be overlooked when examining the reasons behind the non-use of HAs. •



# THE BENEFITS OF COCHLEAR IMPLANTATION FOR ADULTS:

## A SYSTEMATIC UMBRELLA REVIEW


*Tang D., Tran Y., Lo C.,* et al.
*Ear Hear. (2024): 45(4):801–807*
*doi: 10.1097/AUD.0000000000001473.*
*Epub 2024 Jan 18. PMID: 38233980.*

*By Karen Lovelock–Australia*

**The authors carried out a systematic review of existing literature to examine the benefits of cochlear implantation in the adult population. The authors discuss the findings and their impact on clinical practice.**

Cochlear implantation (CI) is the preferred treatment for people with severe to profound hearing loss (HL), yet CI uptake remains alarmingly low, with fewer than 10% of eligible patients opting for the procedure. Barriers such as concerns over surgery, potential loss of residual hearing, and high costs are often cited as deterrents. Additionally, general practitioners and audiologists have expressed a lack of confidence in discussing CIs with patients who could benefit from such an approach. Increasing awareness of the benefits of CIs could play a key role in boosting uptake. To better understand these benefits, the authors conducted a systematic review of 42 studies published between 1990 and 2022.

### MATERIALS AND METHOD

The articles reviewed by the authors outlined several key benefits of CIs, categorising them into the following three categories:

### IMPROVEMENTS IN SPEECH RECOGNITION:

- **Single-sided deafness:** Gains in speech recognition, both in quiet and in noise, along with improved sound localisation.
- **Asymmetric HL:** Bimodal condition – using both a HA and a CI – has been reported to result in better speech recognition in quiet and noisy environments, as well as enhanced localisation, compared to using either device alone.
- **Bilateral CIs:** Individuals with bilateral implants showed better outcomes in speech recognition and sound localisation compared to unilateral implantation.
- **Unilateral CIs:** In one study, individuals with unilateral implants showed up to a 53.9% improvement in speech recognition for words.

### CRITICAL NOTE

*The authors acknowledge that due to the heterogeneity of the articles reviewed, the findings are largely narrative in nature, and that greater standardisation in measuring the benefits of cochlear implants (Cis) would aid in future meta-analyses. However, despite this limitation, the research team successfully evaluated 42 studies that met strict inclusion criteria, and the consistent finding was clear: CIs provide significant benefits for individuals no longer receiving adequate support from hearing aids. Given this conclusion, it is time for CIs to become a standard consideration for patients experiencing poor outcomes with HAs, in one or both ears. This finding is all the more important in view of the fact that, as reported by one study cited by the authors, adults with significant hearing loss tend to wait an average of 10–12 years before seeking CI, which is regrettable given the evidence that longer durations of deafness are linked to poorer outcomes. This finding highlights the importance of initiating discussions about CIs with patients sooner in their hearing care journey. and informed treatment options.*

- **Pre or peri-lingual HL:** Approximately 55.6% of individuals in this group reported improvements in sentence comprehension following CI.
- **Age-related outcomes:** Most studies found no age-related impact on implantation outcomes, though one study noted a small but significant difference in postoperative speech recognition for older adults as compared to younger adults.

- **Single-sided deafness:** The duration of single-sided deafness significantly influenced speech recognition outcomes, with longer periods of deafness associated with poorer outcomes.

## IMPROVEMENT IN QUALITY OF LIFE OR COGNITION

The authors also highlighted several improvements in quality of life, cognition, and other otological symptoms following CI:

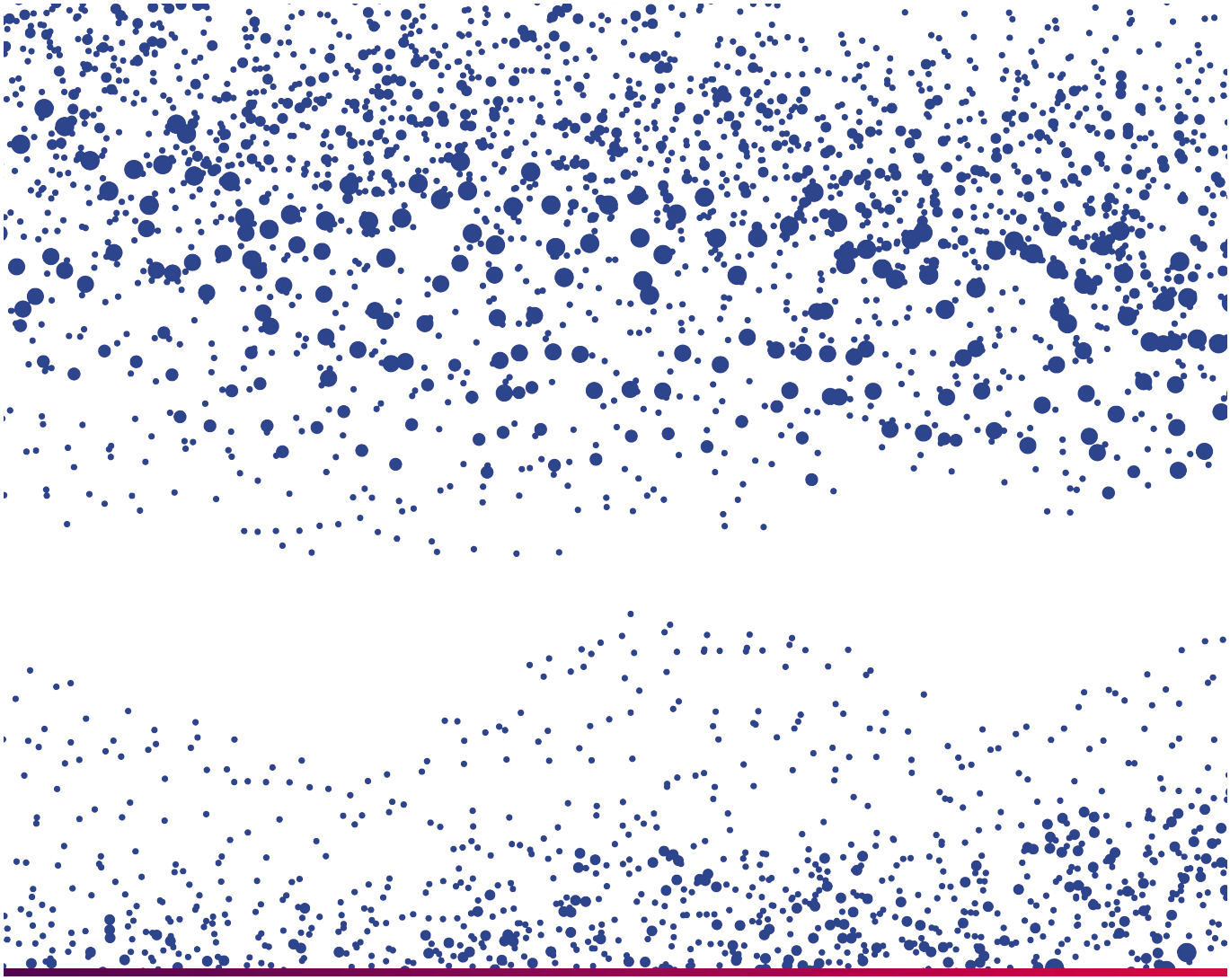
- **Quality of life:** Greater improvements were reported in questionnaires specifically designed to assess benefits from CI, as opposed to general quality of life measures.
- **Cognition:** Although findings were not entirely consistent, the research suggests that cognition is either maintained or improved following cochlear implantation.
- **Other otological symptoms:**
  - **Tinnitus:** Significant improvements were observed in tinnitus symptoms, as measured by various tinnitus scales.
  - **Meniere's disease (MD):** Patients with MD reported improvements in both hearing and balance/vertigo symptoms post-implantation.
  - **Retrocochlear pathologies:** Patients with conditions such as acoustic neuroma saw modest improvements in speech recognition.
- **Additional reported benefits:** The literature also noted improvements in quality-adjusted life years (QALYs), economic benefits, social participation, and music appreciation

## DISCUSSION

A consistent finding across the reviewed studies was that most individuals who underwent CI experienced significant benefits, irrespective of age or the aetiology of their HL. This suggests that CI should be considered a viable treatment option for patients who are not achieving adequate hearing with HAs. Furthermore, the reported improvements in conditions such as tinnitus and vertigo highlight the importance of offering CI as a potential solution for individuals experiencing HL accompanied by these additional symptoms.

## CONCLUSION

The researchers suggest that for most people considering a CI, that the likely benefits outweigh the potential risks. •



# A STEP TOWARDS PRECISION AUDIOLOGY: INDIVIDUAL DIFFERENCES AND CHARACTERISTIC PROFILES FROM AUDITORY PERCEPTUAL AND COGNITIVE ABILITIES


*Cherri D., Eddins DA. & Ozmeral EJ.*
*Trends Hear. (2024): 28, 1–19*
*doi: 10.1177/23312165241263485.*
*PMID: 39099537; PMCID: PMC11301744.*

*By Gian Carlo Gozzelino – Italy*

**The article explores the advances of precision audiology by providing an in-depth analysis of auditory perceptual and cognitive abilities in older adults, both with and without hearing loss.**

**CRITICAL NOTE**

*While the study offers a strong foundation for precision audiology, a few limitations and areas for improvement warrant attention. The sample size of 40 participants, split between the older adults with normal hearing (ONH) and older adults with hearing loss (OHL) groups, is relatively small. This limited sample may not fully capture the full range of auditory and cognitive profiles found in larger, more diverse populations, particularly across different age groups and degrees of HL. Expanding the study to include a larger, a more varied demographic would improve the generalisability of the findings.*
*Another important consideration is the study's reliance on cluster analysis to define characteristic profiles. While clustering is an effective tool for identifying patterns, it may sometimes oversimplify individual variations, potentially overlooking subtle differences in auditory and cognitive abilities. To gain deeper insights, more refined statistical models or longitudinal approaches could be employed to track how these profiles evolve over time and in response to interventions. This would significantly enhance the clinical application of the findings.*
*Furthermore, while the study's emphasis on cognitive abilities is innovative, it raises questions about causality versus correlation. For instance, the observed correlation between working memory and auditory processing in noisy environments may not fully account for other influencing factors, such as overall health or lifestyle. Future research could benefit from a more comprehensive analysis of potential confounding factors, offering a clearer understanding of the complex relationship between cognitive performance and auditory processing.*
*Finally, the study's use of the PART platform represents a promising step towards integrating precision audiology into clinical practice. However, as PART is still a relatively new tool and not yet widely adopted, further validation studies are essential. It would be crucial to test PART's reliability and accuracy across a variety of clinical contexts to ensure it can consistently measure the auditory and cognitive abilities essential for precision audiology.*
*In summary, while this study makes a compelling case for advancing precision audiology, the field would benefit from larger-scale, multi-method research and continued technological validation. Addressing these areas could strengthen the practical application of individualised auditory and cognitive profiles, ultimately improving patient outcomes and care.*

Traditional audiological evaluations tend to focus on pure-tone thresholds. This study, however, seeks to expand the scope by identifying individual differences in auditory processing which could lead to more tailored interventions. By highlighting the growing need for more personalised diagnostics and tailored solutions, this study underscores that individuals with similar audiometric profiles may experience very different perceptual challenges.

## STUDY RATIONALE AND OBJECTIVES

Older adults frequently face greater difficulties in noisy environments, a problem compounded by age-related

hearing loss (HL). The study under review seeks to address these challenges by examining individual auditory profiles, with a particular focus on suprathreshold auditory and cognitive tasks. The authors aim to identify characteristic profiles within groups of older adults, both with normal hearing (ONH) and hearing loss (OHL), as a preliminary step towards precision audiology. By analysing how cognitive and perceptual differences manifest even among individuals with comparable audiograms, the authors propose that a deeper and more comprehensive understanding of auditory abilities could improve intervention effectiveness.

## METHODOLOGY AND PARTICIPANT PROFILE

The study involved 40 participants, evenly split between the ONH and OHL groups. Each group completed a battery of tests designed to assess both auditory perceptual and cognitive abilities, including tasks measuring spatial release from masking (SRM), speech-in-babble comprehension, and tolerance to background noise. The ONH group comprised adults with clinically normal hearing thresholds, whereas the OHL group consisted of individuals with mild to moderately severe sensorineural HL. Cognitive assessments included measures of working memory and fluid intelligence, aiming to provide a broader understanding of each participant's cognitive profile. The authors applied cluster analyses to identify potential distinctive performance patterns, enabling them to define profiles based on both auditory and cognitive data.

## KEY FINDINGS AND AUDITORY PROFILES

The data analysis identified three distinct profiles within each group, highlighting significant variability in both auditory and cognitive abilities. For the ONH group, differences were observed across these profiles in SRM, speech-in-babble comprehension, and binaural temporal processing. In the OHL group, variability was more pronounced for factors such as tolerance to background noise and speech-in-noise perception. These findings underscore that even among individuals with normal hearing, perceptual abilities can vary widely, affecting communication performance.

The study also revealed correlations between auditory and cognitive abilities, suggesting that cognitive factors – such as working memory capacity (WMC) – play a critical role in determining how individuals process auditory information, particularly in noisy environments. Notably, individuals with stronger working memory exhibited better performance in auditory processing tasks, reflecting a possible compensatory effect where cognitive strength helps mitigate auditory challenges. This insight is particularly relevant for HA users, as it highlights the importance of considering cognitive measures when fitting and adjusting hearing devices.

## IMPLICATIONS FOR CLINICAL PRACTICE

The article highlights an essential shift in audiology towards a more comprehensive understanding of auditory challenges, particularly as they relate to cognitive factors. Standard audiometric tests may not fully capture the perceptual difficulties encountered by older adults, suggesting the need to incorporate suprathreshold assessments. Such tests could provide insights into the complex interplay between cognitive decline and auditory perception which often occur with age. Integrating these additional measures would enable clinicians to offer more targeted interventions, such as cognitive training exercises or personalised HA settings, to improve patient outcomes.

Furthermore, the study's use of portable and automated testing platforms, such as the PART (Portable Automated Rapid Testing) system employed in this study, exemplifies a practical approach to applying these insights in clinical settings. The portability and rapid testing capabilities of the PART system make it a scalable solution, enabling audiologists to conduct comprehensive auditory and cognitive assessments efficiently, thereby broadening the potential for widespread adoption.

## CONSIDERATIONS AND FUTURE DIRECTIONS

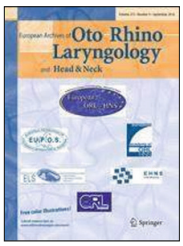
The authors call for further research to refine these profiles and validate their applicability in clinical settings. They propose that future studies should consider larger and more diverse samples to determine the generalisability of these profiles. Additionally, given that cognitive performance emerged as a key factor in auditory processing, the authors further suggest that future studies could explore specific cognitive interventions aimed at improving auditory perception. Additionally, the development of new auditory test batteries which incorporate cognitive measures could be particularly beneficial, as they could provide a fuller picture of a patient's auditory capabilities.

This study also raises questions about how technology, such as advanced HAs, might be optimised to meet the challenges of individual profiles. Tailoring HAs not only to address an individual's HL but also to leverage each person's cognitive and perceptual strengths could lead to greater device satisfaction and reduced listening effort. This precision-driven approach aligns with broader trends in healthcare towards personalised treatment plans that cater to the unique needs of each patient in a comprehensive way.

## CONCLUSION

The findings of Cherri *et al.* present a valuable contribution to precision audiology, highlighting the need for diagnostic methods which address the full spectrum of both auditory and cognitive abilities. By identifying distinct auditory profiles, the study highlights the limitations of traditional audiological evaluations, which may fall short in addressing the complex needs of older adults. This work lays the groundwork for more tailored interventions in audiology, emphasising the need for integration of cognitive assessments alongside auditory care to better support patients. •

# -SPEECH PERCEPTION OUTCOMES IN HEARING-IMPAIRED INDIVIDUALS WITH MICROPHONE & RECEIVER IN THE EAR (M&RIE) HEARING AIDS




*Chaithra MC. & Manjula P.*

*Eur Arch Otorhinolaryngol. (2024): 281(7), 3813–20*

*doi: 10.1007/s00405-024-08632-x. Epub 2024 Apr 20.*

*PMID: 38642084.*

*By Connie Loi — New Zealand*

**In this paper, the authors aim to clinically validate the speech identification and quality ratings associated with microphone & receiver-in-the-ear (M&RIE) hearing aids.**

Hearing aid (HA) technology has remarkable strides, namely by leveraging advances in other fields, such as microphone systems, evolving from basic omnidirectional to sophisticated directional microphones equipped with pinna compensation algorithms. These innovations have, in turn, improved speech recognition, particularly in the presence of background noise, greatly improving the overall hearing experience for HA users. However, directional microphones come with certain limitations, such as higher sensitivity to wind noise, reduced sensitivity to sounds from behind, a reduction in low-frequency gain, and higher internal noise. Similarly, while pinna compensation algorithms aim to optimise sound perception, they are typically calibrated for the 'average ear' and designed to focus primarily on sounds coming from the front along the horizontal plane. This means they may fail to account for sound from all azimuths and elevations.

To address these limitations, M&RIE (Microphone & Receiver-In-Ear) technology was developed, integrating a microphone within the ear canal to provide more natural sound capture through pinna compensation. This innovation aims to recreate a more authentic auditory experience by closely mimicking how the ear naturally receives sound. While M&RIE technology shows promise in overcoming some of the challenges posed by hearing loss, further clinical research is necessary to fully validate its potential for revolutionising HA technology.

## PARTICIPANTS

The study involved 20 Kannada-speaking participants, aged 19 to 50 years, divided into two groups:

- **Naive group:** Participants with no prior HA experience.
- **Experienced group:** Participants with at least two months of HA experience.

**CRITICAL NOTE**

*The study highlights the importance of preserving ear canal and pinna cues for improving speech identification. Placing the microphone at the entrance of the ear canal appears to enhance speech recognition in both quiet and/or noisy environments. However, further research is needed to validate the effectiveness of M&RIE receivers, ideally through real-ear aided gain measurements and acoustic analysis.*

## EXCLUSION CRITERIA

- Individuals with neurological conditions (including auditory neuropathy and/or retrocochlear abnormalities) or psychiatric issues were excluded.

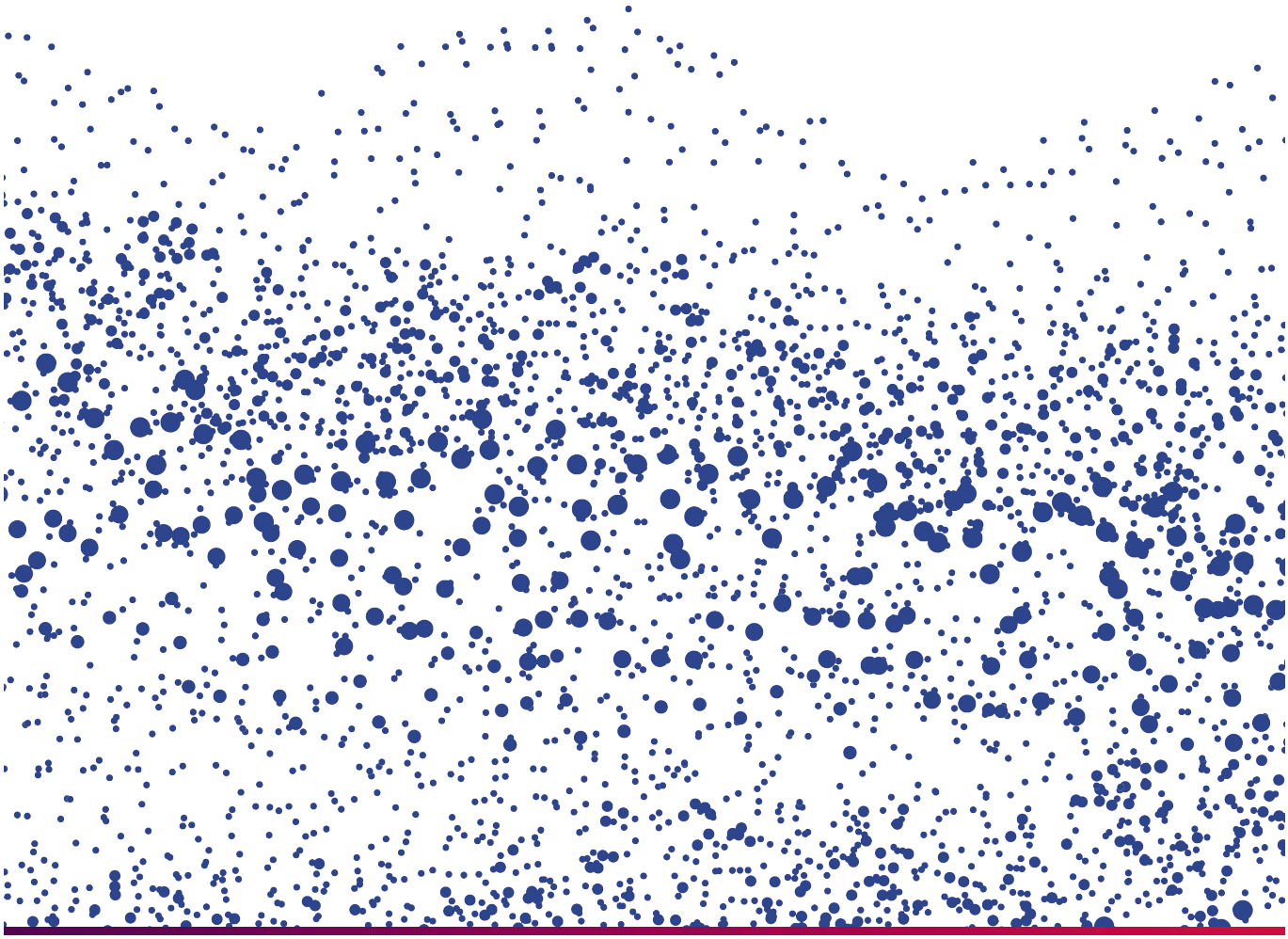
## PROCEDURES

- A thorough case history and pure-tone audiometry (PTA) were conducted to rule out any outer and middle ear pathology.
- Aided testing took place in a sound field, with a calibrated loudspeaker positioned one metre away from the participants, who were tested in two conditions: HAs with receiver-in-the-ear; and an M&RIE receiver, positioned at 0° azimuth.
- The study compared speech identification performance between the two groups in quiet conditions, using ten Kannada phonemically balanced sentences. Speech identification in noise was assessed using the Signal-to-Noise Ratio (SNR-50) and analysed with the Spearman-Karber equation.
- Participants rated the quality of speech perceived through the standard receiver and M&RIE receiver using an 11-point grading system, across five quality parameters:

overall impression; loudness; clarity; naturalness; and pleasantness.

## RESULTS

- There was no significant difference in speech identification scores between the naive and experienced group, either in quiet or in noisy conditions.
- However, when comparing the two receiver conditions within each group, the M&RIE receiver outperformed the standard receiver across all speech perception measures.
- Interestingly, naive users rated the standard receiver higher in terms of overall impression, clarity, naturalness, and pleasantness compared to experienced users.



# HEARING LOSS AND DEMENTIA:

## WHERE TO FROM HERE?


*Dawes P. & Munro KJ.*

*Ear Hear. (2024): 45(3), 529–36 & Ear Hear. (2024): 45(5), 1088*

*doi: 10.1097/AUD.0000000000001494. Epub 2024 Feb 21. PMID: 38379156; PMCID: PMC11008448. & doi: 10.1097/AUD.0000000000001521. Epub 2024 Apr 15. PMID: 38825741.*

*By Lawrence Sim – Australia*

**This paper presents a counterargument to the suggested link between hearing loss (HL) and dementia. The authors urge clinicians to approach hearing interventions cautiously, avoiding claims of dementia prevention, and instead highlighting proven benefits of addressing HL in its own right, such as its potential for improving communication and quality of life.**

Please note, this review also includes the 'Erratum', which was published in September 2024.

### HEARING AND COGNITION: IS THERE A CAUSAL LINK?

The associations between hearing, vision, and cognitive function has been discussed at length for over a century. However, it gained significant attention following a 2011 study by Lin *et al.*, which found that people with reduced hearing were at a higher risk of developing dementia over time. This association could be causative in nature, either directly through changes in auditory input which affect brain structures supporting cognition, or indirectly due to social isolation and a lack of engagement in mentally stimulating activities. Conversely, it is also possible that the causal link may be reversed, with impaired cognitive function contributing to greater hearing difficulties. Another perspective suggests that no direct causal relationship exists between HL and cognition, and that both may be influenced by shared factor(s) which impact both hearing and cognition.

A 2020 Lancet review by Livingston *et al.* – which analysed three studies on dementia interventions – formed the conclusion that eradicating HL could potentially reduce dementia cases by 8%. However, this figure may be misleading as the estimated 8% does not reflect the individual risk level, but rather the 'percent attributable fraction' – a measure that reflects the proportion of dementia cases linked to HL, which is comparatively high as HL was prevalent amongst study participants. Additionally, as highlighted by the authors, the studies focused on sample populations from wealthier countries, such as the United Kingdom, whereas factors such as malnutrition and smoking, may play more significant roles in dementia risk in poorer countries. As a result, it may be an oversimplification to claim that HL is the largest modifiable risk factor for dementia globally.

### CRITICAL NOTE

*The link between hearing loss (HL) and dementia risk, as well as the potential benefits of hearing interventions for reducing cognitive decline remains inconclusive in current research. Rather than focusing on cognitive outcomes to promote the adoption of hearing interventions, the authors suggest that audiology professionals should prioritise addressing HL in its own right by raising awareness of its impact on communication and overall quality of life.*

*It is surprising, however, that the authors describe the hearing intervention programme provided to participants in the ACHIEVE study as 'impressively comprehensive', noting that such a program is typically not implemented in standard clinical settings. In our view, the programme deployed in the study should be considered a baseline intervention and falls short of the requirements outlined in the ISO 21388:2020 standard* (Acoustics – Hearing aid fitting management, or HAFM).*

### CAN HEARING INTERVENTIONS DECREASE THE RISK OF DEMENTIA?

Dawes and Volter (2003) compiled the findings of several observational studies examining the cognitive benefits of hearing interventions over a follow-up period of more than three years. Among the three studies focused on cochlear implants (CIs), the results were promising, with participants showing lasting cognitive improvements post-implantation. However, the authors cautioned that the methodological limitations of these studies, such as the absence of control groups and high dropout rates, made it difficult to draw definitive conclusions about the cognitive benefits of CIs. In contrast, among the 16 studies which involved hearing aid

(HA) interventions, eight reported positive cognitive outcomes, whereas the remaining eight showed no significant benefits.

## ACHIEVE STUDY

Randomised controlled trials (RCTs) are considered the gold standard in clinical research. However, conducting such studies on cognition presents significant challenges. Due to the slow pace of cognitive decline and the relatively low rates of incident dementia, these studies require large sample sizes and long durations to yield meaningful results. One such RCT, the Ageing and Cognitive Health Education in Elders (ACHIEVE) study, was conducted by Lin et al. (2023). In this study, 977 participants with newly diagnosed hearing impairment were randomly assigned to two groups. One group received hearing interventions, including being fitted with HAs and assistive listening devices (ALDs), whereas the other group, serving as a control, received non-hearing interventions such as education on health and chronic disease management. The researchers found no significant difference in overall cognitive outcomes between the two groups over a period of three years.

Participants in the ACHIEVE study were drawn from two sources: the Atherosclerosis Risk in Communities (ARIC) study (n=238); and the general public (n=739). The researchers found significantly less cognitive decline in the ARIC cohort, but no such effect in the public cohort. They concluded that hearing interventions might help slow cognitive decline over three years in older adults at higher risk, but have little impact on those with a lower risk for cognitive decline. While this finding was positive, the authors cautioned against overinterpreting the results given that the study's main finding was negative. They also posited that, by corollary, HA interventions may not be as effective in reducing cognitive decline in individuals with multiple risk factors, as these might be less responsive to hearing-focused intervention. They further questioned the lack of correlation between hearing intervention and severity of HL, as one would reasonably assume that the benefit of HL intervention would be larger among those with higher degrees of hearing impairment.

The authors noted that participants in the ACHIEVE study received an unusually comprehensive hearing intervention, one that is not typically available in standard clinical settings. As a result, it remains uncertain whether the positive outcomes observed in the ARIC cohort would be replicated in more typical hearing care environments.

## ADDRESSING HEARING LOSS IN ITS OWN RIGHT

The issue of HL represents a major public health challenge, and is one of the biggest burdens in terms of years lived with disability. However, the authors noted a troubling trend in recent research, where many papers make a blanket statement to the effect of 'hearing loss is a marker of risk for dementia'. This framing implicitly diminishes the importance of addressing HL itself, positioning it primarily as a risk factor for dementia rather than a condition in need of treatment. The authors cautioned that if the effectiveness of hearing interventions in reducing cognitive decline remains inconclusive, it could lead to a reduction in support or funding for hearing-related research from stakeholders with an interest in hearing care.

Moreover, the authors argued that linking HL directly to an increased risk of dementia may inadvertently discourage people from seeking help for their HL. Research has shown that scare tactics can sometimes backfire, dissuading people from taking action. Instead, the authors stressed the importance of framing the treatment of HL in terms of its direct impact on communication and overall quality of life, without necessarily tying it to the risk of dementia.

## THE RELATIONSHIP BETWEEN HEARING, COGNITION AND DAILY FUNCTIONING

The primary findings from the ACHIEVE study suggest that HAs are unlikely to directly slow cognitive decline in individuals with hearing impairment. However, HL may amplify cognitive impairment, leading to greater functional difficulties. By supporting independence in daily life, HAs may indirectly help reduce the risk of dementia. While the primary benefit of HAs is to mitigate HL and improve communication and daily functioning, the authors contend that by supporting overall cognitive function and daily life activities, HAs can play a key role in mitigating dementia.

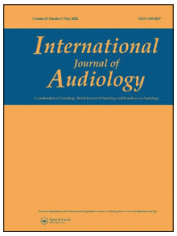
## MEETING THE HEARING NEEDS OF THE DEMENTIA POPULATION

Both HL and dementia are strongly correlated to aging, and as a result, they often co-occur in older adults. However, research indicates that HL is frequently overlooked in individuals with dementia. This is concerning, because untreated HL can compound the effects of dementia, negatively impacting daily functioning, mental health, and overall quality of life. Furthermore, HL can exacerbate common dementia symptoms, such as agitation, delusions, and anxiety.

Despite this, many audiologists express discomfort in providing hearing care services to individuals with dementia, or believe that the challenges in providing such services to this population are too great. However, studies have shown that people with dementia can be tested reliably with adapted testing methodology and respond positively to hearing interventions. The authors urge the audiology community to embrace a more inclusive approach in order to cater to the needs of the dementia population, recognising when a patient may have dementia and offering tailored care that addresses the unique needs of this population. •

*Reference: ISO 21388:2020–Acoustics – Hearing aid fitting management (HAFM)–https://www.iso.org/standard/74602.html

# THE EXPERIENCE OF STIGMA RELATED TO HEARING LOSS AND HEARING AIDS: PERSPECTIVES OF ADULTS WITH HEARING LOSS, THEIR FAMILIES, AND HEARING CARE PROFESSIONALS




*Nickbakht M., Ekberg K., Waite M.* et al.
*Int J Audiol. (2024): 2, 1–8*
*10.1080/14992027.2024.2353862. Epub ahead of print. PMID: 38824458.*

*By Mark Laureyns – Italy – Belgium*

**This qualitative survey is the first of its kind. In addition to perspectives from adults with hearing loss and their families, the authors also included the perspectives of hearing care professionals to explore stigma surrounding hearing loss and hearing aids. The diverse viewpoints make it an essential read for all hearing care professionals.**

## INTRODUCTION

The authors provide an overview of various types and models of stigma:

- **Self-stigma:** The internalisation of negative stereotypes by individuals who seek help, leading to delays in seeking assistance, lower adherence to treatment, and increased social isolation (Corrigan & Watson, 2002; da Silva *et al.* 2023).
- **Affiliate stigma:** Negative feelings relatives of stigmatised individuals develop towards themselves (Mak and Cheung 2008).
- **Discreditable vs. discredited stigma:** Discreditable stigma refers to a stigma that is unknown or concealable; while discredited stigma refers to a stigma that is openly visible or known (Goffman, 1963).
- **Stigma as identity threat:** Stigma-related stressors that are perceived as harmful to one's social identity and extending beyond one's coping capacity. This threat triggers involuntary stress responses and motivates efforts to reduce the threat through coping strategies (Major and O'Brien 2005)).
- **Stigma as belief vs. social process:** Stigma can be viewed either as an individual belief or attitude or as a broader social process that shapes societal interactions and perceptions.

Qualitative research on hearing loss (HL) and hearing aid (HA)-related stigma remains limited, and has been conducted across the following populations:

- Seniors with acquired HL
- Partners of seniors with acquired HL
- Individuals with congenital HL
- Seniors and their significant others
- HA users
- Communication partners of people with hearing loss

The themes, topics and methodologies leveraged in existing studies include:

- Qualitative interviews
- HL linked with ageing
- Negative reactions from others
- Psychosocial experiences
- Impact on self-perception and self-identity
- Self-identity
- Five major stigmatising experiences identified by people with HL (Lash and Helme 2020):
  - Feelings of pity or being the object of sympathy,
  - Perception of not being worth others' time,
  - Being labelled as 'not normal',
  - The perception that hearing loss limits capabilities and intelligence,
  - The view that HL is different from other types of disabilities

## STUDY DESIGN

### Participants

The study involved a total of 63 participants, divided into three groups:

- **Adults with hearing loss (HL):** 20 participants (7 female, 13 male) aged 53–83 years, including 12 HA users with an average PTA4 of 36 dB HL.
- **Family members (FAM):** 20 participants (16 female, 4 male) aged 18–82 years, 8 of whom also had HL.
- **Hearing care professionals (HCP):** 23 participants (19 female, 4 male), comprising 19 audiologists and six audiometrists. Of particular note, the authors highlight that this is the

first study to incorporate the perspectives of hearing care professionals on stigma.

## METHOD

- **Recruitment:** Participants were recruited through social media, organisations, and word of mouth.
- **Questionnaires:** Although not explicitly detailed in the publication, references to Ekberg & Hickson (2023) suggest that multiple questionnaires on hearing loss (HL) and hearing aid (HA) stigma were available, including supplementary materials and interview guides tailored for specific groups.
- **Interviews:** Structured interviews were conducted by trained and qualified audiologists, lasting between 13 and 73 minutes. Interviews were held individually for the HL, FAM, and HCP groups, with joint sessions for HL participants and their respective FAM subjects. Stigma was not directly addressed unless participants failed to mention it during the discussion.
- **Data analysis:** Thematic analysis following the Braun & Clarke (2021) framework.

## RESULTS

**Stigma Experienced by the HL Group**

- **Stereotypes associated with HL/HAs:**
  - Sign of aging.
  - Sign of weakness, disability
  - Associated with being 'not normal' or 'different'.
  - HL/HA users often stereotyped as less intelligent.
- **Varied perspectives:**
  - **Focus of stigma:** Individuals with HL emphasise stigma related to their condition rather than the use of HAs; HCPs view stigma as more focused on HA use than HL itself.
  - **Self-stigma:** 'it's only in our heads.'
  - **Changes over time:** Adults report a reduction in stigma over time; younger individuals report increased stigma but are less affected or discriminated against.
  - **Emotional & social impact:**
    - Feelings of embarrassment, sadness, shame, and worry were common across HL, FAM, and HCP groups, though some HL participants and FAM were unaffected.
    - HL adults feel more at ease with other adults with HL and express a need for peer support groups.
  - **Family and public perception:**
    - **FAM:** Some HL individuals found their FAM understanding and supportive; while others felt misunderstood, ignored, or treated rudely.
    - **General public:** HL participants and HCP noted negative public perceptions of HL/HA, including impacts on jobs and feelings of being judged; in contrast, FAM viewed the general public as more accepting and understanding.
    - **HCPs:** Experiences ranged from feeling HCPs were dismissive or rude to some reporting positive and supportive interactions.
  - **Views on HA design:** HL and FAM were positive about modern HA designs, praising their small, invisible, and aesthetically pleasing features; HCPs expressed mixed views, with some finding HAs bulky or unattractive.
  - **Glasses vs. hearables:** Some HCPs believe HAs are not as acceptable as glasses due to societal norms; others argue that assistive solutions like HAs should be normalised, much like glasses.
- **Affiliate stigma:**
  - FAM largely reported no experiences of affiliate stigma.
  - Some HCPs speculated that affiliate stigma might discourage FAM from encouraging HL individuals to use HAs.

### CRITICAL NOTE

*The authors offer a concise yet comprehensive introduction, setting the stage effectively. A notable strength of this publication is its inclusion of the perspectives of healthcare professionals (HCP) alongside those of HL individuals, hearing aid (HA) users, and their families (FAM), marking a first in such studies. This qualitative approach uncovers interesting contrasts, both within the various groups but also between the Hearing Loss (HL)/FAM and HCP groups. However, the study's qualitative design precludes quantifying the results. Moreover, the absence of detailed information on the questionnaires used is unfortunate and is a missed opportunity for deeper insights. Additionally, while stigma was not directly addressed in structured interviews to avoid influencing participants, stigma-related questionnaires were administered beforehand, creating a methodological inconsistency. Despite these shortcomings, the study's strengths outweigh its limitations and it should be considered essential reading for all hearing care professionals.*

## CONCLUSIONS

The HL group reported experiencing multiple forms of stigma, while the HCP group did not report experiencing affiliate stigma. Both the HL and FAM groups perceive stigma related to HL as more significant than stigma related to HAs. Interestingly, HCPs identify HA stigma as the primary concern – an interesting divergence in perspectives. •

# DEVELOPMENT OF MEASURES FOR D/DEAF AND HARD OF HEARING STIGMA: INTRODUCTION TO THE SPECIAL SUPPLEMENT ON STIGMA MEASUREMENT TOOLS


*Stockton MA., Francis HW., West JS.,* et al.

*Ear Hear. (2024): 45(Suppl 1), 4S–16S*

*doi: 10.1097/AUD.0000000000001543. Epub 2024 Sep 19. PMID: 39294877; PMCID: PMC11414531.*

*By Mark Laureyns – Italy – Belgium*

**The Measures, Models, and Stigma-Reduction Subgroup of the Lancet Commission on Hearing Loss initiated the development of tools to measure stigma associated with being d/Deaf or Hard of Hearing, as detailed in the special issue of Ear and Hearing. The preliminary validation involved 2,584 participants across Ghana and the U.S., divided into five target groups.**

## INTRODUCTION

The article under review serves as the introduction to a special issue of Ear and Hearing (September 2024) created by a subgroup of the Lancet Commission on Hearing Loss (LCH). The team comprises 27 experts in ear and hearing care from around the world, representing high-income (HIC), middle-income (MIC), and low-income countries (LIC). The contributors are affiliated with the World Health Organization (WHO) or prestigious institutions dedicated to ear and hearing health.

The LCH identifies stigma as a significant barrier that can hinder access to and the effectiveness of ear and hearing care. This care is essential in reducing the consequences of untreated HL across HIC, MIC, and LIC. In response, the LCH established the 'Measures, Models, and Stigma-Reduction Subgroup' (MMSR), comprising all the authors of this article.

The title chosen by the authors highlights two particular areas of focus. Firstly, we can see an emphasis on inclusivity, as the paper's scope covers 'd/Deaf and Hard of Hearing (d/DHH) stigma'. The term 'deaf' refers to individuals with hearing loss (HL) who do not identify with Deaf culture, while 'Deaf' refers to those who see themselves as part of the Deaf community and culture. The term 'Hard of Hearing' encompasses the broad range of individuals with auditory disabilities who do not identify as either 'deaf' or 'Deaf.'

The second area of focus in the title is highlighted by the term 'Measure,' which emphasises the development of tools, such as questionnaires, to facilitate research on stigma. These measures aim to assess the extent and impact of stigma, explore its various forms, examine its connections to different aspects of quality of life and health, and ultimately evaluate the effectiveness of interventions designed to reduce stigma.

### CRITICAL NOTE

*The introduction of this article provides a comprehensive overview of the various types of deaf/Deaf and Hard of Hearing (d/DHH) stigma identified in the literature. The thorough process behind the development of new measures for d/DHH stigma and ageism instils confidence in their use for future research. However, while the article offers valuable insights into the validity of these measures, it does not address the prevalence or quantification of different types of d/DHH stigma across various target groups, nor does it explore specific strategies for reducing stigma. Further studies will be necessary to deepen our understanding of these aspects.*

The introduction begins with a foundational overview of stigma, drawing on definitions from key scholars and organisations:

- **Stigma:** 'A relational phenomenon that occurs within the context of power when a person possesses, or is thought to possess, attributes that suggest a condition or social identity that others consider to be of little value, abnormal, or undesirable in a particular social context.' (Becker 1981; Crocker *et al.* 1998)
- **Experienced stigma:** 'Stigma enacted through interpersonal acts of discrimination' (Nyblade *et al.* 2021)
- **Perceived stigma:** 'A stigmatised person's understanding of the prevalence of stigma and how people act towards those with the stigmatised condition or identity' (Nyblade *et al.* 2021)

- **Internalised stigma:** 'Stigma that the stigmatised accept as true and incorporate into their self-image (also known as self or affiliative stigma)' (Nyblade *et al.* 2021)
- **Anticipated stigma:** 'The fear or expectation of stigma or discrimination' (Nyblade *et al.* 2021)
- **Observed stigma:** 'Hearing stories about or witnessing discrimination towards others' (Nyblade *et al.* 2021)
- **Secondary stigma:** 'Stigma faced by people associated with stigmatised individuals or groups' (WHO, 2001)
- **Intersectional stigma:** 'The convergence and amplification of stigma that occurs when a person belongs to multiple stigmatised groups' (Turan *et al.* 2019; Sievwright *et al.* 2022)

## D/DHH STIGMA

The WHO estimates that 23% of the global population is d/Deaf or Hard of Hearing (d/DHH), a group that is particularly vulnerable to stigma. This stigma can also extend to their relatives, caregivers, colleagues, and hearing care professionals (HCPs), who may experience, witness, or perpetuate discrimination.

The perception of d/DHH can vary widely, with some associating it with misfortune due to 'bad luck', as a result of natural causes such as genetics, noise exposure, or infections; while others may attribute it to supernatural explanations, such as witchcraft or divine punishment, depending on the cultural context.

Individuals who are d/DHH are often perceived as distant, insecure, disabled, weak, elderly, or unintelligent. However, these perceptions can shift depending on the social environment and cultural influences.

Those individuals who do identify with Deaf culture embrace their deafness with pride, seeing it as an integral part of their identity, culture, history, and language. They may experience stigma differently, in ways that are uniquely tied to their use of sign language and alternative forms of communication.

For d/DHH children, the reliance on parents, caregivers, teachers, and others to access language can lead to delays in the development of language, education, and social skills. These delays can either result from or contribute to stigma at various stages of childhood. In early adulthood, d/DHH individuals may face negative impacts on their education, employment opportunities, salaries, and romantic relationships due to stigma. In later life, challenges such as job retention, social isolation, ageism, acceptance of being HH, and delayed access to hearing care can further exacerbate the effects of stigma.

## IMPORTANCE OF MEASURING D/DHH STIGMA

Documenting the impact of stigma on the health and well-being of d/DHH individuals, as well as their access to healthcare interventions, is crucial. Measuring d/DHH stigma is equally important for assessing the effectiveness of stigma reduction strategies. This evaluation should account for cultural differences, socio-economic factors, and varying life stages.

## HOW TO CREATE D/DHH STIGMA MEASURES?

In order to be relevant, measures need to be developed and validated in both HIC and LIC. They should be applicable to d/DHH individuals with acquired HL as well as those who have been d/DHH since birth, alongside their significant others, caregivers, and HCPs. These measures should evaluate stigma related to HL, HAs, and ageism. The development process followed five stages:

- **Survey Development:** A comprehensive scoping literature review identified 200 survey items related to various dimensions of stigma. These were selected for different target groups, such as lifelong d/DHH, acquired d/DHH, relevant others, HCPs, and the general population. The aim was to create a core set of items which could be applied to most target groups.
- **Modified Delphi Process:** Experts from the LCH stigma group conducted reviews across 15 countries, engaging with individuals who have acquired or lifelong d/DHH (both sign language users and those who rely on spoken communication), parents of d/DHH children, researchers, and HCPs.
  - After each review session, participants assessed the survey items based on:
  - Their relevance and appropriateness for identifying different types of stigma or discrimination.
  - Clarity and cultural appropriateness.
  - Potential for shortening or removing items.
  - Identifying any missing aspects.

Following these evaluations, the teams refined the survey items for the next stage of development.

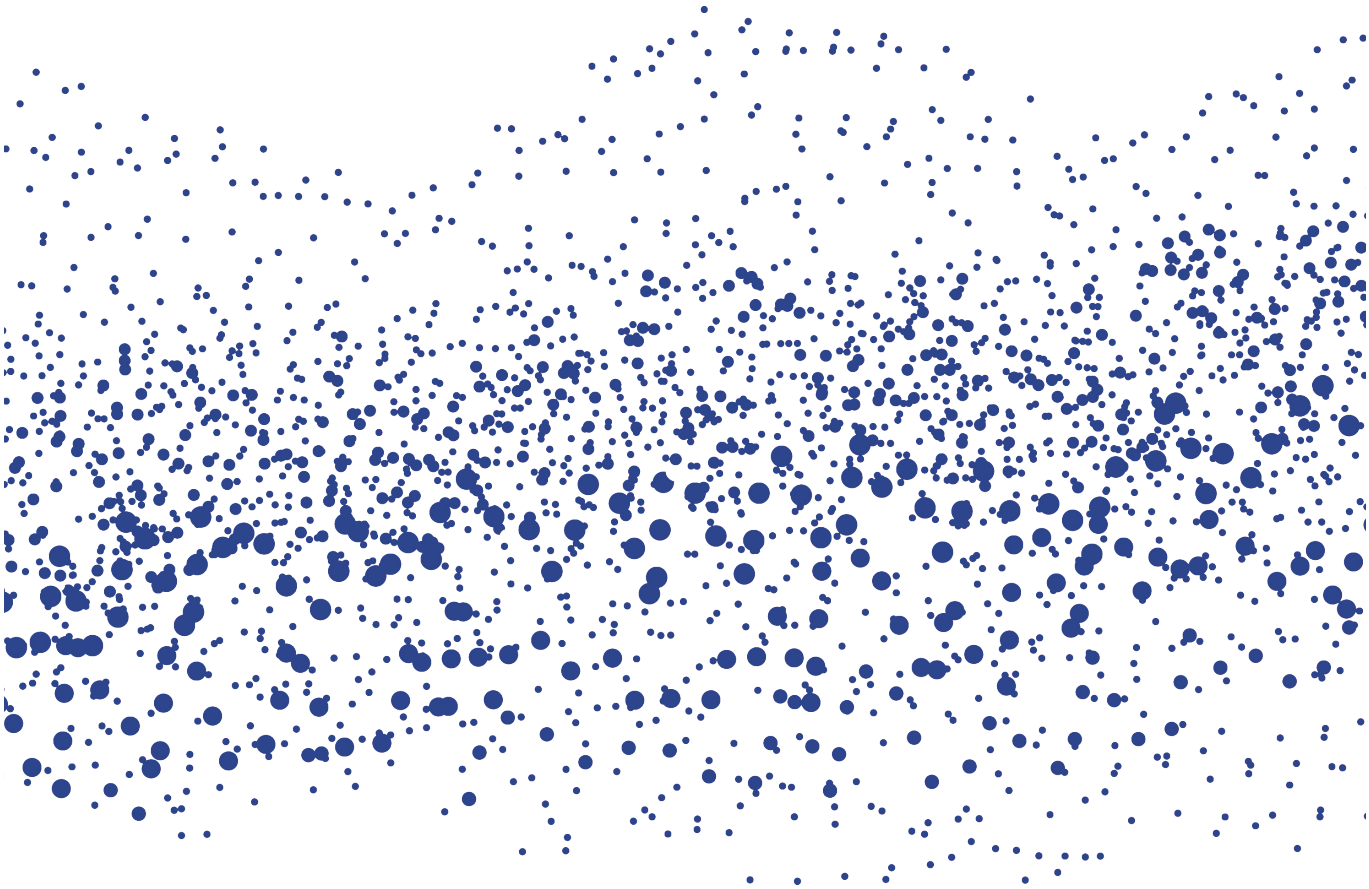
- **Cognitive Interviews:** These interviews aimed to assess the clarity and comprehension of the survey questions, identify the most relevant questions regarding stigma, and determine which questions were either irrelevant or inappropriate. Conducted in both the United States (HIC) and Ghana (LIC), the interviews involved a diverse range of participants, including lifelong d/DHH individuals, those with acquired d/DHH, parents and caregivers of d/DHH children, HCPs, and members of the general public, all selected based on specific inclusion criteria. Following these interviews, the surveys were revised.
- **Pretesting:** The revised survey was administered to a diverse group of participants in both the United States (HIC) and Ghana (LIC), recruited through various methods, including in-person interviews by trained interviewers, online surveys, and paper-based questionnaires. In Ghana, 90 participants (33% lifelong d/DHH, 33% acquired d/DHH, and 33% parents of d/DHH children) completed the pretest. In the U.S., 152 participants (22% acquired d/DHH, 20% care partners of d/DHH, 21% hearing care professionals,

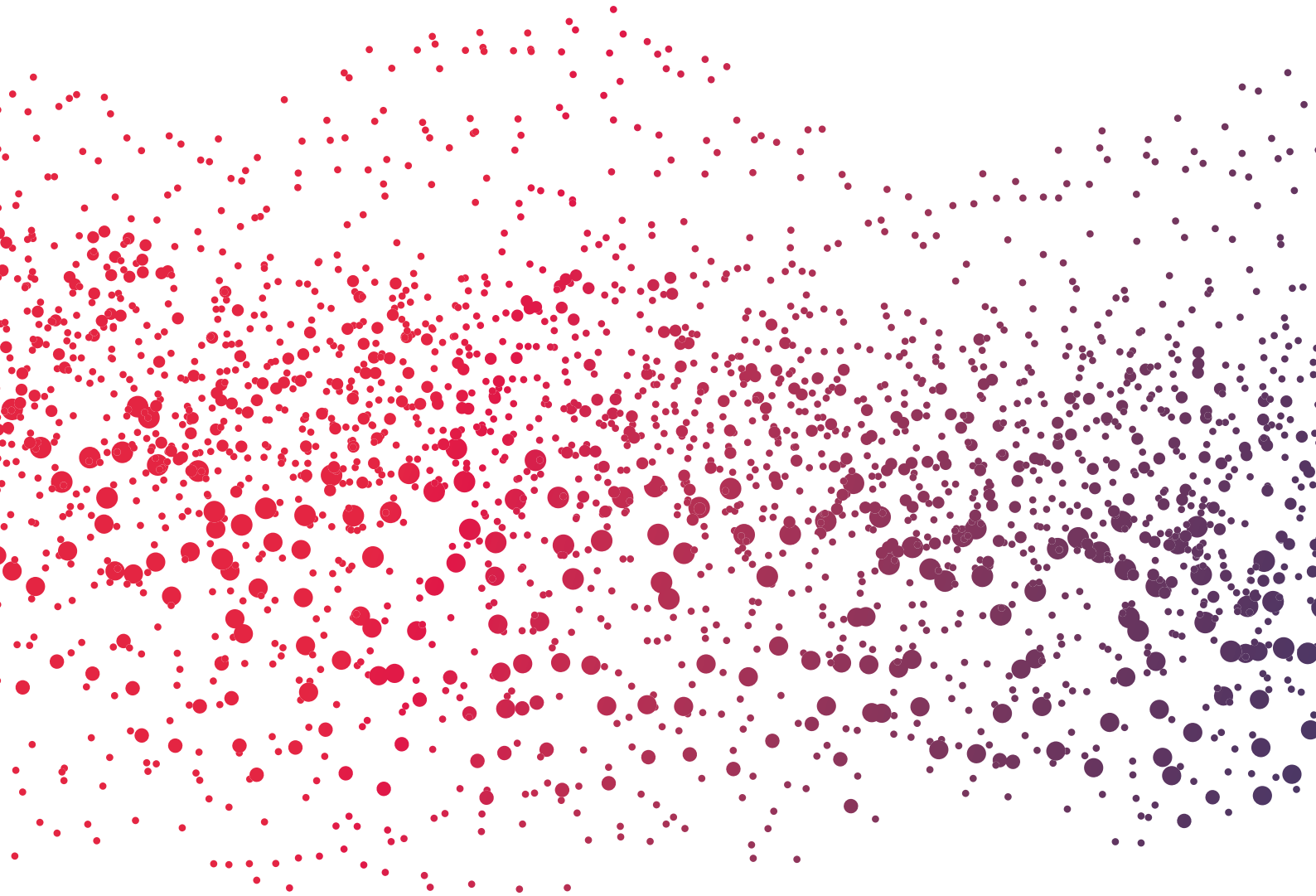
and 38% members of the general public) completed the pretest. The pretest surveys were analysed and revised based on factors such as timing, any issues encountered, and the clarity of specific items. As a result, distinct surveys were developed for six target groups: lifelong d/DHH; acquired d/DHH; parents of d/DHH children; HCPs; care partners of d/DHH; and the general public.

- **Psychometric Validation:** The detailed results of the psychometric validation are presented in other articles within this special supplement of Ear and Hearing. For ease of reference, we provide a summary of the key findings below:
  - 'Preliminary validation of measures of experienced, perceived, and internalised stigma among adults who are d/deaf or hard of hearing in the United States and Ghana' (Stelmach *et al.* 2024): The study involved 271 lifelong d/DHH participants and 393 with acquired d/DHH. Results indicated that the scales measuring experienced, perceived, and internalised stigma are valid, with ordinal αs ranging from 0.73 to 0.95, 0.86 to 0.94, and 0.86 to 0.94, respectively.
  - 'Preliminary validation of stigma measures among parents of children who are d/deaf or hard of hearing in the United States and Ghana' (Saalim *et al.* 2024): This study included 293 parents of d/DHH children. The findings demonstrated strong reliability for all scales, with ordinal αs ranging from 0.86 to 0.96. However, further research is needed to test these measures across various countries and with more diverse populations.
  - 'Development and preliminary validation of stigma measures for care partners of persons who are d/deaf or hard of hearing' (Wallhagen *et al.* 2024): This study included 151 care partners of d/DHH individuals. Results indicated satisfactory internal reliability for the subscales (with ordinal αs all greater than 0.9), but additional validation is required.
  - 'Development and Preliminary Validation of Scales to Measure Enacted, Perceived, and Experienced Hearing Loss Stigma in Health Care Settings' (Adams *et al.* 2024): The study involved 204 HCPs, including 50% primary healthcare professionals, 26% ENT specialists, and 24% audiologists. The results showed satisfactory reliability, with ordinal alpha coefficients ranging from 0.85 to 0.94.
  - 'Preliminary validation of hearing device-related stigma measures in four United States populations' (West *et al.* 2024): This study involved 539 participants, including 14% lifelong d/DHH, 13% acquired d/DHH, 15% parents of d/DHH children, 20% care partners of d/DHH, and 38% HCPs. The results indicated that the four stigma measures performed well in their respective populations, with ordinal alpha coefficients as follows: 0.93 for lifelong d/DHH, 0.94 for acquired d/DHH, 0.91 for parents of d/DHH children, 0.95 for care partners of d/DHH, and 0.89 for HCPs.
  - 'Preliminary validation of experienced ageism measures with four populations in the United States' (Nyblade *et al.* 2024): This study included 733 participants, with 20% being acquired d/DHH individuals over 60 years old, 10% care partners of acquired d/DHH, 43% from the general population, and 28% HCPs. The results showed strong reliability for ageism measures, with ordinal alpha coefficients ranging from 0.74 to 0.98 for acquired d/DHH> 60 years, 0.95 for care partners of acquired d/DHH, 0.96 for the general population, and 0.96 for HCPs. These findings provide a solid foundation for further research.

## CONCLUSIONS

This special issue presents a robust procedure for developing measures to assess d/DHH stigma, with a particular emphasis on the psychometric evaluation of these tools. This approach lays the groundwork for future research into d/DHH stigma, fostering a deeper understanding of its implications for ear and hearing care. Ultimately, the goal is to drive stigma reduction initiatives, with these validated measures serving as a means to assess the effectiveness of such actions. •





AMPLIFON CENTRE FOR RESEARCH AND STUDIES

amplifon